

DST/NRF Centre
of Excellence at the

Percy FitzPatrick Institute

Annual Report
January – December 2006

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Dr G. Avery (Wildlife and Environment Society of Southern Africa)
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Prof. T.J. Robinson (University of Stellenbosch, co-opted)
Prof. L.G. Underhill (UCT)
Mr F. van der Merwe (co-opted)
Dr G. Verdoorn (BirdLife South Africa)

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Introduction

For the DST/NRF Centre of Excellence (CoE) at the Percy FitzPatrick Institute, the reporting period represents one of leaving the starting blocks in a competitive sprint. At the same time, the Institute itself continues on a long-distance race where consistent performance is of the essence. The CoE is now well placed to continue the production of high quality science and well-educated students, and the quality of our research publications (as measured by SCI impact factors) continue to rise. We are confident that this will have a generally strong positive effect on the opportunities that await our graduates, and that our impact as a Centre of Excellence, in the sphere of biodiversity conservation, will be acknowledged by our partners and funders as a significant return on investment.

The Percy FitzPatrick Institute has had a substantially productive year in 2006. Besides continued solid performance in the arenas of scientific publication and post-graduate student graduation, this report also includes information on our activities related to public service. While it is impossible to record every achievement of the Fitztitute in a report such as this, I wish to make a number of points that are either not made fully elsewhere, or that demand highlighting.

The Conservation Biology Programme continues to go from strength to strength. As before, we are indebted to several colleagues and guest lecturers from across the world (see Page 44). Prof. David Cumming completed a comprehensive review of the programme and, like the earlier review by Prof. Andrew Balmford, proposed that a workshop be held to reassess the curriculum. To this end, a workshop is planned for early March 2007 at which a wide range of conservation educators and practitioners are invited.

In 1999 the Percy FitzPatrick Institute was informed that Mrs Pola Pasvolsky had left a significant bequest to support a Chair in Conservation Biology. Unfortunately, the amount fell one third short of fully endowing such a position in perpetuity and we were unable to make an appointment for some years. The CoE award has enabled us to appoint Prof. Graeme Cumming to the Chair, and he joined the Fitztitute on 01 January 2006. The activation of this position significantly strengthens the Institute's capacity in the field of conservation biology. We have already seen the fruits of the skill and enthusiasm of Prof. Cumming and he is rapidly setting up what promises to be a highly productive post-graduate research group. This report includes two new research programme themes headed by him (see below).

It is to be expected that research themes at the Fitztitute will show some flux over time. This can be the result of changes in personnel as well as the opportunities and demands of the biological landscape. As a result of the retirement of Dr Richard Dean at the end of 2005, this report no longer contains a research theme on *'Arid-zone Ecology'*. However, we here report on four new research programmes. First, *'Rarity and Conservation of Southern African Birds'* has been separated from *'Life History Strategies'*. Second, *'Ecological and Evolutionary Physiology'* reports on the research area of our CoE team member from Wits, Dr Andrew McKechnie. Third, Prof. Graeme Cumming has established two new programmes, viz. *'Pattern-process Linkages in Landscape Ecology'*, and *'Spatial Parasitology and Epidemiology'*. The latter programme includes a strong focus on avian influenza and an increasing emphasis will be placed on the role that Percy FitzPatrick Institute researchers can play in this regard.

While this annual report places particular emphasis on our research programmes and the research capacity that we build, Percy FitzPatrick Institute members make substantial contributions to social responsiveness (see Appendix 1). We also have an active seminar programme (Appendix 2), and vibrant weekly research discussion groups coordinated by our post-doctoral associates, a weekly Conservation Biology



discussion group (where journal articles, careers, and conservation issues are discussed). Without wishing to single out individuals who drive these initiatives, the reader should be made aware of the role that the postdocs and each post-graduate student plays in the intellectual development of every person linked to the Institute.

Together with our colleagues at the Centre of Excellence for Invasion Biology (based at the University of Stellenbosch) we ran a highly successful Biodiversity Academy for young South African biologists (see Appendix 3). Already we have seen several of the attendees proceed to undertake post-graduate degrees at a range of institutions.

One of the greatest perks of directing an institute such as the Fitztitute (and the broader CoE), is having exceptional competence and commitment among both research and support staff. In addition, the strong support of the Chairs of both our CoE (Prof. Cheryl de la Rey) and Percy FitzPatrick Institute Boards (Prof. Kathy Driver) means that we can get on with the business that we do best; viz. science and the education of post-graduate students. We thank Prof Jenny Day (HOD Zoology) for her stint on the PFIAD Advisory Board, and welcome to the Board her successor, Prof John Hoffman.

Peter Ryan received *ad hominem* promotion to the level of Associate Professor. This is extremely well deserved as he is not only one of the staff members with the heaviest administrative burden (as coordinator of the Conservation Biology Programme), but he performs exceptionally as a scientist, academic supervisor and colleague. Moreover, he contributes significantly to the development of conservation policy and management plans of oceanic islands.

Dr Rauri Bowie, one of our highly productive CoE team members, took up a prestigious tenure-track position in late

2006 at the Museum of Vertebrate Zoology, University of California at Berkeley. While his contribution as a team member will be sorely missed, we are both proud and pleased. We have charted a way in which several of our CoE post-graduate students will benefit from working in Prof Bowie's laboratory at Berkeley, while remaining closely linked to the CoE at the Fitztitute. Rauri's appointment at Berkeley is indeed a feather in the cap of both the Fitztitute and Prof Tim Crowe (Rauri's primary PhD mentor at the Fitztitute).

Dr Penn Lloyd, manager of the CoE, and Mrs Charlene Jacobs, secretary of the CoE, have developed into a formidable and able team and are pivotal to the smooth functioning of the Centre of Excellence. Chris Tobler and Lionel Mansfield continue to provide world class support services to the researchers at the Fitztitute.

Mrs Hilary Buchanan has this year single-handedly undertaken the compilation, design and layout of the annual report. Peter Ryan offered his practiced editorial eye. I thank them, as well as the team leaders and other researchers, for the effort that they have put into this task. Once again, I trust that the report will not only be visually pleasing, but impressive in its content.

In a report such as this, one has to constantly balance detail with overview. I trust that readers will find this report informative although some readers might feel that in some places we have once again gone too light on detail. For those who desire more information on the specifics of any research programme or project, we have a comprehensive website which is updated regularly: www.fitzpatrick.uct.ac.za

Morné A. du Plessis (February 2007)
Director

MISSION STATEMENT

To promote and undertake scientific studies involving birds, and contribute to the practice affecting the maintenance of biological diversity and the sustained use of biological resources.

Changes in Personnel

Nokuthula Malamlela resigned as Senior Secretary for the Centre of Excellence at the end of 2005.

Charlene Jacobs took over from March 2006.

A recent B.Bibl. graduate from UWC, **Nomonde Sotashe**, started work as the CAPE Intern in the Niven Library in charge of the development of the Fynbos Ecology database.

Rauri Bowie, an external CoE team member, has taken up a post of assistant professor at the Museum of Vertebrate Zoology at the University of California at Berkeley, USA.

Samantha Petersen upgraded her MSc to a PhD.

Graduates

PhD: Colleen Seymour (Dec 2006)

MSc: Duan Biggs, Ruth Parker (Dec 2006)

Conservation Biology MSc:

Tammy Baudains, Sarah Fox, Potiphar Kaliba, Marie Lauret-Stepler, Takalani Maswime, Zoe McDonnell, Noah Scovronick, Vanessa Stephen, Terence Suinyuy, Karen Vickers (June 2006)

Applied Marine Science MSc:

Benedict Dundee (Dec 2006)

BSc Hons: Anne Braae, Matthew Child, Tali Hoffman, Candace Lyons, Nicola Okes (Dec 2006)

External Graduates:

PhD: Claire Spottiswoode (Cambridge, Jan 2006)

MSc: Anu Rao (Memorial University of Newfoundland, June 2006); **Menashe Kahsai** (Stellenbosch, July 2006)

Anne George, Brian Spiesman (Florida, Dec 2006),

BSc Hons: Dalemari Swanepoel (Pretoria, Dec 2006); **Robert Ashdown, Candis Lubbe** (Wits, Dec 2006)

B.Tech: Sieglinde Rode (April 2006)

New students

PhD: Ian Little (supervised by Tim Crowe), **Peter Ngoma** (supervised by Jane Turpie) and **Martha Nelson** (supervised by Morné du Plessis and Mandy Ridley)

Conservation Biology (CB) MSc: Fourteen students began the CB MSc in January 2006.

Personnel

Director

Du Plessis, M.A. PhD (Cape Town) Professor *

Academic and Research Staff

Crowe, T.M. PhD (Cape Town) Professor *

Cumming, D.H.M. PhD (Rhodes) Honorary Professor

Cumming, G.S. PhD (Oxford) Professor *

Hockey, P.A.R. PhD (Cape Town) Associate Professor *

Lloyd, P. PhD (Cape Town) Manager, Centre of Excellence

Milton, S.J. PhD (Cape Town) Honorary Professor

Ryan, P.G. PhD (Cape Town) Senior Lecturer*

Turpie, J.K. PhD (Cape Town) Senior Lecturer

External CoE Team Members

Bloomer, P. PhD (Pretoria) - University of Pretoria

Bowie, R.C.K. PhD (Cape Town) - University of Stellenbosch

Mandiwana, T. MSc (Cape Town) - Botany Dept, University of Cape Town

McKechnie, A.E. PhD (Natal) - University of Witwatersrand

Research Associates

Barnard, P.E. PhD (Uppsala)

Dean, W.J.R. PhD (Cape Town)

Jenkins, A.R. PhD (Cape Town)

Kemp, A. PhD (Rhodes)

Knight, A. MSc (NMMU)

Milewski, A. PhD (Murdoch University, W. Australia)

Simmons, R. PhD (Wits)

Visiting Scientists

Grémillet, D. PhD (Kiel)

Dale, J. PhD (Cornell University, USA)

Postgraduate students

Post-doctoral students

Covas, R. PhD (Cape Town)

Cunningham, G. PhD (U. California, Davis)

Delpont, W. PhD (Pretoria)

Eising, C.M. PhD (Groningen)

Johansson, U. PhD (Stockholm)

Radford, A. PhD (Cambridge)

Ridley, A.R. PhD (Cambridge)

Roxburgh, L. PhD (Ben Gurion)

Taylor, W.A. PhD (Pretoria)

Doctoral

Barnes, K.N. MSc (Cape Town)

Cohen, C. BSc (Hons) (Cape Town)

De Ponte, M. MSc (Cape Town)

Little, I.T. MSc (Cape Town)

Loewenthal, D. MSc (Cape Town)

Mandiwana, T.G. MSc (Cape Town)

Nelson, M. MSc (Vancouver)

Ngoma, P. MSc (Malawi)

Petersen, S. BSc (Hons) (Cape Town)

Seymour, C. MSc (Cape Town)

Techow, M. MSc (Cape Town)

Van Zyl, H. (MSc) (Cape Town)

Wanless, R. MSc (Cape Town)



Masters by Dissertation

Biggs, D. BSc (Hons) (Pretoria)
Hampton, S. BSc (Hons) (Cape Town)
Oatley, G. BSc (Hons) (Cape Town)
Parker, R. BSc (Hons) (Cape Town)
Teroerde, A. BSc (Hons) (Rhodes)
Vincent, Z. BSc (Hons) (Port Elizabeth)

Masters in Conservation Biology 2006

Bird, M. BSc (Hons) (Cape Town)
Boundja, R.P. BSc (Hons) (Marien Ngouabi)
Burnside, J. BSc (Hons) (Imperial College)
Daniels, F. BSc (Hons) (Cape Town)
Gordon, H. B.Comm (Hons) (KwaZulu-Natal)
Hill, H. BSc (Hons) (Cape Town)
Jenkins, J. BSc (Hons) (Canterbury)
Nupen, L. BSc (Hons) (Cape Town)
MacGregor, L. BVetSci (Pretoria)
Musangu, M.M. BSc (Hons) (Moi)
Raharinjanahary, D. BSc (Hons) (Antananarivo)
Schultz, P. BVetSci (Murdoch)
Shelton, J. BSc (Hons) (Cape Town)
Thomas, H. BSc (Hons) (Exeter)

Masters in Conservation Biology 2005

Baudains, T. BSc (Hons) (Cape Town) Jan-June
Fox, S.J. BSc (Hons) (Cape Town) Jan-June
Kaliba, P. BSc (Hons) (Malawi) Jan-June
Lauret-Stepler, M.A.V. BSc (Hons) (Reunion) Jan-June
Maswime, T. BSc (Hons) (Pretoria) Jan-June
McDonnell, Z.J. BSc (Hons) (British Columbia) Jan-June
Scovronick, N. BSc (Hons) (Emory) Jan-June
Shine, K.I. BSc (Hons) (Trinity) Jan-June
Stephen, V. BSc (Hons) (London) Jan-June
Suinyuy, T. BSc (Hons) (Buea) Jan-June
Vickers, K. BSc (Hons) (British Columbia) Jan-June

Masters in Applied Marine Science

Dundee, B. BSc (Hons) (Cape Town)

Zoology (Hons)

Braae, A. BSc (Cape Town)
Child, M. BSc (Cape Town)
Hoffman, T. BSc (Cape Town)
Lyons, C. BSc (Cape Town)
Okes, N. BSc (Cape Town)

Externally registered students

Doctoral

Golabek, K. MSc (Bristol) - registered at U. Bristol
Hermann, L. MSc (Pretoria) - registered at U. Pretoria
Knowles, A. MSc (Stellenbosch) - registered at U. Stellenbosch
Nangammbi, T. MSc (Cape Town) - registered at UKZN
Raihani, N. MSc (Cambridge) - registered at U. Cambridge
Spottiswoode, C. BSc (Hons) - registered at U. Cambridge

Masters

Burney, C. BSc (Hons) (Florida) - registered at U. Florida
George, A. BSc (Hons) (Florida) - registered at U. Florida
Pichegru, L. MSc (Paris) - registered at U. Strasbourg
Rao, A. BSc (Hons) (MUN) - registered at Memorial University of Newfoundland, Canada

Seoraj, N. BSc (Hons) (Durban-Westville) - registered at UKZN
Spiesman, B. BSc (Florida) - registered at U. Florida

Honours

Ashdown, R. BSc (Wits) - registered at Wits
Atyeo, M. BSc (Queensland) - registered at U. Queensland
Lubbe, C. BSc (Wits) - registered at Wits
Swanepoel, D. BSc (Pretoria) - registered at U. Pretoria

BTech

Rode, S. - registered at Tshwane University of Technology

Research Assistants

Bragg, C. (Jan-Dec)
Brown, L.H. (Jul-Dec)
Burle, M. (Jan-Oct)
Gibberd, M.J. (Oct-Dec)
Herrmann, E. (Jan-Apr)
Joubert, A. (Aug)
Meyer, E. (May-Sep)
Mills, M. (Jun-Jul)
Nupen, L.J. (Feb-Mar)
Perry, J. (Jun-Sep)
Rode, S.C. (Jan)
Russo, I.M. (Jan-Oct)
Schaefer, D. (Aug-Dec)
Suinyuy, T. (Aug-Dec)
Van der Waal, L.J.G. (Feb-Jul)
Watkins, B.P. (Jan-Jun)
Wilson, J. (Jan-Oct)

Support Staff

Principal Technical Officer

Tobler, C.J. *

Administrative Assistant

Buchanan, H.J. *

Senior Secretary, Centre of Excellence

Jacobs, C. (Mar-Dec)

Library Staff

Sandwith, M. * (Librarian)
Dalglish, S. (Volunteer)
Loubser, D. (Volunteer)
Sotashe, N. (Intern)

Departmental/Accounts Assistant

Mansfield, L.F. *

Webmaster

Stander, M.J.

* Denotes permanent member of the UCT staff establishment. All other personnel are contractual or ad hoc appointees held against posts supported by grants in aid of research, bursary holders or part-time postgraduate students employed outside the FitzPatrick Institute.

Prof. Tim Crowe

is the immediate past president of the Southern African Society for Systematic Biology; an Elected Fellow and past member of the council of the Willi Hennig Society of Systematic Biology; and an immediate, past associated editor of its journal *Cladistics*. He is a member of the International Ornithological Congress Committee, the Steering Committee of the South African Biosystematics Initiative (of which he is the immediate past chairperson), the Board of the South African Biological Information Facility, and a research associate at the American Museum of Natural History in New York. He acted as external examiner for the MSc Programme in Mammalogy at the University of Pretoria.

Tim co-ordinates the Postgraduate Programme in Conservation Biology and runs the module *Characterizing Biodiversity*. In the year under review he supervised or co-supervised three MSc and three PhD students. He taught a module to one undergraduate class. He was author or co-author of 12 scientific papers. He attended and presented a plenary paper at one international meeting and one local conference and gave talks to two membership-based societies. He refereed 12 scientific papers for seven different journals, reviewed one application for a research grant and assessed one local researcher for personal scientific evaluation for the National Research Foundation.

Assoc. Prof. Peter Ryan

also leads the *Island Conservation Programme* and the *Seabird Research Programme*

Systematics and Biogeography

Programme leaders

Prof. Tim Crowe
Assoc. Prof. Peter Ryan
Assoc. Prof. Paulette Bloomer (University of Pretoria)
Dr Rauri Bowie (University of Stellenbosch)

Research team

Dr Keith Barker (University of Minnesota, USA)
Dr John Bates (Field Museum of Natural History, Chicago, USA)
Dr George Barrowclough (American Museum of Natural History, New York, USA)
Dr. Michael Double (Australian National University, Australia)
Dr Gareth Dyke (University College, Dublin, Ireland)
Prof. Jon Fjeldså (Zoological Museum, University of Copenhagen, Denmark)
Dr Jeff Groth (American Museum of Natural History, New York USA)
Dr Shannon Hackett (Field Museum of Natural History, Chicago)
Prof. Terry Hedderson (Department of Botany, UCT)
Dr Dai Herbert (Natal Museum)
Charles Kahindo (Makerere University, Kampala, Uganda)
Tshifhiwa Mandiwana (Department of Botany, UCT)
Tshifhiwa Nangammbi (Natal Museum)
Rick Nuttal (National Museum, Bloemfontein)
Dr Colleen O'Ryan (UCT, Department of Molecular and Cell Biology, UCT)
Asst Prof. Bret Payseur (Department of Medical Genetics, University of Wisconsin, USA)
Dr Sergio Pereira (Department of Natural History, Royal Ontario Museum, Toronto)
Dr Ettore Randi (Istituto Nazionale per la Fauna Selvatica, Italy)
Prof. Mike Sorenson (Boston University, USA)
Dr Gary Voelker (University of Memphis, USA)

Post-doctoral Associates

Dr Wayne Delport (UCT)
Dr Ulf Johansson (University of Stellenbosch)



Left: Male and female of the newly described Dark Batis *Batis crypta*. Right: Male and female Short-tailed Batis *Batis mixta*.

Centre of Excellence member Rauri Bowie was part of a team that described a new species of Batis from East Africa.



Overview

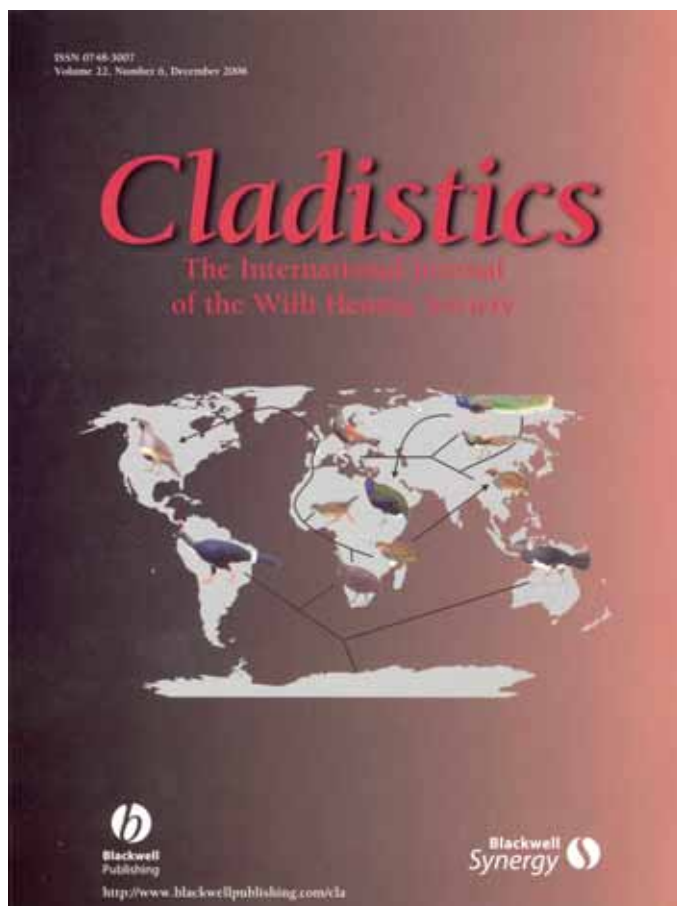
South Africa is the third richest country on Earth in terms of its biological diversity, yet perhaps as much a 90% of Earth's biodiversity remains unknown to science. In terms of birds, about 10% of the species currently recognized worldwide occur in southern Africa. However, the use of more modern analytical approaches to bird systematics, especially those that employ combined morpho-behavioural and DNA evidence and evolutionary relevant species concepts, could perhaps result in a doubling of the number of species. Moreover, the phylogenetic (evolutionary genealogical) relationships between and within bird genera are still poorly known, and the biogeographical factors that have promoted this evolutionary diversification are even less well understood.

Members of this heterogeneous programme tackle a range of projects aimed at discovering and determining the taxonomic validity of species, inferring their phylogeographic (within species and among populations) or phylogenetic (evolutionary genealogical) relationships, and identifying and explaining patterns of species distribution and diversity (biogeography). The research approach in virtually all projects within this programme is multi-faceted, using a range of organismal and molecular data and analytical approaches.

detail in last year's report) by Tim Crowe, Rauri Bowie, Paulette Bloomer, Terry Hedderson, Ettore Randi, Tshifhiwa Mandiwana and Sergio Pereira on the phylogenetics, biogeography and classification of, and character evolution in, gamebirds (Aves: Galliformes), exploring the effects of character exclusion, data partitioning and missing data. This 37-page paper summarizes the evolutionary relationships among an entire order of birds and is based on a wealth of molecular, morphological and behavioural data, and was honoured with the cover illustration of the journal *Cladistics*.



A lowland 'Tristan' Bunting on Inaccessible Island. Molecular evidence on the evolution of these birds has necessitated a revision of their taxonomy, with two species on Nightingale Island and one polytypic species on Inaccessible. Photo: Peter Ryan.



Fitz-based researchers' paper on gamebird systematics made the cover of Cladistics.

Gamebirds

The most significant research development during the period under review was the publication of the paper (discussed in

Island buntings

Peter Ryan, Wayne Delport and Paulette Bloomer used other genetic markers to study the relationships between (and within) two species of *Nesospiza* buntings that occur on the Tristan de Cunha islands. These buntings inhabit two of the three islands (Nightingale and Inaccessible) in the group, and each island has a representative subspecies of the two morphologically different forms. While this appears to be a relatively simplistic example of an adaptive radiation when compared with the more speciose radiations among finches at the Galapagos islands and honeycreepers in the Hawaiian archipelago, the situation is complicated in that there is hybridization between the different forms in a particular habitat zone on Inaccessible Island. Most surprisingly, the large- and small-billed forms appear to have evolved independently at each island, suggesting the possibility of ecological speciation. A paper summarizing the results of this research is currently in press in *Science*.

Sandgrouse

Wayne, Paulette, Tim and Penn Lloyd investigated genetic structure within the Namaqua Sandgrouse *Pterocles namaqua*, the species that Penn focused on for his PhD research some years ago. This sandgrouse is a highly nomadic/semi-migratory granivore characteristic of semiarid to arid habitats within

Assoc. Prof. Paulette

Bloomer is based at the Department of Genetics, University of Pretoria. During 2006, Paulette continued to serve on the IUCN Specialist Group on Afrotheria; the Yellowfish Working Group Scientific Advisory Panel, and the Interim Scientific Advisory Panel at the National Zoological Gardens which wound up its duties in early 2006. She has been vice-president of the South African Society for Systematic Biology since 2005.

Paulette attended and gave presentations at two local conferences and was co-author of three presentations given by her students at the International Ornithological Conference in Hamburg. She refereed papers for three different journals.

Dr Rauri Bowie

was based at the Department of Zoology at the University of Stellenbosch for most of 2006.

Rauri is an editor of *Ibis*, and heads the African Working Group for the All Bird Barcoding Initiative, and sits on the Global Steering Committee for the same initiative. He supervised or co-supervised five masters students, four PhD students and two post-doctoral students. Eight of his students presented papers of which he was co-author at international and local conferences. Rauri gave three talks to different interest groups and reviewed 12 papers for six different journals.

southern Africa. As a result of nomadic movements in response to rainfall, the size of the breeding population in any one area differs dramatically between breeding seasons. This high mobility is thought to be a response to spatio-temporal variation in the abundance of food resources, and is expected to result in extensive genetic mixing between birds from different areas. Namaqua Sandgrouse also show a seasonally predictable partial migration between the southeast and northwest regions of South Africa, and a further possible north–south migration between southwestern South Africa and central Namibia. It is unclear whether birds migrating between these regions breed in only one or both regions. If populations breed in only one region of their migratory range, then genetic differences could develop between regions.

This study addresses sandgrouse movements with the analysis of mitochondrial DNA sequences. Mitochondrial DNA is only passed on from females to their offspring and therefore only reflects the movements and mixing between populations partially. Few genetic differences were found between even widely spaced sandgrouse sampling sites as one would expect for such a highly mobile species. However, there were also patterns in the resulting data that appears to have been caused by large differences in population numbers over time. These patterns may mask the true extent of mixing between areas. Future research, using more variable genetic markers (such as those employed on oystercatchers) that are passed on by both sexes could detect much more subtle evidence of the effects of movement patterns within this important gamebird species.

Oystercatchers

Honours student Dalemari Swanepoel conducted research on the within-species genetics of the African Black Oystercatcher *Haematopus moquini* using microsatellite markers. Before genetic variation within a particular species can be studied, an appropriately sensitive set of DNA markers must be identified. These are regions of DNA that differ even between parents and their offspring and that can identify each individual uniquely. Only two such DNA regions are known from a study done on the Eurasian Oystercatcher (*H. ostralegus*). Dalemari identified five such genetic markers in the African Black Oystercatcher and used them to study birds from which blood has been collected so far. These samples are representative of the overall distribution of the species along the southern African coast. Analysis of these molecular data should shed additional light on the biology of this near-threatened shorebird.



African Black Oystercatcher. Photo: Jessie Walton.



Petrels

PhD student Mareile Techow has nearly completed writing up her PhD research on the phylogeography of giant petrels *Macronectes* and selected *Procellaria* petrels. Seabirds pose interesting problems for systematists, especially in the Southern Ocean, where breeding islands are widely spaced, and strong faithfulness to breeding islands may result in the evolution of distinctive local taxa. All seven species in both genera studied are listed as globally threatened or near-threatened, largely as a result of threats occurring at sea (mainly accidental mortality due to fishing practices). Understanding the phylogeography of these seabirds is important for two reasons. There may be distinct populations that warrant conserving and managing as separate entities. Also, if there is strong regional genetic structuring, results of Mareile's research could be used to identify the origins of birds killed at sea. Mareile's PhD has examined both aspects, using both mitochondrial and nuclear DNA markers. She confirmed that the Spectacled Petrel *P. conspicillata*, confined to Inaccessible Island, is indeed a species distinct from the widespread White-chinned Petrel *P. aequinoctialis*. She also found that White-chinned Petrels from the New Zealand region are also distinct from those found elsewhere in the Southern Ocean, and was able to use this to show that there is little if any movement of birds between regions outside the breeding season. The two sister species of giant petrels are quite distinct with regard to nuclear genes, but the Northern Giant Petrel *M. halli* clearly evolved fairly recently from the Southern Giant Petrel *M. giganteus*, according to the results generated from analysis of a maternally inherited mitochondrial gene.

Collecting trips

The collecting of blood, tissue and voucher (preserved skins) specimens is essential for the long-term research planned for this programme. To this end, three collecting trips were undertaken during the period under review. The first trip (3-15 March) coincided with the SAFRING ringing course in Wakkerstroom, Mpumalanga. The second trip (14-25 August) took place in the Free State. The third collecting trip (25 September - 4 October) was conducted along the west coast of the Western Cape. In total material from 78 species was collected, including 314 tissue and voucher specimens and 94 blood samples. All projects involving the use of live birds have been reviewed and sanctioned by the Animal Ethics Committees of UCT and/or Stellenbosch.

Highlights

- Rauri Bowie was offered and has taken up a post of assistant professor at the Museum of Vertebrate Zoology at the University of California at Berkeley, USA.
- Honours student Dalemari Swanepoel graduated from the University of Pretoria with distinction.
- Tim Crowe was a co-author of an article in *Quest* entitled *Discovering our Biodiversity* that highlights the theoretical and practical importance of systematics and biogeography.

- Keith Barnes completed his PhD studies on lark systematics and is currently revising his dissertation in the light of examiners' comments.
- Conservation Biology students Potiphar Kaliba and Terence Suinyuy completed their research projects and graduated in June.

Students

- Keith Barnes (PhD, supervisors Peter Ryan & Paulette Bloomer) *The evolution of Africa's larks Alaudidae*.
- Callan Cohen (PhD, supervisor Tim Crowe) *The evolution of the bustards: implications for African biogeography, evolution of display and conservation*.
- Lucille Hermann (PhD Pretoria, supervisors Paulette Bloomer & Peter Ryan) *Comparative phylogeography of forest avifauna*.
- Tshifhiwa Mandiwana (PhD, supervisors Tim Crowe & Rauri Bowie) *Taxonomy, phylogenetics and biogeography of francolins and spurfowls*.
- Tshifhiwa Nangammbi (PhD UKZN, supervisor Dai Herbert, Natal Museum, co-supervisor Tim Crowe) *Taxonomy, phylogenetics and biogeography of Tricolia, Phasianella and Gabrielona complex of marine molluscs of southern Africa*.
- Mareile Techow (PhD, supervisors Colleen O'Ryan & Peter Ryan) *The phylogeography of Procellaria and Macronectes petrels*.
- Graeme Oatley (MSc, supervisors Tim Crowe & Rauri Bowie) *Exploring species boundaries within the Cape White-eye Zosterops virens and Orange River White-eye Z. pallidus complex using organismal and molecular evidence*.
- Potiphar Kaliba (CB MSc, supervisors Tim Crowe & Rauri Bowie) *Faunal turnover between east and southern African birds and small mammals: is Malawi the geographical break?*
- Lisa Nupen (CB MSc, supervisors Tim Crowe & Rauri Bowie) *Evolution of selected southern African cisticolas*.
- Terence Suinyuy (CB MSc, supervisors Tim Crowe & Rauri Bowie) *Taxonomic status and phylogenetic relationships of some Cameroon phasianoid birds*.
- Dalemari Swanepoel (BSc Hons Pretoria, supervisors Phil Hockey & Paulette Bloomer) *The isolation of species-specific microsatellite markers for the African Black Oystercatcher Haematopus moquini*.

Acknowledgements

The National Research Foundation, Department of Science and Technology for financial support. The American Museum of Natural History (New York), Field Museum (Chicago) University College (Dublin), University of Pretoria and Boston University for access to facilities, specimens and logistical support.

Dr Penn Lloyd

is the Manager of the DST/NRF Centre of Excellence at the Percy FitzPatrick Institute. He coordinates a long-term project on avian life-history strategies at Koeberg Nature Reserve. He supervised the research projects of one MSc student and three Honours students. He authored or co-authored two papers, and peer-reviewed 7 manuscripts for 5 local and international journals. Penn organised the weekly Research Discussion Group meetings involving postgraduate students and academic staff. He also lectured a 2-week course in Evolutionary Ecology to Zoology II students. Penn presented oral papers at the 22nd International Ornithological Congress in Hamburg, Germany (August 2006), and the 4th Penduline Tit workshop at the Hungarian Academy of Science in Matrahaza, Hungary (November 2006).

Life History Strategies

Programme leaders:

Dr Penn Lloyd

Research team:

Dr Rob Simmons (Research Associate, PFIAO)

Dr Jim Dale (Max Planck Institute for Ornithology, Germany)

Prof. Thomas Martin (University of Montana, USA)

Dr Tamas Szekely (Bath University, UK)

René van Dijk (Bath University, UK)

Ákos Pogány (Eotvos Lorand University, Hungary)

Post-doctoral Associates

Dr Corine Eising (UCT)

Dr Andrew Taylor (UCT)

Overview

Life-history strategies describe the anatomical, physiological and behavioural adaptations that control how individuals invest in reproduction and self-maintenance in response to their environmental conditions. A major challenge in evolutionary biology is to explain why life-history strategies vary among species along a slow-fast continuum. Species at the slow end of the spectrum are characterised by slow metabolism and development, delayed reproduction, low reproductive investment, long life, and long-term pair bonds, with the opposite expression at the fast end. The South African south-temperate avifauna comprises species with life-history strategies that span much of the slow-fast continuum, making it an ideal region in which to study environmental influences on life-history strategies. Koeberg Nature Reserve, on the West Coast north of Cape Town, is the site of a long-term research programme examining the life history strategies of a community of southern hemisphere bird species, co-ordinated by Penn Lloyd.



*Grassbird egg and nestling: One focus of research at Koeberg is on environmental influences on embryonic development in birds. South African species show a wide range in embryonic development rates, and the Cape Grassbird (*Sphenoeacus afer*) is one of the slowest. Photo: Anna Chalfoun.*



Life-history and ecological correlates of reproductive investment

The first major publication arising from the Koeberg study (Martin *et al.* 2006) examined potential causes of geographical variation in investment in egg mass and clutch size among 74 passerine bird species from four different regions of the world. A central prediction of life-history theory, that egg mass increases as clutch size decreases, was supported. However, there was considerable variation in this relationship between geographic regions. A further prediction that increased egg predation can directly favour reduced reproductive investment was also supported. South African birds, which are exposed to substantially higher nest predation risk than birds of North and South America, produce smaller eggs. Investment in total clutch mass also decreased with increased nest predation risk within all four regions. Finally, we found that species with increased parental care, where the male and female share incubation, produced larger eggs than species with female-only incubation.

A central focus of the Koeberg study, to determine annual adult mortality rates of a variety of species, is now nearing completion. With the invaluable help of a group of volunteer bird ringers from the Tygerberg Bird Club, over 2,000 adults of 20 species have been ringed with individually unique colour-ringing combinations since 2001. The annual re-sighting and territory-mapping of all colour-ringed birds over the past six years now allows us to estimate annual adult survival for 18 species. These data are being used to examine the influence of adult mortality risk on life history strategies, particularly investment in reproduction and mating strategies.

Greater Kestrel responses to increased nest predation risk

Dr Rob Simmons continued with long-term monitoring of a Greater Kestrel population nesting on telephone poles in otherwise tree-less habitat in the Northern Cape. The kestrels use old crow nests as nest sites, yet crows also prey on kestrel eggs. One focus of the study is testing the prediction from life-history theory that kestrels nesting close to crows should decrease clutch size in response to increased predation risk from crows. The study is also monitoring the impact of a range expansion by Pied Crows into the area, joining the resident Black Crows, which is expected to further increase nest predation risk to kestrels.

Environmental and parental influences on embryonic development

Variation in embryonic development rate, measured as incubation period length, among passerine birds is thought to be influenced largely by body mass (slower development in larger species) and intrinsic physiological constraints linked to offspring quality (slower development for higher offspring quality). The potential additional influences of embryonic mortality rate (higher mortality risk selecting for faster development) and parental influences on embryonic temperature (lower parental nest attentiveness and incubation temperature leading to slower development) remain

controversial. Research at Koeberg is examining variation in incubation parameters among 18 species in the community in relation to environmental temperature, nest attentiveness, and age-specific mortality to better understand the relative importance of these different influences.

During 2006, Nicola Okes (BSc Hons) tested the importance of food availability and ambient temperature as constraints on female nest attentiveness and incubation temperature in the Karoo Prinia, where the female incubates alone and has relatively low daytime nest attentiveness. She measured incubation temperature and nest attentiveness by inserting a bead-thermister into an egg in the clutch. She then compared incubation parameters between females experimentally presented with abundant food and control females that were not, under a range of ambient temperatures. The results were promising, but a larger sample size is still required for a rigorous test of hypotheses.



2 pictures of male Bar-throated Apalis: Male Bar-throated Apalis (*Apalis thoracica*) differ in the size of their black chest-band. Females paired to males with broader chest bands are in better condition, and lay larger eggs and clutches. Photo: Corine Eising.

Strategies of maternal investment in egg constituents

Bird mothers can tailor the future developmental trajectories of their offspring to expected environmental conditions by varying their investment in egg nutrients, immunoglobulins, yolk

hormones and carotenoids. After a spell of maternity leave at the beginning of the year, Dr Corine Eising continued her work on a variety of projects investigating the relationship between environmental factors and maternal effects. First, she has been testing a prediction of sexual selection theory that females paired with good quality males invest more heavily in their offspring, as they have a greater chance of success. Preliminary results show that female Bar-throated Apalis in better condition lay larger eggs, larger clutches, and are paired with males with larger chest bands (see photo). Yolk hormone levels vary with laying order, but after controlling for maternal body size, do not seem to be related to male chest-band size as a measure of quality. Second, she finalised two papers with collaborators at the University of Antwerp (Belgium), University of Groningen (Netherlands), and Washington State University (USA) describing studies that experimentally manipulated breeding density of European Starlings and Black-headed Gulls, to test the prediction that females would invest more testosterone in their eggs when breeding at higher density, to prime their young for a more competitive social environment once they hatch. These predictions were supported. Finally, she has been working on a further two collaborative papers, one (with Claire Spottiswoode) examining maternal investment in yolk hormones and carotenoids by Sociable Weaver females nesting in colonies of varying size, and the second examining patterns of maternal investment in yolk hormones in the Australian Brush Turkey.

Hormonal control of plumage expression in Red-billed Queleas

Male Red-billed Queleas exhibit one of several discrete plumage types when in breeding condition. These different morphs do not appear to correlate with male quality, the traditional explanation. Instead, father-son correlations of plumage morphology suggest a strong genetic basis. Indeed the slopes of the father-son regressions are so high they suggest that females mate assortatively – females carrying the genes of a particular morph mate preferentially with a male of that morph, even though females do not express the plumage poly-morphism. One possible mechanism to explain this is that daughters might imprint on the plumage morph of their father, and use this as a basis for selecting a future mate. Drs Jim Dale and Corine Eising have initiated a study this year to investigate the mechanism of poly-morphism maintenance in this species.

Sexual conflict in birds: comparative behavioural analyses of north- and south-temperate penduline tits

Sexual conflict, which stems from the antagonistic interests of males and females during breeding, is a powerful evolutionary process that is thought to be important in the evolution of body size, appearance, and behaviour. As part of a new bilateral Hungary/South Africa project, Dr Tamas Szekely (Bath University, UK), together with PhD students René van Dijk (Bath University, UK) and Ákos Pogány (Eotvos Lorand University, Hungary) spent a month at Koeberg Nature

Reserve. This project aims to test predictions of sexual conflict theory by comparing the behaviour, plumage and ecology of the Eurasian Penduline Tit *Remiz pendulinus* in Hungary and Cape Penduline Tit *Anthoscopus minutus* in South Africa. Male and female Eurasian Penduline Tits co-operate in building the nest, but either the male or the female deserts at the end of egg-laying to pursue additional mating opportunities, leaving the other parent to incubate the eggs and raise the chicks alone. The Cape Penduline Tit, on the other hand, is monogamous, and both parents share the duties of incubation and chick rearing. The project is testing the prediction that greater sexual conflict in the Eurasian Penduline Tit leads to greater sexual selection (plumage elaboration and more complex song in the male). It will also investigate how sexual conflict is mediated by differences in life history and the environments (particularly food availability) that these two species experience.

Highlights

- The publication of a paper on the evolution of egg size among passerine birds in the multi-disciplinary journal *Evolution* (Martin et al. 2006)
- CB MSc student Tammy Baudains (June) and BSc Hons students Nicola Okes and Candice Lyons (Dec) graduated.

Students

Tammy Baudains (CB MSc, supervisor Penn Lloyd) *The effects of human disturbance on the nesting behaviour and breeding success of White-fronted Plovers.*

Candice Lyons (BSc Hons, supervisor Penn Lloyd) *Survival rates of male and female passerine species with respect to their relative roles in reproduction.*

Nicola Okes (BSc Hons, supervisor Penn Lloyd) *The effect of ambient temperature and food availability on incubation behaviour of the Karoo Prinia, Prinia maculosa.*

Visitors

Dr Jim Dale (Max Planck Institute for Ornithology, Germany) now uses the Fitztitute as a base for his studies on quelea, and visited on several occasions through 2006. Dr Tamas Szekely (Bath University, UK) visited during August and September, accompanied by PhD students René van Dijk (Bath University, UK) and Ákos Pogány (Eotvos Lorand University, Hungary), to start work on a collaborative study comparing the behavioural ecology of penduline tits.

Acknowledgements

Tygerberg Bird Club bird ringing unit, particularly Margaret McCall, Bob Ellis, Lee Silks and Bridget de Kok, for assistance with bird ringing; South African National Parks, ESKOM, particularly Hilton Westman and Gert Greeff, for research facilitation at Koeberg; Davide Gaglio and Marty Stander, for assistance in the field; and the Claude Leon Foundation, for post-doctoral fellowship support to Corine Eising.



Prof. Morné du Plessis

serves as a member of the International Ornithological Congress Committee, the Advisory Board to the Leslie Hill Institute for Plant Conservation, the Council of BirdLife South Africa, the Steering Committee of SAFRING and the Advisory Committee of the Mammal Research Institute at the University of Pretoria. He also serves as a Trustee to WWF-SA, and as Chair of WWF-SA's Conservation Committee. He serves on the editorial board of the Southern African Journal of Wildlife Research. Morné co-convened a UCT Honours Discussion Group on 'Cooperative breeding in birds'. He supervised or co-supervised two PhD students, and worked with five post-doctoral researchers. He also co-supervised three MSc Conservation Biology students, and co-supervised two students registered at other universities. He regularly participates in nature programmes on both radio and television and gave two presentations to membership-based societies. He reviewed numerous NRF proposals, as well as 9 applications for research grants and 14 manuscripts submitted to various scientific journals.

Cooperative Breeding and Sociality in Birds

Programme leader

Prof. Morné du Plessis

Research team

Mark Anderson (Northern Cape Nature Conservation)

Prof. Ben Burger (Laboratory for Ecological Chemistry, University of Stellenbosch)

Dr Penn Lloyd, (PFIAO)

Prof. Joseph B. Williams, (Ohio State University, USA)

Post-doctoral Associates

Dr Rita Covas (Edinburgh University, UK)

Dr Andrew Radford (Cambridge University, UK)

Dr Mandy Ridley (UCT)

Dr Lizanne Roxburgh (UCT)

Dr Andrew Taylor (UCT)

Field researchers

Eric Herrmann (PFIAO)

Edward Matebula (Klaserie Private Nature Reserve)

Betsie Meyer (PFIAO & Tshwane University of Technology)

Michael Mills (PFIAO)

Sieglinde Rode (PFIAO & Tshwane University of Technology)

Doug Schaefer (PFIAO)

Terence Suinyuy (PFIAO)

Lizelle van der Waal (PFIAO)

Overview

Cooperative breeding is a reproductive system in which more than a pair of individuals show parent-like behaviour towards young of a single nest or brood. Numerous variations have been identified including helping-at-the-nest by non-breeding offspring that have delayed dispersal and remained with their parents on their natal territory, and various forms of cooperative polygamy or plural breeding in which more than a single male or female share breeding status within the same social unit. Aid generally consists of feeding nestlings or fledglings but can also include incubation and defence of the nest or territory. Aid-givers or co-breeders are often related to the focal breeding pair. The evolution of cooperative breeding can usually, but not invariably, be broken down into two complementary processes: the decision to stay in the natal unit and the decision to help.

The objectives of this programme are (1) to conduct a broad, phylogenetically-controlled analysis of the ecological and life-history strategies of African birds that might predispose them to cooperative breeding; (2) to uncover the factors underlying the divergent evolutionary pathways that might lead to regular versus opportunistic cooperative breeding; (3) to perform a series of controlled experiments that investigate the effects of factors identified in (2) on the tendency for birds to breed cooperatively (i.e. among opportunistic cooperative breeders); (4) to develop and test dispersal models in two widely different cooperative breeding systems, viz. singular and colonial breeding systems; and (5) to investigate experimentally the ecological factors underlying reproductive sharing and the degree of help provided by non-breeders in cooperatively-breeding societies.

Sociable Weaver Project

The Sociable Weaver *Philetairus socius* project at Benfontein Game Farm, Kimberley, remains a highly productive research study. Claire Spottiswoode completed her PhD as a student registered at Cambridge University under the direct supervision of Nick

Davies. Meanwhile postdoctoral researcher, Rita Covas, is still completing several research papers on her earlier work on this species. The potential for broad-scale demographic analysis increased significantly after Doug Schaefer developed a single consolidated Sociable Weaver database, by merging three different earlier datasets. Eric Herrmann continued to oversee infrequent capture operations and 2006 represents a period of relatively low-level field work.



Ant-eating Chat. Photo: Mark Anderson.

Ant-eating Chat Project

Eric Herrmann continued our work on Ant-eating Chats *Myrmecochliza formicivora*, a Southern African endemic cooperative breeder, until he took up a permanent position with Northern Cape Conservation Department. However, he continued to manage the Research Centre, and coordinated the field work activities on this project throughout the breeding season. Terrence Suinyuy spent several months doing intensive nest finding, and capture and bleeding of entire families during the breeding season. To this end, since 2002 we now have caught and individually colour-ringed 111 adults and 363 nestlings in 24 groups. We also have blood samples for complete families at 28 breeding events. This will form the basis of a genetically-based investigation into the mating system of this species. This project is now available for focused further post-graduate research project.

Green Woodhoopoe Project

Field work continued at a low level on the Green Woodhoopoes *Phoeniculus purpureus* of the Morgan's Bay study site. The study now enters its 27th year and this large dataset enables us

to continue analysing data on life-time reproductive success of woodhoopoes. Morné du Plessis spent several weeks in July 2006 doing censuses, and maintenance capture and ringing of this population. Currently, the study population consists of 26 adjacent groups in the Morgan's Bay area in which virtually all individuals are colour-ringed with a unique combination. A new tar road to nearby Kei Mouth has opened the area up for large-scale development and it appears as if at least 50% of the long-term woodhoopoe groups are likely to be affected in terms of habitat degradation.

Pied Babbler Project

Mandy Ridley continues her research on the causes and consequences of cooperative breeding behaviour in the Pied Babbler *Turdoides bicolor*. She is the principal investigator of the Pied Babbler Research Project, located in the southern Kalahari at the Kuruman River Reserve. The project continues to expand and now contains 18 fully habituated, colour-ringed groups, ranging in size from three to 12 adults. Research activities at the project also continue to expand, and 2006 saw the addition of several members, including two PhD students, Martha Nelson (UCT) and Krystyna Golabek (U. Bristol) and two Honours students, Matt Child and Candice Lyons (UCT).

The Pied Babbler Project currently comprises a major focus on each of the following specific research topics:

Coaching behaviour: Extending on research recently published on this system, in collaboration with Nikki Raihani, they aim to unequivocally prove the presence of 'coaching' in this species. While teaching has only recently been proven in animals, this proof provided evidence of 'opportunity teaching' where adults provide young with the opportunity to learn. In contrast, 'coaching' (as defined by Caro & Hauser 1992) suggests adults actively encourage young to learn by either actively rewarding or punishing them until they learn the behaviour of interest. The team are now setting out, using a series of experimental manipulations, to provide the first ever proof of coaching behaviour in a non-human animal.

Maternal effects: In biparental species, the condition of the mother and her investment in young is commonly associated with offspring survival and development. However, in cooperative species, the extra help provided by non-breeding group members may remove the importance of maternal condition on offspring. Mothers may respond to this 'load-lightening' by either investing more in each brood, investing in subsequent broods quicker, or by maintaining dominance for longer. The Pied Babbler research team are now investigating the maternal effects on offspring in pied babblers, and maternal investment decisions according to group size.

Babbler-drongo interactions: Extending on research recently published in this system, Mandy and her co-workers are now looking at how Fork-tailed Drongos *Dicrurus adsimilis* identify and specifically target the most vulnerable babbler for kleptoparasitic attacks, as well as investigating the context-dependent alarm-calling strategies of drongos. Drongos appear to show different patterns of alarm calling according to whether they are actively following a babbler group or not, suggesting an 'audience effect' of alarm-calling behaviour. In addition, it



seems that drongos need to maintain a certain level of honesty in alarm calling in order to occasionally deceive pied babblers by giving false alarm calls in order to steal food items.

In 2006, following exceptional rains during the 2005/6 summer, there was an exceptional amount of breeding and the intensity of inter-group social interactions increased dramatically. Highlights include several kidnapping events, one in which the group managed to rescue their young, and another case in which the kidnapers continued to raise the stolen young as their own, and several infanticide attempts (first recorded events in the study population). As the project continues, the fascinating patterns of dispersal, eviction, punishment and other social dynamics continue to unravel and provide an insight into the fascinating and complex life of this social species.



Mandy Ridley (post-doc) climbing to a nest while trusting Martha Nelson's (PhD student) support. Photo: Morné du Plessis.

Ground Hornbill Project

Our field study on the Ground Hornbill *Bucorvus leadbeateri* population in the Association of Private Nature Reserves (APNR, including Balule, Klaserie, Timbavati, and Umbabaat) along the Kruger National Park's western boundary, continues. The primary goal of this project is to develop a better understanding of the basic ecological requirements of this species, and in particular to interpret the reasons for the slow development of young, the regular loss of one of the two nestlings, and cooperative breeding in this species. The 2005/6 breeding season turned out to be a very unproductive one with only four nests in the APNR producing large nestlings, and only three fledged any young. Sieglinde Rode, our field assistant, suddenly left the project in late January 2006. Lizelle van der

Waal stood in as our field worker and saw to it that the nestlings in three APNR nests were ringed and bled. She also ensured that a further five nestlings were ringed and bled in the Kruger National Park. All in all, the latter represented the sum total of fledglings produced in over 36 nests that are checked in KNP each year. Doug Schaefer joined the project in August 2006 and immediately set about refining capture techniques, which soon led to his catching most individuals in four groups. A VHF transmitter was deployed on an adult bird in each case. Capture operations were terminated in mid-October to allow groups to remain undisturbed for the breeding season which runs through into March or even April each year.

Chemical Defence Projects

We have collected further uropygial gland secretion samples from Common Scimitarbills *Rhinopomastus cyanomelas* in KZN to add to earlier samples from Kimberley and Brandfort. This work is done in collaboration with Prof. Ben Burger of Stellenbosch University. These samples were collected to enable us to produce a more representative analysis of chemistry of the secretions produced by the preen gland of this species. It turns out that Common Scimitarbills produce some of the chemically most complex uropygial gland secretions known.

Karoo Scrub-Robin: investigating the causes and consequences of facultative co-operative breeding

The Karoo Scrub-Robin *Cercotrichas coryphaeus* is a facultative co-operative breeder. On 15-20% of territories, between one and three male offspring delay dispersal to help the breeding pair raise young. Since 2001 Penn Lloyd has been studying the behavioural ecology of cooperative breeding in this species using a population at Koeberg Nature Reserve that now comprises 180 individually colour-ringed individuals occupying 80 territories. During 2006, Penn and postdoc Andrew Taylor continued to collect data comparing the breeding performance and survival of Karoo Robin pairs with and without helpers, including some 50 known-age birds. One goal of the project is to measure the inclusive fitness benefit to helpers of helping, and to contrast this with the direct fitness benefits of breeding in the first year. Another goal is to determine the importance of offspring quality to long-term fitness, and whether hatching asynchrony is an adaptive mechanism for the optimal production of high quality offspring.

Helen Withers, a PhD student at Cambridge University (UK), visited for two months to examine the functions of food calling and begging behaviours in the Karoo Scrub-Robin. By setting up miniature spy cameras over nests and individually marking the nestlings, she was able to examine how parents provisioned the various members of their brood.

Working in Rauri Bowie's lab, Anne Braae (BSc Hons) perfected the molecular technique for sexing Karoo Scrub-Robins from a blood sample, and sexed 138 offspring from the 2005 breeding season to test several predictions of sex allocation theory. Specifically, she tested the prediction that females (particularly younger females) without helpers should bias the primary sex ratio in favour of male offspring (the

helping sex) to facilitate breeding productivity, whereas female with helpers (particularly older females with a greater number of descendent young on neighbouring territories) should bias the primary sex ratio in favour of female offspring (the dispersing sex) to reduce competition among kin. She found no support for the prediction that older females would bias the primary sex ratio in favour of female offspring, but she did find that young females (1-2 years old) bias the sex ratio in favour of male offspring to secure helpers for future breeding seasons.

Because of high natal philopatry, all male offspring comprise an essentially closed population, so sexing of offspring also allows us to monitor the post-fledging survival and long-term fitness of male offspring in relation to their initial rearing conditions.

Highlights

- The publication of a high-profile multi-disciplinary paper on a novel form of extended parental care in pied babblers in *Current Biology* (Radford & Ridley 2006).
- The publication of a woodhoopoe paper on the multiple functions of allopreening (Radford & du Plessis 2006, *Behavioural Ecology and Sociobiology*)
- Presentation of a plenary lecture by Morné du Plessis on 'Cooperative breeding in African Birds' at the International Ornithological Congress in Hamburg, Germany (August 2006).
- The Pied Babbler Research Project was featured in newspapers and several radio and TV programmes internationally.

Students

Krystyna Golabek (PhD Bristol, co-supervised by Mandy Ridley) *Social communication and information transfer in Pied Babblers* (*Turdoides bicolor*): *implications on social behaviour*.

Martha Nelson (PhD, supervisors Morné du Plessis & Mandy Ridley) *Kin recognition: mechanisms and consequences in the cooperatively breeding Pied Babbler* *Turdoides bicolor*.

Nicola Raihani (PhD Cambridge, co-supervised by Mandy Ridley) *Parent-offspring conflict and signal communication in the pied babbler*.

Nimmi Seoraj (MSc UKZN, co-supervised by Morné du Plessis) *Warning vocalisations and predator information transfer in social birds*.

Sieglinde Rode (BTech Tshwane, co-supervised by Morné du Plessis) *Understanding the role of vocalisations in territoriality of Ground Hornbills*.

Anne Braae (BSc Hons, supervisor Rauri Bowie) *Sex ratio allocation in the Karoo Scrub-Robin: young mothers raise more helping offspring*.

Matthew Child (BSc Hons, supervisor Mandy Ridley) *Cunning kleptoparasitism: dynamic strategies to obtain food rewards in a terrestrial system*.

Candice Lyons (BSc Hons, supervisor Penn Lloyd) *The relative effect of environmental versus social factors on changes in territory size in the Kalahari-dwelling southern Pied Babbler*

Turdoides bicolor.

Lectures

Team members led a discussion group for UCT Honours students on 'Routes to cooperative breeding in birds'.

Visitors

Prof Tim Birkhead (University of Sheffield, UK); Ms Helen Withers (Cambridge University, UK) visited for two months in September-October to study food calling behaviour in the Karoo Scrub-Robin and other passerine species.



Edward Matebula, a ranger at Klaserie Private Nature Reserve, with an adult Ground Hornbill female. Photo: Morné du Plessis.

Acknowledgements

De Beers Consolidated Mines Limited (Morgan Hauptfleisch, Graham Main, Peter Gibbs) for the establishment of and access to the Benfontein Research Centre outside Kimberley; National Research Foundation; European Union; University Research Committee; private landowners in Komga district (Sean Cockin, Frank Cockin, Johan Breetzke, Willem Fourie, Trevor Brown, Mike Putzier) and Kei Mouth Municipality; Klaserie Nature Reserve (Mike Myers, Colin Rowles); Timbavati Nature Reserve (Bryan Smither, Scott Ronaldson) and Umbabaat Nature Reserve (Paul de Luca, Errol Peterson); Dow Chemicals (Ross Maclean, Doritha Erwee). Steve Beal has taken over sponsorship of the Ground Hornbill Project's field vehicle, and Tandathula Lodge, Ntsiri Lodge and Nlopfu Lodge all contribute to the running of that project.



Assoc. Prof. Phil Hockey

is a member of the Board of Trustees of the Seychelles Island Foundation. He is also a member of the Bird Taxon Advisory Group to the Pan-African Association of Zoological Gardens, Aquaria and Botanical Gardens, and the Editorial Board of the journal *Biological Conservation*.

Phil co-ordinates the Oystercatcher Conservation Programme, which has proved to be a high-impact subregional project. He was Editor-in-Chief of *Roberts - Birds of Southern Africa* (second, revised impression printed March 2006) and a co-author of the best-selling *Sasol Birds of Southern Africa*, the larger edition of which was republished in second edition in 2005. In the period under review, he supervised the work of one PhD student, three MSc students and one honours student. He authored or co-authored two scientific papers, with a further four in press and five submitted, two semi-popular articles and one semi-popular book. He also refereed four papers for four journals.

Phil was on sabbatical for the second half of the review period, primarily catching up with a backlog of paper-writing that had built up during the writing of *Roberts*.

Ecology of Migration

Programme leader

Assoc. Prof. Phil Hockey

Research team

Prof. Paulette Bloomer (University of Pretoria)



Red-billed Teal in flight. Photo: Peter Ryan.

Overview

In recent years we have directed much effort at unravelling ecological correlates of short- to medium-distance migrations among African birds. Migration patterns are, *inter alia*, closely linked with climatic seasonality, habitat structure, diet and foraging mode. These findings are summarised in a book chapter authored by Phil Hockey and published in 2005 (John Hopkins University Press). Several so-called paradigms, stemming mostly from studies in the Americas, do not apply in Africa. We therefore revisited the big picture, by making inter-flyway comparisons, not previously attempted across all three major flyways (Americas, Africa and Asia). The results of this work have been written up and are pending submission.

Locally, we have continued studies of movement patterns of juvenile African Black Oystercatchers *Haematopus moquini*, monitoring the occurrence of individually colour-banded birds along the South African and Namibian coasts. We have also started investigation of the seemingly complex and poorly resolved movement patterns of southern African anatids (ducks and geese). Many waterbirds in southern Africa are nomadic or highly dispersive. Understanding their movement patterns is crucial to population/habitat management and predicting the spread of pathogens such as avian influenza (see *Spatial Parasitology and Epidemiology*).

A major project to be tackled during the review period (the relative roles of history and ecology in determining movement patterns of African birds – see below) came to a halt in late 2005 following the death of PhD student Kirsten Louw.

Anatid movements

Monitoring schemes, such as the Atlas of Southern African Birds (SABAP), African Bird Ringing Unit (AFRING) and Co-ordinated Waterbird Counts (CWAC), aim to provide avifaunal density, distribution and movement information. CB student, Hannah Thomas used Red-billed Teal *Anas erythrorhyncha* as a focal species for interrogating these datasets to determine whether they supported conclusions drawn from published studies. Monthly counts from regional sites suggest that high spatial and

Research Programmes & Initiatives

temporal variation in teal abundance may follow a seasonal rainfall gradient. SABAP data revealed no evidence for seasonal redistribution, since purely presence/absence records masked the amplitude of abundance. SAFRING data provided clear movement vectors but low recovery rates and biases in ringing/recovery sites made it difficult to draw significant conclusions. Bi-annual CWAC counts were uninformative, as counts did not coincide with peaks of teal abundance. These results clearly demonstrate weaknesses in large-scale monitoring efforts that lack detailed research objectives. Monitoring protocols could be improved by including abundance and sampling effort data into SABAP, broadening the geographical coverage of AFRING, and improving the temporal resolution of CWAC through quarterly counts.



African Black Oystercatcher. Photo: Peter Ryan.

African Black Oystercatcher Movements

Having established an extensive observational database of juvenile oystercatcher movements in the subregion (see 2005 Annual Report), we have now started to assess whether genetic evidence supports these observations in terms of the direction and extent of gene flow in the population. Several hundred blood samples were collected from around the coast from Possession Island, Namibia to East London, South Africa, and a subset of these were analysed by Dalemari Swanepoel with the aim of developing species-specific microsatellite markers. The use of microsatellite markers for the inference of population structure has proven invaluable in several other bird species, including the Eurasian Oystercatcher *Haematopus ostralegus*, but the development of markers is a necessary prerequisite for such studies. We successfully developed five polymorphic microsatellite loci with the use of the FIASCO protocol. Preliminary results indicate a low level of genetic variation (only two or three alleles per locus) and apparent heterozygote excess. Further development of polymorphic loci and the screening of more individuals will still be necessary for the accurate inference of demographic processes, including past changes in population size (Coalescence Analysis): this work will be carried out by Paulette Bloomer during 2007.



Doug Loewenthal (PhD student) and research assistants ringing oystercatchers on Malgas Island. Photo: Phil Hockey.

Students

Douglas Loewenthal (PhD, supervisor Phil Hockey) *Population dynamics and conservation of the African Black Oystercatcher* *Haematopus moquini*.

Anu Rao (MSc Memorial University of Newfoundland, co-supervisor Prof. Phil Hockey) *Movements and conservation of juvenile African Black Oystercatchers* *Haematopus moquini*.

Hannah Thomas (CB MSc, supervisors Phil Hockey & Graeme Cumming) *Understanding the movements of waterbirds in southern Africa: can the long-term ornithological data collection programmes reveal the pattern?*

Dalemari Swanepoel (BSc Hons Pretoria, co-supervisors Paulette Bloomer & Phil Hockey) *The isolation of species-specific microsatellite markers for the African Black Oystercatcher* *Haematopus moquini*.



*Southern Africa hosts large numbers of migrant birds, such as these Common Terns *Sterna hirundo*. Photo: Peter Ryan.*

Acknowledgements

Oystercatcher migration research was funded by Namakwa Sands (through WWF-SA); AFRING, CWAC and SABAP for the use of data in Hannah Thomas' project.



Dr Andrew McKechnie

is a Senior Lecturer in the School of Animal, Plant and Environmental Sciences at the University of the Witwatersrand, Johannesburg, where he teaches undergraduate and honours-level courses in ornithology, physiological ecology, stable isotope ecology and neurobiology. During the review period, he was awarded Wits University's Friedel Sellschop Award for promising young researchers. He is currently serving as Associate Editor for the journal *Ostrich*. During the review period, he supervised one MSc student and two BSc(Hons) projects, and co-supervised a PhD student. Two peer-reviewed publications were accepted during the review period, and Andrew authored five popular articles. Members of the research team gave five conference presentations.

Ecological & Evolutionary Physiology

Programme leader

Dr Andrew McKechnie

Research team

Dr Walter Jetz (University of California, San Diego, USA)

Robert Freckleton (Oxford University, UK)

Prof. Barry Lovegrove (University of KwaZulu-Natal)

Prof Mark Brigham (University of Regina, Canada)

Dr Barend Erasmus (Wits University)

Overview

Ecological and evolutionary physiology links physical and chemical processes at a cellular level to whole-animal responses and performance. By bridging the gaps between physics, chemistry, ecology and evolution, these fields of study reveal how internal and external environments affect the interactions between an organism's genotype, phenotype, short-term performance and long-term performance. Ecological and evolutionary physiologists have a particularly important role to play in understanding the current and future responses of animals to climate change.

Phenotypic plasticity in avian metabolic rates

The rates at which birds metabolize nutrients have far-reaching consequences for their performance and reproductive success, and ultimately for their evolution. Contrary to the view that persisted for most of the 20th century, there is increasing evidence that many birds can rapidly adjust their metabolic machinery in response to changes in energy supply and/or demand. Many year-round residents at high latitudes, for instance, show impressive increases in metabolic capacity during the winter months, allowing them to produce enough metabolic heat to avoid hypothermia, even at environmental temperatures far below freezing.

This project investigates various aspects of phenotypic plasticity in avian metabolic rates, using Laughing Doves *Streptopelia senegalensis* as a model species as well as synthetic analyses of literature data. The Laughing Dove experiment revealed that doves can adjust basal metabolic rate (BMR) by up to 26% over a 3-week period, and more significantly, that the direction of these adjustments can be reversed. The synthetic analysis found novel patterns in the allometric scaling of avian BMR, revealing the wild birds and birds raised in captivity differ physiologically in fundamental ways.



A Freckled Nightjar in Kgaswane Mountain Reserve. A temperature-sensitive radio transmitter has been attached, and the bird is about to be released. Photo: Andrew McKechnie.

Torpor and hibernation in southern African birds

Many birds feed on food resources whose availability fluctuates unpredictably, such as flying insects, nectar and fruit. Some of these birds have evolved the capacity to reduce their energy requirements by entering a physiological state during which their metabolic rates and body temperatures are down-regulated to far below normal levels. During torpor, this physiological state occurs for less than 24 hours, whereas during hibernation it may last for weeks or months. Torpor has been reported in a number of avian groups, including the hummingbirds, mousebirds, nightjars and doves, but hibernation has been observed only in the Common Poorwill *Phalaenoptilus nuttallii*, a North American caprimulgid.



Prof. Mark Brigham (University of Regina, Canada) and Robert Ashdown (Wits Honours student) in Kgaswane Mountain Reserve. The antenna is part of a telemetry recording station used to monitor body temperature in radio-tagged Freckled Nightjars. Photo: Andrew McKechnie.

Robert Ashdown (a CoE-funded Wits Honours student) has been investigating the occurrence of torpor and hibernation in the Freckled Nightjar *Caprimulgus tristigma*, a southern African species with striking ecological similarities to the Common Poorwill. Small temperature-sensitive radio transmitters were used to monitor the body temperature of seven individuals in Kgaswane Mountain Reserve, Rustenburg during the winter of 2006. Although the nightjars did not hibernate, several individuals regularly entered torpor around midnight, before rewarming a few hours after sunrise. One nightjar reduced its body temperature to 13°C, one of the lowest values ever observed in a bird. This study confirms the occurrence of torpor in an African caprimulgid, and adds to the increasing body of literature revealing that avian torpor is more widespread than

previously thought.

Climate change and birds in hot deserts

Many of the world's deserts are characterized by high air temperatures that may exceed 50°C at midday during summer. Unlike mammals, desert birds are generally diurnal, and with few exceptions do not make regular use of burrows or rock crevices to escape these challenging thermal conditions. Although birds living in hot environments have evolved a range of behavioural and physiological mechanisms to avoid potentially fatal heat stress, the increases in maximum air temperatures associated with global warming will directly affect survival and reproduction in desert avifaunas. This project, which commenced in 2004, models the effects of global warming on survival and reproduction in desert birds, by linking expected temperature increases in desert areas to physiological models of avian evaporative water loss to predict the increases in water requirements that will be experienced by desert birds in coming decades. It has revealed that the effects of global warming will be strongly dependent on body size, with small birds requiring disproportionately more water to keep cool under climate change scenarios than larger species. As climate change accelerates, desert bird communities are likely to experience more frequent catastrophic mass mortality events similar to those occasionally observed in the Australian deserts during the 20th century.

Highlights

- A paper was published in *Proceedings of the Royal Society B* (McKechnie, Freckleton & Jetz 2006), revealing the influence of phenotypic plasticity on avian metabolic scaling.
- A further two peer-reviewed publications were accepted for publication in *Journal of Experimental Biology* and *Journal of Avian Biology*.
- Andrew McKechnie was awarded the Friedel Sellschop Award for promising young researchers by Wits University.
- Honours students Robert Ashdown and Candis Lubbe graduated.

Conference presentations

Five presentations were given by Andrew McKechnie or his collaborators at the following meetings: 20th Annual Meeting of the Society for Conservation Biology, 24th International Ornithological Congress, 4th North American Ornithological Congress, American Physiological Society Intersociety Meeting, and North American Symposium on Bat Research.

Students

Robert Ashdown (BSc Hons Wits, supervisor Andrew MacKechnie) *Environmental correlates of Freckled Nightjar (Caprimulgus tristigma) activity in Kgaswane Mountain Reserve, Rustenburg.*

Candis Lubbe (BSc Hons Wits, supervisor Dr Andrew MacKechnie) *The thermal biology of a small Afrotropical arid-zone parrot, the Rosy-faced Lovebird (Agapornis roseicollis).*



Assoc Prof. Phil Hockey
is also the leader of the **Ecology of Migration Research Programme** and co-leader of the **Spatial Parasitology and Epidemiology Programme**.

Prof. Morné du Plessis
is also the leader of the **Cooperative Breeding & Sociality in Birds Research Programme** and co-leader of the **Spatial Parasitology and Epidemiology Programme**.

Assoc. Prof. Peter Ryan
also leads the **Island Conservation** and the **Seabird Research Programmes** and is co-leader of the **Systematics & Biogeography Programme**.

Dr Rob Simmons
Is co-leader of the **Raptor Research** and the **Climate Change, Vulnerability and Adaptation Programmes**.

Rarity and Conservation of Southern African Birds

Programme leaders:

Assoc. Prof. Phil Hockey
Prof. Morné du Plessis
Assoc. Prof. Peter Ryan
Dr Rob Simmons

Research team:

Dr Lizanne Roxburgh (PFIAO)
Odette Curtis (PFIAO)

Overview

Birds are perhaps the best-studied group of vertebrates world-wide; the breadth of this knowledge may explain why ca 12% of the world's birds are included in the International Red Data Book (Hockey 2002). The forces that have driven birds towards extinction have changed over the past 400 years, from direct persecution to habitat loss and degradation, and invasion of alien taxa. For several years, researchers at the PFIAO have used a diversity of model taxa to investigate the reasons for avian rarity. In almost all cases, the search has been for the life-history stage(s) at which demographic bottlenecks occur, and identifying the root causes of such bottlenecks.

This programme is something of a catch-all for miscellaneous conservation projects. However, underpinning these studies is the philosophy that conservation action is only likely to be effective if the root cause of the problem can be identified. Practical examples of this include managing the successful re-introduction of the Aldabra Rail *Dryolimnas [cuvieri] aldabranus* to Picard Island, and effect a marked increase in African Black Oystercatcher *Haematopus moquini* numbers after identifying the key population bottleneck. The pool of expertise that the PFIAO has developed in the field of linking life-history studies with remedial action for threatened taxa is considerable. This expertise has been applied in locations as disparate as sub-Antarctic and tropical Islands, forests and highland wetlands. As increasing numbers of species are added to Red Data Lists, continued development of this expertise will become ever more essential. We have already started this development by addressing problems associated with highly dispersed and/or rare taxa (e.g. Southern Ground Hornbill *Bucorvus leadbeateri* and Chaplin's Barbets *Lybius chaplini*).

African Black Oystercatchers

The long-term, ongoing study of the population dynamics of the African Black Oystercatcher has involved data gathering throughout the species' breeding range and beyond at Namibian nurseries (see 'Migration'). During the course of this study, significant environmental changes have affected the species' demographics, notably the invasion of the shore by an alien mussel species and the banning of off-road vehicles from South African beaches. This environmental change is spatially variable and has allowed us to fine-tune demographic models in response to observed changes in reproductive performance. Examination of local population dynamics which incorporate both periods of stability and population change, is allowing us to model the effect of environmental changes, both natural and human-induced, on territorial behaviour and hence on local carrying capacity. In particular, we are interested in the extent to which territory size (and hence population density) is governed by resource availability and/or social interactions between birds.

We have demonstrated that increased food resources and improved protection independently result in population increases. Many increases in local breeding populations have occurred too fast to be explained by intrinsic recruitment alone. Increases appear to result largely from increased settlement of non-breeding adults that were previously excluded by virtue of resident breeders having larger territories;

these birds are termed 'floaters'. As optimal territory size decreases, space is made available that can be occupied by 'new' breeders. This implies that the size of the floater population at any one time may be determined primarily by the behaviour of territory holders, rather than by the recent breeding success of territory holders. Modelling of these processes allows prediction of local carrying capacity based on (1) the population density at which sexually mature birds are excluded from the breeding population by territorial behaviour; (2) the increased rate of exclusion of sexually mature birds as density of territorial breeding pairs increases; (3) site-specific reproductive rates; and, (4) post-fledging and adult survival rates. From these parameters, we can predict stable population densities for local populations, and thus determine whether existing oystercatcher populations have reached carrying capacity. If so, additional conservation measures are unlikely to produce a measurable response in terms of increasing numbers.



Lizanne Roxburgh (Post-doc) has individually colour-ringed a small population of the Zambian endemic, Chaplin's Barbet, in the Choma district. Photo: Lizanne Roxburgh

Chaplin's Barbet

Post-doc Lizanne Roxburgh is studying the factors limiting the distribution of Chaplin's Barbets, a Red Data Book species endemic to a restricted area within Zambia, and to determine whether the species is additionally threatened by habitat transformation. Preliminary results suggest that not only have Chaplin's Barbets disappeared from parts of their historical range, but also that their total population size has been overestimated in the recent past. Land clearance for agriculture and urban development are reducing the extent of suitable habitat for the birds. In addition, the removal of dead branches from trees, which are used as nesting sites, and the lack of recruitment of Sycamore Fig trees, their main source of food, is leading to habitat degradation. Hunting of birds with bird lime and catapults is also widespread, and probably contributes to population decreases in areas near rural villages and towns.

Black Sparrowhawks

Odette Curtis, Phil Hockey and Ann Koeslag completed a study on determinants of reproductive performance of Black Sparrowhawks *Accipiter melanoleucus* on the Cape Peninsula.

Although these birds breed in the wet season (they are dry-season breeders elsewhere), the greatest impact on their breeding success is not environmental. Rather, performance is determined primarily by the probability of their nests being usurped by Egyptian Geese *Alopochen aegyptiaca*, a species that has increased greatly in abundance on the Peninsula. This research is now in press in *Ibis*.

Blue Cranes

The close association of Rob Simmons with the Namibian Nature Foundation (through Dr Chris Brown), and the Namibian Crane Working Group (Ann and Mike Scott) has led to collaboration on a study of the population dynamics of the isolated Blue Crane *Grus paradisea* population in Etosha National Park. Initial genetic sampling suggests the population is genetically isolated too. Aerial and ground surveys in April 2006 revealed that the population has remained stable at just over 60 birds relative to the previous survey 10 years ago. Pairs with chicks were found inside the park but none of the birds outside the park had bred. Breeding inside indicates a high level of adaptation to a predator-rich and hot environment that will be investigated in 2007. The Blue Crane in Namibia was recently designated a *Critically Endangered* bird under IUCN criteria in the new Namibian Red Data book that is now finished but awaits final printing.

Shorebird conservation

A long-term collaboration between Namibian and Angolan researchers has borne fruit in the form of two recent publications. The first assessed for the first time the conservation significance for shorebirds of the only sandy island along the 2000-km long Namib Desert. The Baia dos Tigres area (Bay of Tigers) in Angola has never been previously assessed and the study indicated that 11 000 shorebirds can use the area and the density of birds is substantially higher than regions just south in Namibia. The paper was jointly written with Albertina Nzuzi – an ex-Conservation Biology student who works with the Angolan Ministry of Environment. We recommended the incorporation of the Ilha dos Tigres into the Iona National Park.

The second study took an overview of the commonest migrant shorebird on Namibia's coast and in collaboration with the Avian Demography Unit's Tony Williams a paper was produced on the number of Curlew Sandpipers *Calidris ferruginea* regularly seen on the coast.

In an Africa-wide assessment of a highly localized and specialized species – the Chestnut-banded Plover *Charadrius collaris* – data was drawn from 9 authors (from Botswana, Namibia, South Africa Tanzania UK) to re-assess the global status of the Chestnut-banded Plover. We showed that this diminutive and highly specialized species qualifies as globally *Near Threatened*, occurring as it does in less than 10 places during the austral winter, in a total area much less than 2000 km² threshold used by Birdlife International to designate threatened species. This bird will therefore enter the *Near Threatened* category in the new Birdlife International assessment and garner increased international attention.



Southern Double-collared Sunbird– impacted by habitat fragmentation in renosteveld and strandveld; also one of the species impacted by golf estate development. Photo: Peter Ryan.

Multi-species studies

In addition to single-species studies of threatened taxa, we have recently adopted multi-species approaches, with the aim of predicting existing or future threat. Phil Hockey and Odette Curtis developed a simple model, based on one of botanical extinction risk and using basic biological information, that appears robust in predicting the threat status of vertebrates, using birds and lemurs as examples. It also highlights several taxa not currently listed in Red Data Books that probably should be. Nicola Okes, in conjunction with Phil Hockey and Graeme Cumming, analysed range changes in southern African waterbirds and concluded that both range expansions and range contractions could be better predicted by ecological traits (such as habitat usage) than by life-history traits (manuscript currently under review with *Conservation Biology*). This study also highlighted several species considered to be likely candidates for future wide-scale range contractions (many are already known to have undergone local range contractions or population decreases). Vanessa Stephen and Phil Hockey undertook an analysis of potential future threats to coastal bird populations stemming from Harmful Algal Blooms (Red Tides). By analysing historical data on the incidence and severity of HABs, they were able to provide strong evidence for an increasing frequency of HABs in the southern Benguela, and fairly strong evidence for an increase in their severity, with concomitantly increased risk for coastal birds feeding on organisms impacted by toxic HABs.

Golf courses and estates are one form of development threatening coastal vegetation in South Africa's Cape Floristic Region. They occupy substantial tracts of land, fragmenting indigenous vegetation. Sarah Fox and Phil Hockey investigated the effects on bird community structure and function of replacing natural Strandveld vegetation with a 170 ha golf estate in which 46 ha of Strandveld vegetation was retained, in conditions ranging from pristine to moderately degraded. The golf estate was more species rich overall, but many species were uncommon, several were present only as a consequence of the creation of new habitats, and species were not evenly distributed across the remaining Strandveld fragments. Bird diversity and abundance were significantly higher in the adjacent conservation area. We calculated that more than 8500 individual birds were displaced by construction of the golf

estate and four Strandveld species were not represented at all within the golf estate. Within the estate, the minimum area of continuous pristine vegetation required to maintain the natural species assemblage was estimated at 51 ha. Pathways of energy flow through the bird communities in the two areas were markedly different, and pollination and fruit dispersal potential within the golf estate were substantially compromised. This study clearly highlighted the fact that biodiversity analyses and assessments based on species richness or species diversity alone can be misleading because they take no account of species representation and, more importantly, of ecological processes. The research is in press with *South African Journal of Science*.

Highlights

- In September, Phil Hockey visited the AP Leventis Ornithological Research Institute in Jos, Nigeria. This is a recently founded and privately endowed institute, and is the only ornithological institute in Africa apart from the PFAO. As a result of this visit, we have recruited Adams Chaskda, an MSc graduate (Conservation Biology) of the University of Jos to join the Koeberg research team as a PhD student, starting in early 2007.

Students

- Douglas Loewenthal (PhD, supervisor Phil Hockey) *Population dynamics and conservation of the African Black Oystercatcher* *Haematopus moquini*.
- Anu Rao (MSc, MUN, co-supervisor Phil Hockey) *Movements and conservation of juvenile African Black Oystercatchers* *Haematopus moquini*.
- Sarah Fox (CB MSc, supervisor Phil Hockey) *Impacts of a South African coastal golf estate on shrubland bird communities*.
- Vanessa Stephen (CB MSc, supervisor Phil Hockey) *Harmful Algal Blooms: a potential conservation problem in the Benguela Upwelling System?*
- Nicola Okes (BSc Hons, supervisor Phil Hockey) *Can life-history characteristics be used to predict the responses of birds to habitat change?*

Lectures

The team collectively gave many lectures to bird clubs, natural history societies, agricultural groups and other NGO's throughout the reporting period. Lizanne gave a public lecture on Chaplin's Barbet for the Zambian Ornithological Society in Lusaka, to increase awareness of this little-known species. She also gave a presentation on the impacts of fuelwood collection and farming on Chaplin's Barbet at the International Ornithological Congress in Hamburg in August.

Acknowledgements

African Bird Club; Cape Nature Conservation; Claude Harris Leon Foundation; Cleveland Metroparks Zoo; Gordon Sprigg Scholarship Fund; Namakwa Sands; South African National Parks; University of Cape Town Research Committee and WWF-SA.

Assoc. Prof. Peter Ryan

is on the Editorial Board of *Bird Conservation International* and is a member of the IMAF Working Group of CCAMLR and the South Atlantic Island Plant Specialist Group, which is part of the IUCN Species Survival Commission. He is a Tristan da Cunha Conservation Officer, a member of the newly constituted Tristan Biodiversity Advisory Group and the IUCN Specialist Group on Invasive Plants at Atlantic Islands.

Peter continues to act as academic co-ordinator of the Conservation Biology MSc course, teaching two modules on this course. He also teaches in the undergraduate courses on marine biodiversity and vertebrate biology. During the review period he supervised six PhD and two MSc students as well as three CB MSc student projects and one Applied Marine Science MSc student project. He authored or co-authored 11 scientific papers, two book chapters, one monitoring manual and seven popular articles. He gave several talks to bird clubs and other special interest groups. In addition to his editorial duties for *Bird Conservation International*, Peter reviewed 13 manuscripts submitted to eight scientific journals.

Assoc. Prof. Peter Ryan

Is also the leader of the Seabird Research Programme, and together with Prof. Tim Crowe, leads the **Systematics & Biogeography Programme**.

Island Conservation

Programme leader

Dr Peter Ryan

Research team

John Cooper (Avian Demography Unit, UCT)

Dr Rob Crawford (Marine and Coastal Management)

Dr Richard Cuthbert (Royal Society for the Protection of Birds, UK)

Dr Geoff Hilton (Royal Society for the Protection of Birds, UK)



Richard Cuthbert, Marie-Helene Burle, Peter Ryan and Ross Wanless geared up for an amphibious landing on Gough Island. Photo: CHC Helicopters.

Overview

Oceanic islands – those that have never been connected to a continental landmass – are among the most sensitive of terrestrial ecosystems. Surrounding large stretches of open sea prevent many elements typical of continental biota from colonising oceanic islands. The few terrestrial species that manage to reach the islands often evolve into endemic species, many of which lack appropriate defences against introduced predators, or are unable to cope with introduced competitors. Colonisation of these environments by man and his commensals has had catastrophic results – more than 90% of avian extinctions since 1600 have been of island forms. Even where species persist, they are often at greatly reduced population sizes, and are thus prone to extinction from chance events such as environmental variability and catastrophes. Land-bridge islands are less susceptible to disturbance, but off southern Africa all are small, and support large numbers of breeding seabirds, many of which are endemic to the region and globally threatened. Conservation of these breeding sites is thus of considerable importance. This programme dovetails with the Seabird Research Programme, but covers the broader issues of island conservation, including the control of alien organisms and conservation of land birds on islands.

Impacts and eradication of House Mice

Most focus over the last few years has been on the impacts of introduced House Mice *Mus domesticus* on seabirds at Gough Island, which forms the topic of Ross



Wanless's PhD. Following confirmation of the scope of the problem, Ross was supposed to return to Gough in Sept 2005, but had to revise his plans after the birth of his son Alén, so two field assistants were sent in his stead. From Sept 2005 to Oct 2006 Marie-Helene Burle and Johnny Wilson collected baseline data on the abundance, movements and breeding biology of mice on the island. The main aim of the study was to provide data essential for planning an eradication exercise, should this be considered technically feasible, as well as increasing our understanding of the peculiarly localised pattern of attacks on Tristan Albatross *Diomedea dabbenena* chicks in the island's highlands. They confirmed that mouse densities are greater in the lowlands, where reproduction commences earlier each spring, and that absolute densities are high but not exceptional. Movements of marked and radio-collared mice indicated few movements >100m. Sadly, the visit to Gough Island by Derek Brown, a New Zealand specialist in the eradication of rodents, planned for 2006 had to be cancelled at the last minute. A new consultant is being appointed to undertake a feasibility study in 2007. Currently, any eradication attempt is likely to require dropping large volumes of poison bait from helicopters over the entire island. This can have potentially severe side-effects on other organisms, which have to be considered before an eradication can proceed. During 2006 Ross Wanless conducted feeding trials to test whether Subantarctic Skuas *Catharacta antarctica*, Lesser Sheathbills *Chionis minor* and Gough Buntings *Rowettia goughensis* are prone to direct or secondary poisoning at Marion and Gough Islands.

Eradication of other invasive species

Attempts to eradicate the invasive Procumbent Pearlwort *Sagina procumbens* from Gough Island continued in 2006, with a team on the island during summer 2005/06, and a follow-up visit in Sept-Oct 2006. Further efforts are planned for February and June 2007. Fortunately, follow-up can be more infrequent for the slow-maturing New Zealand Flax *Phormium tenax*. Initial clearing took place at Inaccessible in 2004 and Nightingale in 2005, and follow-up is planned for 2007. An application has been made to the UK Overseas Territory Environment Programme (OTEP) to fund this work, as well as surveys of other alien plants at the Tristan islands with a view to identifying other potential problem species, and assessing the feasibility of eradication exercises. The application was ranked joint first among proposals submitted by Tristan, but the outcome of the application will only be known later in 2007.

Ecotourism and environmental education at Tristan da Cunha

Tristan da Cunha and Gough Island are globally important sites for biodiversity conservation, thanks to large numbers of endemic species. The islands are an Endemic Bird Area and contain one of only two UK Natural World Heritage Sites. Tristan's Biodiversity Action Plan highlights the pressing need to diversify the island's economy, and identifies ecotourism as a key growth area. At the same time, one of the Action Plan's key objectives is to strengthen support for biodiversity conservation at Tristan. One way to attain both these goals is

to produce a guide to the fauna and flora of the islands. This is currently nearing completion, funded by OTEP and the RSPB. One copy will be given to each household on Tristan, and the remainder sold to tourists and other interested parties, with the proceeds going to Tristan's conservation fund.

Highlights

- During 2006, no papers were published, but work progressed well on a field guide to the animals and plants of Tristan and Gough, edited by Peter Ryan. The impacts of mice on Gough Island featured as a note in National Geographic.
- Two researchers spent a year on Gough Island, studying the biology of introduced House Mice with a view to a possible future eradication attempt.
- Fourth census of Tristan Albatross breeding success indicates consistent spatial pattern in mice mortality.
- Trials undertaken at Marion and Gough Islands to test the susceptibility of native birds to direct and secondary poisoning should eradication plans be implemented.

Students

Ross Wanless (PhD, supervisors Peter Ryan and Geoff Hilton)
The impacts of introduced mice on birds at Gough Island.

Lectures, Workshops and Symposia

Peter Ryan presented a wide-ranging seminar on seabirds and island conservation at the Université de la Réunion in November 2006, and gave a talk on island conservation to the new Gough Team in September 2006. Ross Wanless was appointed conservation officer for the annual relief voyage to Gough Island in Sept-Oct 2006, which required briefing lectures to passengers and crew visiting the islands.

Visitors

Mike Hentley, Tristan Administrator, visited the Fitztute en route from Tristan to take the opportunity to discuss conservation matters at the islands. Geoff Hilton, RSPB, spent a week at the Fitz to help Ross Wanless with the analysis of stable isotope data for his PhD. Richard Cuthbert, RSPB, returned to the Fitztute in August to joint the annual relief voyage to Gough Island.

Acknowledgements

I thank the UK Foreign and Commonwealth Office for their support of conservation work at Tristan da Cunha through the Overseas Territories Environmental Programme. Monitoring and research activities at the Prince Edward Islands are supported by the Department of Environmental Affairs and Tourism, partly through grants to Dr Rob Crawford. I am grateful to the numerous people who together help conserve our fragile islands. The ongoing support of the Tristan community is especially important.

Assoc. Prof. Peter Ryan

also leads a programme on **Island Conservation** and, together with **Prof. Tim Crowe**, leads the **Systematics & Biogeography Programme**.

Seabird Research

Programme leader

Assoc. Prof. Peter Ryan

Research team

John Cooper (Avian Demography Unit, UCT)

Dr Rob Crawford (Marine and Coastal Management)

Dr Richard Cuthbert (Royal Society for the Protection of Birds, UK)

Dr David Grémillet (CNRS, France)

Dr Geoff Hilton (Royal Society for the Protection of Birds, UK)

Dr Akiko Kato (National Institute of Polar Research, Japan)

Dr Deon Nel (World Wide Fund for Nature, South Africa)

Dr Richard Phillips (British Antarctic Survey, Cambridge, UK)

Dr Yan Ropert-Coudert (National Institute of Polar Research, Japan)

Prof. Les Underhill (Avian Demography Unit, UCT)

Dr Marianne de Villiers (Avian Demography Unit, UCT)

Post-doctoral Associate

Dr Greg Cunningham (UCT)

Overview

As a group, seabirds are among the most threatened birds in the world, with almost a third of all species included on the global red list. Seabirds also dominate the list of globally threatened species at a regional level in southern Africa. They are vulnerable to human activities both at sea and at their breeding sites. Consequently, the seabird research programme has a strong applied focus, assessing the magnitude of threats faced by various seabird species, and attempting to provide practical management solutions to mitigate against these threats. However, because many seabirds are easily observed and caught at their breeding colonies, they also provide excellent models for testing ecological and evolutionary theories. The programme thus includes several studies of a more academic nature. It forms the bulk of Peter Ryan's research activities, and overlaps to some extent with the island conservation programme.

Individual variation in albatross reproduction

A five-year programme to study individual variation in reproductive success among albatrosses commenced in 2006. This study takes advantage of the colonies of marked birds set up by John Cooper in the 1980s, which have been monitored annually since then. They provide long-term breeding histories for large numbers of individuals. Albatrosses are classic examples of long-lived, monogamous birds, with delayed maturity and limited reproductive output (at most one chick per year). Like all birds, there is strong variation among individuals in terms of life time reproductive success. This study will determine the importance of the factors that could account for this variability, including individual condition ('quality') and good parenting skills. Phenotypic and genotypic effects are being disentangled using a four-way cross-fostering experiment. Genevieve Jones, a former field assistant on Marion Island, has been appointed to lead the project for her PhD, and is currently collecting data on Wandering *Diomedea exulans* and Grey-headed Albatrosses *Thalassarche chrysostoma* at Marion Island. Additional data are being collected on Atlantic Yellow-nosed Albatrosses *T. chlororhynchos* at Gough Island.

Demography of albatrosses

This project, closely allied to the preceding one, is using the latest multi-stage maximum likelihood models to estimate demographic parameters for albatross populations studied at Marion and Gough Islands. Model development is being led by Hal Caswell and colleagues from Woods Hole Oceanographic Institution, USA, and the CNRS, France, as part of an international initiative to improve and standardize parameter estimation for these globally threatened birds. The analysis of the Fitzitute



data is being conducted by Zach Vincent for his MSc. Zach visited Marion Island in April-May, to see the study colonies first hand and to collect additional data on recruitment and emigration outside colonies. He then spent time in France and the USA working on the data. In addition, a paper on breeding frequency in Grey-headed Albatrosses was published, discussing the reasons for the greater frequency of annual breeding at Marion Island than in other studied populations at South Georgia and Campbell Island. A manuscript on divorce in albatrosses has been drafted, highlighting the different forms of mate fidelity exhibited by these birds. Another manuscript reporting the relatively high incidence of two-egg clutches among Atlantic Yellow-nosed Albatrosses has been submitted.



Immature Wandering Albatrosses displaying together on Marion Island. A new research project is assessing the factors that influence differences in breeding success among this long-lived species. Photo: Peter Ryan.

Foraging ecology of Cape Gannets

David Grémillet arrived in mid-2006 for a one-year sabbatical, during which time he will write up data collected over the last few years, and supervise PhD student Lorien Pichegru. His initial focus is on the data collected from implanted heart-rate loggers and geolocator (GLS) loggers deployed year-round on Cape Gannets *Morus capensis*. Lorien Pichegru returned to Malgas Island in October 2006, once again tracking foraging trips of breeding gannets using GPS loggers, and recording foraging trip durations as well as chick growth and breeding success. This is the fifth successive year that these data have been collected, and Lorien is busy analysing how the foraging ecology of gannets breeding at Malgas has changed over this period, which coincides with a steady decrease in the abundance of pelagic schooling fish off the west coast. In the interim, Lorien has drafted a manuscript describing the foraging distribution of birds from Malgas and Bird Island, Algoa Bay, in relation to fish distributions determined by acoustic surveys. Yan Ropert-Coudert persevered with a long-standing paper using heart-rate measurements of foraging gannets to assess the costs of flapping and gliding flight, which was finally published in *Marine Ecology Progress Series*.

Foraging ecology of cormorants and African Darters

Following the success deploying accelerometers on Cape

Phalacrocorax capensis and Crowned *P. coronatus* Cormorants at Malgas Island in 2005, Lorien Pichegru gathered further data on the foraging ecology of Cape Cormorants breeding at Malgas in 2006 by recording foraging bout lengths among pairs feeding chicks. Coupled with data from the accelerometer study, it will give some idea of the foraging range of Cape Cormorants during this crucial stage of breeding. Lorien plans to use this, together with existing data from Cape Gannets and African Penguins *Spheniscus demersus*, to explore the question of what would constitute effective buffer zones around breeding islands should current initiatives to incorporate environmental approaches to fisheries management come to fruition.

Although not strictly seabirds, darters or anhingas are fresh-water diving birds related to cormorants. They are unique in allowing their plumage to become fully saturated with water, lowering their buoyancy and thus allowing them to hang in shallow water and ambush their prey. During research for the revision of *Roberts Birds*, it emerged that surprisingly little has been published on the diving ecology of these birds. Accordingly a study of African Darters *Anhinga melanogaster* was undertaken, comparing their diving ecology with that of White-breasted Cormorants *Phalacrocorax lucidus* at two sites near Cape Town. What started as a field camp exercise for third year students evolved into a neat study that is in press with the *Journal of Avian Biology*.



Ian Lavarello, Warren Green, Ross Wanless and Rich Cuthbert are all smiles after deploying GLS loggers onto Sooty Albatrosses breeding in the south-east of Tristan. Photo: Peter Ryan.

Foraging ranges of albatrosses

PhD student Samantha Petersen continued tracking non-breeding Black-browed *Thalassarche melanophrys* and Shy Albatrosses *T. cauta* on their foraging grounds off the coast of South Africa in 2006. Sam is now comparing the positions of albatrosses with those of fishing vessels obtained from MCM to assess how important vessels are in determining the distributions of these seabirds. From this, we can infer how much the birds rely on fishery discards. Such data are crucial for planning sensible conservation management of offshore resources, especially if one of the management options is to create open ocean marine protected areas. We also continue to deploy tracking devices on seabirds breeding at sub-

Antarctic colonies to assess their foraging ranges during both the breeding and non-breeding seasons. Six Sooty Albatrosses *Phoebastria fusca* breeding at Gough Island were equipped with satellite transmitters in September 2006, which are currently providing information on their movements during the breeding season. During the same visit to Gough, Ross Wanless was able to recover several leg-mounted GLS loggers deployed on Sooty Albatrosses in 2003, which will provide a record of their movements for up to three years. A new batch of GLS loggers were deployed on Sooty Albatrosses breeding on Tristan, to check if birds from this island have a different foraging area from those at Gough Island. Data already obtained from GLS loggers currently are being analysed for Tristan *Diomedea dabbenena* and Atlantic Yellow-nosed Albatrosses from Gough and Wandering and Grey-headed Albatrosses from Marion Island.

Impacts of long-line fishing on seabirds

For her PhD, Samantha Petersen is assessing the impacts of a suite of long-line fisheries on seabirds, turtles and sharks, testing mitigation measures to reduce bycatch, and attempting to understand the impediments to the implementation of mitigation measures. She has been working closely with Les Underhill to develop multivariate models of the factors driving bycatch patterns in the South African fishery for tuna and swordfish. It appears that bird bycatch can be explained by a suite of parameters such as region, season and moon state. However, few robust patterns emerge to explain variability in shark bycatch. Turtle catches are too infrequent to assess using this approach. Sam also has been conducting line-weighting studies in both the tuna and hake fisheries to measure line sink rates under a range of weighting regimes, and the impacts this has on fish catch rates. Increasing line sink rates is an effective way to reduce seabird bycatch. In real life, Sam manages the BirdLife & WWF Responsible Fisheries Programme, which works with fishers at sea to reduce seabird bycatch as well as developing educational materials and running education and training programmes. She is assisted by a team of three, which form part of BirdLife International's 'Albatross Task Force'. During 2006, large numbers of fishery observers and compliance officials have been trained, resulting in a marked improvement in observer data quality. The team also has run a series of highly successful industry workshops, attended by skippers and fishing managers. A significant breakthrough in 2006 was the extension of this programme to Namibia. Although workshops had been conducted there, this year saw the first trips to sea, which reported worryingly high levels of White-chinned Petrel bycatch in the hake long-line fishery off southern Namibia.

Impacts of trawlers on seabirds

During the last few years it has become apparent that substantial numbers of albatrosses and petrels are killed when they were entangled on trawl warps and dragged underwater. A dedicated study by Barry Watkins on deep-water hake trawlers operating off South Africa was completed in early 2006. It found that under certain conditions large numbers of

Shy Albatrosses and, to a lesser extent, Black-browed Albatrosses and White-chinned Petrels *Procellaria aequinoctialis*, are killed by trawl warps. Cape Gannets are killed mainly when they are tangled in nets during hauling and shooting. Mortality mainly occurs when dumping takes place, and is higher in winter, when there are larger numbers of birds attending vessels. Data are scant, but simple extrapolation suggests that at least 10,000 birds are killed annually. These estimates caused quite a stir, with Marine and Coastal Management implementing mitigation measures which required trawlers to deploy bird-scaring or *tori* lines over each warp from July 2006. These lines were designed by Barry Watkins, and a partnership was set up with the Kommetjie Environmental Action Group to manufacture *tori* lines using handicapped people from Ocean View. Compliance by the industry has been encouraging, and trials are ongoing to test the efficacy of the *tori* lines, and to improve their design to make them as effective and as easy to use as possible.



Barry Watkins found a novel use for road cones as weights on *tori* lines designed to reduce the numbers of seabirds killed by trawl cables. Photo: Peter Ryan.

Impacts of pelicans on seabirds

The population of Great White Pelicans *Pelecanus onocrotalus* breeding at Dassen Island has increased considerably in recent years. This probably has been driven by the provision of readily available food at a local pig farm, where up to 2000 pelicans scavenge chicken offal being fed to pigs. Probably linked to this behaviour, there has been a steady increase in records of pelicans eating chicks of seabirds. Initially these were confined to Dassen Island, but in the last few years pelicans have invaded the guano islands around Saldanha Bay, causing substantial mortality of several species, including four globally threatened or near-threatened species. PhD student Marta de Ponte has been studying this phenomenon, attempting to make observations at the pig farm, the islands



and more traditional wetland feeding areas. She has been assisted in 2006 by Mwema Musangu (CB MSc student), who spent three months on Dassen Island, freeing Marta to concentrate on other areas. This has been a particularly bad year for pelican attacks, with only 5% of Kelp Gulls *Larus dominicanus* managing to raise chicks at Dassen Island, and even fewer Cape and Crowned Cormorants. The Saldanha Bay islands have been equally hard hit, with some 200 apparently non-breeding pelicans working the islands, mainly targeting cormorants, but also Kelp Gulls and Cape Gannets. Given the poor conservation status of the cormorants and gannets, it has reached the point where direct management action is necessary (e.g. shooting pelicans observed to forage on seabirds).



Marta de Ponte (PhD student) and Ralf Mullers survey the Cape Gannet colony at Malgas Island for marauding pelicans. Photo: Peter Ryan.

Impacts of flipper bands on African Penguins

Several studies have shown lower survival rates of banded penguins, raising concerns about the large numbers of African Penguins banded, especially following major oil spills. During 2006, MSc student Shannon Hampton completed her study to test whether banded African Penguins also show reduced survival. The most compelling evidence comes from a comparison of return rates detected by an automated sensor using passive transponders implanted in birds breeding at Robben Island. Of 200 birds marked in 2005, 73 unbanded birds returned to the island in 2006 year compared to only 65 banded birds. This difference is not significant, but it suggests that bands may have an impact on African Penguin survival.

Use of scent by seabirds

Many procellariiform seabirds have a well-developed sense of smell. They are known to use scent to locate food at sea and, in some cases, their burrows at night. Post-doc Greg Cunningham, who did his PhD on the development of olfaction in petrel chicks at UC Davis, visited the Fitz to test whether albatrosses and petrels could be protected by spraying a solution of methyl anthranilate, a potent avian chemosensory irritant, over the danger areas around fishing vessels. He conducted trials from a demersal trawler, but although there was evidence of a reduction in some bird species' numbers

around the vessel, the effect was weak, and does not appear to offer a viable deterrent to protect seabirds from potentially lethal interactions with fishing vessels. Greg also tested whether African Penguins respond to dimethyl sulphide, a pungent compound released by phytoplankton. Dimethyl sulphide is one of the key cues used by several petrels to locate food at sea, and Greg's experiments on captive and free-ranging penguins suggest that they too orientate towards this compound, providing the first evidence of scent use by penguins.

Marine debris and its impacts on seabirds

Although only indirectly linked to the rest of the programme, Peter Ryan retains an interest in marine litter dating back to his MSc on the impacts of plastic ingestion on seabirds. A survey of marine debris on South African beaches conducted in 2005 was written up in 2006, and the results presented at a meeting in Spain by the Director of the Plastics Federation of South Africa. Peter was also invited to write a country report for UNEP summarising the status of marine litter in South Africa (including a review of the amounts, sources and impacts of marine litter as well as legal and policy frameworks designed to address the problem). From a more biological perspective, a paper has been drafted reporting long-term decreases in the abundance of plastic pellets ingested by a suite of seabirds off South Africa and in the central South Atlantic. This mirrors results reported from the Pacific and North Atlantic, suggesting that industry measures to limit spillages of pellets have been effective in curbing this form of pollution.

Highlights

- During 2006, 8 papers were published as well as a monitoring manual and one semi-popular article. A chapter reviewing the role of seals and seabirds as pelagic predators is in press in a book on the interactions between marine and terrestrial systems at the Prince Edward Islands.
- Benedict Dundee graduated with an Applied Marine Science MSc following the completion of his project on the diet and foraging ecology of Cape Gannets in Namibia.
- A five-year research programme on albatross reproduction and demography commenced in 2006, supported by SANAP.
- Studies continued into the foraging ecology of Cape Gannets and albatrosses off South Africa in relation to fishing activities.
- Extensive monitoring of trawl and long-line mortality took place, including first dedicated trips in Namibian waters.
- There was considerable media coverage of seabird-fishery issues, including a 20 minute slot on TV show *Carte Blanche* which caused a great deal of action by affected fisheries.
- *Tori* lines were designed for use in long-line and trawl fisheries, and their use made mandatory in South Africa.
- Training programmes for fishery observers from South Africa, Namibia and Angola are showing dividends in terms of improved data collection.

Research Programmes & Initiatives



In addition to specific research projects, we also monitor population trends among breeding seabirds. Here Rich Cuthbert, RSPB man of action, is busy counting Northern Rockhopper Penguins from the cliff top at Gough Island. The population of this species has decreased over the last 20 years. Photo: Peter Ryan.

Students

Marta de Ponte (PhD, co-supervisors Peter Ryan & Les Underhill) *Food supplementation, population growth and impacts of Great White Pelicans on breeding seabirds.*

Samantha Petersen (PhD, co-supervisors Peter Ryan, Les Underhill, Len Compagno & Ronel Nel) *Assessing and managing the impacts of long-line fishing on seabirds, turtles and sharks off southern Africa.*

Mareille Techow (PhD, co-supervisors Peter Ryan & Colleen O'Ryan) *The phylogeography of Procellaria and Macronectes petrels.*

Ross Wanless (PhD, co-supervisors Peter Ryan & Geoff Hilton) *The impacts of introduced mice on birds at Gough Island.*

Lorien Pichegru (PhD Strasbourg, co-supervisors Peter Ryan & David Grémillet) *Foraging behaviour and chick growth of Cape Gannets.*

Shannon Hampton (MSc, co-supervisor Peter Ryan & Les Underhill) *The impacts of flipper bands on African Penguins.*

Zach Vincent (MSc, supervisor Peter Ryan) *Demography and individual variation in reproductive performance of Wandering albatrosses at Marion Island.*

Helen Hill (CB MSc, co-supervisors Peter Ryan & Barry Watkins) *Patterns of seabird attendance at trawlers targeting hake Merluccius spp. off South Africa.*

Mwema Musangu (CB MSc, supervisor Peter Ryan) *The effect of Great White Pelican predation on breeding seabirds at Dassen Island, South Africa.*

Benedict Dundee (AMS MSc, supervisor Peter Ryan) *Diet and foraging ecology of Cape Gannets in Namibia.*

Lectures, Workshops and Symposia

Peter Ryan presented a seminar on seabird and island conservation at the Université de la Réunion in November. In May, Zach Vincent attended a workshop at Chize, France on albatross demography hosted by Hal Caswell from Woods Hole Oceanographic Institute. Subsequently, Zach spent several

months working with Hal in the USA from July, funded by a grant from Woods Hole. Samantha Petersen attended the planning meeting to decide research priorities for ACAP species in the South Atlantic, held in the Falklands in March. She also attended the IOTC Bycatch Working Group meeting in the Seychelles in August, as well as several fishery working group meetings in South Africa and Namibia. Sam and the BirdLife Seabird team give regular lectures on seabird conservation to the public, and run training courses for skippers of fishing vessels, fishery observers and enforcement officials, both in South Africa and Namibia. During 2006, 10 workshops were held with industry, and 98 fishery observers and 33 compliance officers were trained during 15 workshops. In October, Barry Watkins presented a paper at a Southern Seabird Solution workshop on trawl impacts on seabirds in Nelson, New Zealand jointly with Barrie Rose (I&J). Barry then attended CCAMLR meetings in Hobart, Tasmania.

Visitors

Long-standing collaborator Dr David Grémillet (CNRS, France) arrived for a one-year sabbatical at the Fitztute in August 2006. Our joint PhD student, Lorien Pichegru, arrived in September to conduct additional fieldwork on Cape Gannets and Cape Cormorants, and will remain at the Fitz to write up her thesis. Dr Greg Cunningham spent three months at the Fitz as a Centre of Excellence post-doc, conducting research into the use of scent by seabirds. Richard Cuthbert visited from Aug-Oct to accompany the seabird monitoring team to Gough Island. Ahmed Saeed, manager of a UN-sponsored biodiversity conservation programme in Socotra, spent a month in Cape Town during Oct-Nov to improve his seabird research skills. He spent time working in the field with Lorien Pichegru at Malgas Island, and accompanied an MCM cruise to several other guano islands to census breeding seabirds.

Acknowledgements

Seabird research in the Southern Ocean is supported financially and logistically by the Directorate: Antarctica and Islands, Department of Environmental Affairs and Tourism. Bird research on Gough Island is co-funded by the Royal Society for the Protection of Birds. Studies on the foraging ecology of Cape Gannets were initiated as part of a collaborative NRF-French programme but are now supported by the CNRS and a grant from the European Union to David Grémillet. The study of the impact of trawlers on seabirds was funded by I&J and the Deep Sea Trawler Association. Studies of the impacts of long-line fishing are supported and funded by Marine and Coastal Management, the Benguela Current Large Marine Ecosystem Programme, WWF-SA, and the BirdLife partnership. The Charl van der Merwe Trust supported the study of the potential impacts of flipper bands on African Penguins. Surveys of marine litter on South African beaches are funded by the Plastics Federation of South Africa; I am especially grateful to recently-retired director, Bill Naude, for his support. Colleagues both at the university and in the field are thanked for their assistance. This programme is a truly a collaborative effort.



Dr Andrew Jenkins

assisted with the co-supervision of two CB MSc students during the period under review. He authored or co-authored one scientific paper and two semi-popular articles, and reviewed four manuscripts submitted to four different scientific journals.

Dr Rob Simmons

is a research associate of the PFIAO, co-founder of its Climate Change Programme and co-leader of its Western Cape Raptor Research Programme. He combines evolutionary and population ecology with practical conservation issues such as rarity and persistence of small populations, and the responses of endemic, wetland and raptorial species to climate change. Rob also works on behavioural ecology issues such as the factors favouring siblicide and size dimorphism in birds of prey, and the evolution of secondary sexual characters. Rob is a corresponding editor of *Ostrich*, reviews manuscripts for many other journals, and in 2006 was NRF rated and funded. During the review period, Rob supervised two CB masters students, one honours student and cosupervised one masters student. He co-authored two papers and has four in press, and contributed one semi-popular article. Rob expects the *Namibian Red Data book*, of which he is senior author to be published in 2007.

Raptor Research

Programme leaders

Dr Andrew Jenkins
Dr Rob Simmons

Research team

Anthony van Zyl (PFIAO research affiliate)
Koos de Goede (Birds of Prey Working Group, Endangered Wildlife Trust)
Odette Curtis (PFIAO)
Adam Welz (MSc student, Botany Dept, UCT)
André Botha (Manager, Birds of Prey Working Group, Endangered Wildlife Trust)

Overview

Birds of prey are generally rare, charismatic, apex predators, often suitable as indicators of environmental health, and ideal as icons for broader conservation initiatives. The Western Cape Raptor Research Programme (WCRRP) is the administrative umbrella for a number of research projects focused on the biology and conservation of raptors and raptor habitats in the Western Cape Province and beyond. The programme includes established, long-term studies of raptor populations in the Cape Town area, and newer, more applied projects on raptors and land-use in the Karoo and Fynbos biomes. An important objective of the programme is to identify the conservation needs of the region's birds of prey, and to develop parallels, overlaps and synergies between these needs and broader regional and national environmental initiatives.



Ongoing, long term studies of Peregrine Falcon and Black Sparrowhawk populations on the Cape Peninsula continued apace during the review period. Over 50 Peregrines were colour-ringed, and over 50% of the adults in both populations are now individually marked. Here a brood of four young Peregrines recover at their nest site (an old White-necked Raven nest) just after ringing. Photo: Andrew Jenkins.

This was a transitional year for the raptor research programme, primarily because two major projects – the Black Harrier *Circus maurus* Project and the Eskom Electric Eagle Project – were reconfigured and scaled down, and also because much time and effort was spent on initiating new projects, forging a new partnership with the Birds of Prey Working Group (BoPWG) of the Endangered Wildlife Trust, and looking for new sources of funding.

Black Harrier Project

The Black Harrier *Circus maurus* is one of 16 species of harriers worldwide, with the most restricted range of any continental species. It is endemic to the grasslands and

fynbos of southern Africa, it has been the subject of only one breeding study, and is classified as globally 'Vulnerable'. Its world population is estimated at 1000-2000 birds, of which less than 100 occur in protected areas. This 6 year study is investigating the breeding ecology and resource requirements of Black Harriers, with a view to improving management strategies to meet its conservation needs. Specifically, there are three major components to this project:

(1) an overview of the life history of the species in different regions of South Africa. Results from 90 nests sites and over 200 nesting attempts indicate that in the Western Cape smaller clutches and fledging success occurs in inland sites such as mountains and Overberg habitats relative to coastal areas where mice are more numerous (ii) breeding in the Northern Cape is sporadic occurring approximately 2 in every 3 years with similar data emerging from the Eastern Cape, and (ii) polygyny occurs at a low level only in the mountains; Reversed Size Dimorphism levels are relatively high and predict the presence the existence of polygyny in this species

(2) an investigation of the use of remnant patches of the Cape Floral Kingdom's most threatened habitat, renosterveld. The MSc thesis of Odette Curtis showed that Black Harriers were (i) rare in these areas with only about 60 pairs estimated present day relative to a maximum of 1500 pairs before renosterveld transformation, (ii) they chose only patches above 100 ha in which to breed (iii) radio-tracked males foraged only within natural habitat despite having agricultural and fallow lands available to them and (iv) the Honours project of Marion Atyeo indicated that small mammals were not more numerous in the patches used by Black Harriers for breeding relative to the unused ones.

(3) the present CB masters project (Julia Jenkins) focuses on the possibility that the Black Harrier is a good indicator of the biodiversity value of the large patches by assessing the density of (i) small mammals, passerine birds and plant richness in those patches used by breeding harriers. Initial indications are that plant species richness and rarity are correlated with harrier presence while small mammals and passerines are not.

Cape Vulture conservation and bush encroachment in Namibia

Cape Vultures have almost disappeared from Namibia and are designated *Critically Endangered* in the new Red data book. A study of the use of habitat by Maria Diekmann through the deployment of satellite tags was initiated in 2004 on 5-6 vultures. We are using this unique opportunity to assess where the vultures forage in relation to the highly bush encroached regions around the Waterberg Plateau Park. CB Masters student Pippa Schultz has spent 3 months (i) following up previous satellite data to find old carcasses and the bush density in these areas and (ii) experimentally providing carcasses in areas of varying bush encroachment. Results to date suggest (i) most naturally located carcasses were in open areas (e.g. game caught in fence lines) and (ii) heavily bush encroached areas are not suitable for birds to locate experimentally placed carcasses. Carcasses pulled into the open from such areas are subsequently quickly exploited

indicating the carcasses weren't simply an inappropriate food source.

Eskom Electric Eagle Project (EEEP)

This project was started in 2002 with the primary objective of developing a management strategy to minimize the incidence of eagle-related power outages on Eskom transmission lines in the central and southwestern Karoo. EEEP has largely fulfilled its initial brief, and work in 2006 was reduced to a single helicopter survey of all the lines included in the study, and some resulting practical interventions. We are now investigating ways to continue the pure research on large eagle biology which until now has been done as a by-product of more applied work. The project has accumulated five years of breeding success data for a population of about 90 breeding pairs of eagles spread across a large area of the Karoo. This is a significant foundation from which to build a long-term study of eagle population dynamics and, in particular, to study productivity and turnover under different commercial land use options and across protected area boundaries.



Adam Welz with an African Fish Eagle nestling on the Breede River. Blood and feather samples were taken from a number of Fish Eagle chicks in this area in 2006. These samples will be analysed for chemical contamination, as part of an investigation into the utility of the species as an indicator of levels of pollution in our aquatic systems. The plastic patagial tag will identify this individual eagle throughout its life. Photo: Andrew Jenkins.

Breede River Fish Eagle Project

This project was resurrected in 2006 after work on this initiative lapsed in 2004/2005. In essence, the project aims to investigate the utility of African Fish Eagles *Haliaeetus vocifer* as indicators of chemical pollution in freshwater systems. The Breede is one of the most heavily cultivated catchments in the region, with associated widespread use of a range of pesticides to improve fruit crop production, and it supports a population of about 20 pairs of African Fish Eagles. After some initial work done by Adam Welz as part of his Honours research in 2003,



we now have plans to continue the project in collaboration with Prof. Bill Bowerman, environmental toxicologist at Clemson University, Michigan, USA, linked with equivalent work being done on the Vaal and Orange Rivers by Mark Anderson of the Northern Cape Department of Tourism, Environment and Conservation, and facilitated by André Botha of BoPWG. This year, Bill, who has studied *Haliaeetus* eagles and pollution in many aquatic systems around the world, gave a workshop in Kimberley on survey, sampling and analytical protocols for this kind of work. Adam Welz attended this workshop, and then collected blood and feather samples in the prescribed manner from 10 Fish Eagle nests along the Breede River and nearby areas. This material will be analysed in Bill's lab. Ultimately, we hope to expand both the spatial and temporal scope of this study, and to establish the Fish Eagle as an important 'biosentinel' of the contamination of southern African waterways.



Anthony van Zyl and Lucia Rodrigues scanning the massive cliffs of the Mpumalanga escarpment for the rare and diminutive Taita Falcon. Photo: Andrew Jenkins.

Taita Falcon Project

The review period also saw the start of the **Taita Falcon Project**, conducted in collaboration with the BoPWG. The Taita Falcon *Falco fasciinucha* is a small and highly specialized, bird-hunting raptor, which is sparsely and patchily distributed throughout eastern sub-Saharan Africa. While it is poorly known throughout much of its discontinuous distribution, it is generally thought to be rare where it occurs, and fewer than 50 nest sites are known. The first breeding pair of Taita Falcons in South Africa was discovered on the Drakensberg escarpment in Mpumalanga Province in the late 1980s. Since then, another confirmed site has been found, and as many as 5 possible sites suggested, although the area has not been thoroughly or systematically searched, largely because the cliff habitat favoured by these birds is so formidable and remote. The initial goal of this project was to obtain a more accurate estimate of the number of breeding pairs present in the region, as an important precursor to a longer-term research and monitoring project to clarify the resource requirements and conservation status of this population. The 2006 Taita Falcon survey took

place over a two-week period in September, and involved 12 top local raptor experts accumulating 58 person-days of effort at over 50 potential Taita Falcon nest cliffs, spread along about 40 km of the more or less linear escarpment edge. We also did some helicopter-based survey work. Overall, we were able to re-confirm the two known sites as still current, and add another two definite nests. We also located over 50 nest sites of other cliff-nesting birds, including Red-listed species such as Peregrine Falcon *Falco peregrinus*, Lanner Falcon *F. biarmicus* and Black Stork *Ciconia nigra*.

Highlights

- A mutually beneficial collaboration was forged between the WCRRP and the EWT's Birds of Prey Working Group.
- The Breede River Fish Eagle Project was revitalized by linking it with similar ecotoxicological work being done on the Vaal and Orange Rivers, and by involving Bill Bowerman and his lab in project design and sample analysis.
- The known South African breeding population of the rare Taita Falcon was doubled in an intensive survey of the Mpumalanga/Limpopo escarpment area.

Students

Julia Jenkins (CB MSc, co-supervisors Rob Simmons & Morné du Plessis) *Are Black Harriers indicators of Renosterveld fragment quality? Conservation implications for a threatened species in a fragmented habitat.*

Pippa Schultz (CB MSc, co-supervisors Rob Simmons & Les Underhill) *Does bush encroachment impact foraging success of the critically endangered Namibian population of the Cape Vulture Gyps coprotheres?*

Marion Atyeo (BSc Hons Queensland, co-supervisor Rob Simmons) *The relationship between small mammal populations and nest site selection by Black Harriers in the Overberg, South Africa.*

Lectures

Members of the WCRRP gave at least five talks to membership-based societies during the review period.

Acknowledgements

The Black Harrier Project was funded by the Critically Endangered Ecosystem Fund, the Table Mountain Fund and supported by C.A.P.E., the Electric Eagle Project is conducted on contract to Eskom Transmission, the Breede River Fish Eagle Project is funded by Distell Group Ltd, Taita Falcon survey work in Mpumalanga and Limpopo Provinces was supported by The Peregrine Fund, the African Bird Club, and by Glendower whisky, and raptor research on the Cape Peninsula is sponsored by Peregrine Properties. Thanks to Chris van Rooyen for facilitating the EEEP so effectively, and to Lucia Rodrigues and Anne Koeslag for their tireless help with raptor monitoring on the Cape Peninsula. The Cape Vulture Project received support from REST, particularly Maria Diekmann and John Mendelsohn.

Prof. Tim Crowe
together with **Assoc. Prof. Peter Ryan**, also leads the **Systematics & Biogeography Programme**.

Gamebird Research

Programme leader
Prof. Tim Crowe

Research team

Assoc. Prof. John Carroll (University of Georgia)

Assoc. Prof. Brian Reilly (Dept of Nature Conservation, Tshwane University of Technology)

Dr Ray Jansen (Dept of Environmental Sciences, Tshwane University of Technology)

Overview

In the broadest sense of the word, gamebirds are birds that humans have utilized for food and sport since pre-historic times. The only attribute common to all gamebirds is that they are, at least potentially, sufficiently abundant and productive to withstand 'harvesting' year after year. Gamebirds are ideal subjects for scientific research because knowledge of their natural history has enabled significant advances in virtually every biological discipline from anatomy, behaviour and genetics through to parasitology and zoogeography.

This programme was initiated in 1990 and aims to identify the key factors that sustain or otherwise affect populations of gamebirds (e.g. guineafowl, francolins, spurfowl, etc.), to develop area-specific management strategies for the species concerned, and to determine the extent to which they act as indicators of the status of overall diversity. Publications produced by programme researchers have focussed on systematics (reviewed elsewhere), ecology, demography, ecotoxicology and parasitology of the species studied. The key practical products of this programme's research have been the development of biologically sustainable and economically viable wingshooting industries, and area-specific management strategies for gamebird species. In terms of research, key findings have emphasised the importance of maintaining gamebird meta-populations.

Management of Southern African Gamebirds: Opportunities and Threats

Perhaps the culmination of this programme was an invitation to Tim Crowe to present a plenary address at a Joint Conference: Quail VI and Perdix XII at the University of Georgia, USA in June 2006. The presentation, Management of Southern African Gamebirds: Opportunities and Threats, summarizes key results of more than 50 person-years of research on southern African gamebirds by Tim and team members: Rob Little (Greywing Francolin *Scleroptila africanus* and Cape Spurfowl *Pternistis capensis*), Ray Jansen (Redwing Francolin *S. levaillantii* and Swainson's Spurfowl *P. swainsonii*), and Lionel Pero, Luthando Maphasa, Gerard Malan, Charles Ratcliffe, Helen Prinsloo and Ian Little (Helmeted Guineafowl *Numida meleagris*).

Helmeted Guineafowl: Tim's research in the 1970s in the southern Kalahari demonstrated that Helmeted Guineafowl use frequency of heavy rainfall as a cue to breed in protected areas, and that year-to-year variation in guineafowl populations is strongly positively correlated with rainfall. The availability of insect food (critical for successful breeding) is also strongly positively correlated with rainfall, suggesting a cause-effect linkage between rainfall and guineafowl population size. Furthermore, population increases were lower in successive years with high rainfall, suggesting that the populations are limited in a density dependent manner.

Starting in mid-1980s there were reports from farmers and wingshooters of broad-scale collapses of guineafowl populations outside of protected areas. Tim attributed these to several successive years with lower than normal rainfall. He was wrong. Subsequent research by programme team members and students showed that the number of pesticides, toxicity levels and percentage of land under cultivation are negatively correlated with guineafowl populations, but positively correlated with



Swainson's Spurfowl populations on the same properties. However, these correlations were not evidence of causation. The fundamental cause of guineafowl population declines and collapses in agricultural landscapes was population fragmentation due to extensive and 'cleaner' (through the use of pesticides) crop farming (especially maize). This more intensive farming led to the isolation of guineafowl sub-populations and a lowering of the availability of insect and seed (from weeds) food. In other words, when fragmented sub-populations came under threat (for whatever reason) they could not be resuscitated by immigration from nearby adjacent sub-populations.

Guineafowl in human-transformed landscapes do not have a home range as traditionally understood. Their daily movements are determined by the dispersion of habitat focal points: roosts, drinking water and feeding/dusting cover habitat. Indeed, at a re-vegetated coal mine where all focal habitat components were closely clustered, guineafowl flocks moved virtually not at all. In agricultural areas, they also prefer a mosaic of habitats with large amounts of edge mosaic index. So, the critical management strategy for guineafowl is to cluster habitat focal points (like shops in a mall) and keep local sub-populations in close proximity.

Orange River Francolin *Scleroptila levaillantoides*: Unlike Helmeted Guineafowl, the Orange River Francolin population in an arid grassland within a protected area collapsed from one that could support sustainable wingshooting to virtually nil after a five-year bout of overgrazing during the 1930s. This still very poorly studied francolin is one of the most sensitive birds to the grazing and burning. Only pristine (rarely burned and ungrazed) arid grasslands can support shootable populations, and then only at very low levels.

Redwing Francolin: Redwing Francolin and other grassland birds in highland wetland grasslands are strongly negatively affected by grazing pressure and frequency of burning. Indeed, as one moves below shootable densities of Redwing, one ceases to encounter a range of Red Data grassland birds, making it an ideal indicator of healthy highland grassland. As with Orange River Francolin, it is absolutely essential to minimize the negative effects of grazing and burning on Redwing habitat.

Greywing Francolin: Unlike the previous two francolins, the Greywing thrives under moderate sheep grazing and can even withstand as much as a 50% annual shooting offtake. For this reason, this francolin currently is considered as one of southern Africa's champagne gamebirds.

Cape Spurfowl: Like the Helmeted Guineafowl, this Spurfowl thrives in golf courses with large amounts of edge habitat and the rough dominated by alien trees and brush. It does not, however, readily traverse large patches of non-Mediterranean vegetation (within which it evolved); especially open vegetation continuous or connected vegetation. It is currently probably under-exploited as a gamebird.

Swainson's Spurfowl: Unlike all other gamebirds discussed here, this species has, in most instances, benefited from agriculture. Its numbers decline only when its preferred breeding habitat ('islands' of brush and trees) are eliminated. Consequently, it is the focus of what is locally known as community shoots (dozens of groups of wingshooters, blanketing the landscape over a weekend), which may ultimately threaten local populations because of over-shooting.



Swainson's Spurfowl in amongst debris of maize stalks, Springbok Flats, Limpopo Province. Painting by Simon Barlow from Little and Crowe Gamebirds of Southern Africa.

Summary: Each southern African gamebird studied to date has its own management 'signature' and thus gamebird management is situation dependent. Before we can provide an ironclad management strategy for any of these species, situation-specific research is still a necessity.

Highlights

- Three papers on Swainson's Spurfowl emanating from Dr Jansen's PhD dissertation were published, one showing the effect of rainfall on breeding phenology (Ostrich), one on feeding preferences (SA Journal of Wildlife Research) and one on the low incidence of blood parasites (Ostrich).

Lectures

Tim Crowe gave one talk to a gamebird-hunting organization outlining past and current research results.

Acknowledgements

This programme was funded by the National Research Foundation. We would like to thank a host of colleagues (in particular Dr Rob Little, WWF-SA), students, wingshooters (in particular Messrs Roger Johnson and Peter Wales) and farmers for making this programme possible.

Prof. Graeme Cumming

is the Pola Pasvolsky Chair in Conservation Biology. Graeme moved from the University of Florida in Gainesville to start work at the Fitzitute in January, 2006. He currently leads two new programs, 'Spatial parasitology and epidemiology' and 'Pattern-process linkages in landscape ecology'. During 2006, Graeme supervised five students at UCT (three honours students and two CB MSc students) and three thesis MSc students at the University of Florida. Two of these students graduated from UF in June, and the third is due to graduate in June 2007. Graeme published eight peer-reviewed papers in international journals in 2006 and has a ninth in press, as well as co-editing a book ('Complexity theory for a sustainable future') that is currently in its final review stages with Columbia Press. He taught the 4-week landscape ecology module on the CB MSc course, gave a week of undergraduate lectures in Applied Ecology, and led an Honours "chatty" on sustainability. His other contributions in 2006 have included serving as an associate editor for two journals, *Diversity and Distributions* and the *South African Journal of Wildlife Research*; reviewing 12 papers for 8 international journals (*Biological Conservation*, *PLoS Biology*, *Ecological Applications*, *Ecology and Society*, *Conservation Biology*, *Ecology*, *Landscape Ecology*, and *Landscape and Urban Planning*); reviewing two book proposals, and participating in several professional meetings, including an AHEAD working group meeting for the Greater Limpopo Transfrontier Conservation Area, a SANBI-led workshop on the criteria for listing endangered ecosystems, and a CSIR-led workshop on freshwater conservation planning.

Prof. Graeme Cumming
Is also the leader of the **Pattern Process Linkages in Landscape Ecology Programme**

Spatial Parasitology and Epidemiology

Programme leader

Prof. Graeme Cumming
Prof. Morné du Plessis
Assoc. Prof. Phil Hockey

Research team

Dr Celia Abolnik (Onderstepoort Veterinary Institute)
Dr Mike Kock (WCS FVP)
Prof. David Cumming (PFIAO and TREP)



Wading birds and ducks (and their parasites and pathogens) at Stradfontein. How many species are really in this picture? Photo: Graeme Cumming.

Overview

Pathogens have a high relevance for conservation, particularly in small protected areas, small or endangered populations, or localities in which there are strong anthropogenic influences. Conservation areas in Africa often occur in close proximity to agricultural systems; and in many countries, areas that have high conservation significance are also used for grazing by cattle, donkeys and goats. Many important pathogens of mammals and birds are carried by ectoparasites (such as ticks, fleas, and tsetse flies).

The community dynamics of most pathogens and parasites are dependent on both their host communities and on their immediate biophysical environment. The close proximity of wild animals, domestic animals and humans in Africa raises many interesting questions from both theoretical and applied perspectives. For example: Does environmental modification (tree felling, heavy grazing, controlled burning, and so forth) affect ectoparasite numbers and hence the prevalence of pathogens in the human population? Do more diverse host communities harbour more diverse pathogen communities, and what would be the implications of such a conclusion for the management of disease in wild populations? Are there thresholds in ectoparasite abundance that dictate the likelihood of disease outbreaks occurring? Are there thresholds in host occurrences that dictate the abundance of ectoparasites? And how would such thresholds be influenced by changes in stocking densities and the species composition of large mammals and birds?

Given the relevance of ectoparasites as vectors of disease, one would expect that many of these questions would have been investigated in detail. In general, however, the spatial dynamics of ectoparasites are poorly understood. There has been relatively little spatially-explicit research on parasites, and few studies have crossed traditional disciplinary boundaries to integrate perspectives from landscape and



community ecology, biogeography, veterinary science, and medicine. It is only recently that ecologists have started to develop a food web and community ecology perspective on host-parasite-pathogen relationships, and even more recently that the field of veterinary conservation science has started to gain recognition.

Within this general area, we are working on two main projects, primarily from a food web and community ecology perspective (but with links to other agendas and approaches). The foci are (1) ticks as models for understanding the drivers of ectoparasite dynamics across multiple spatial scales; and (2) the relationships between landscape heterogeneity, wetland dynamics, the fine-scale movements of water birds, and avian influenza.

Ticks as models for understanding ectoparasite dynamics

Graeme Cumming has already assembled and analysed a broad-scale data set for the distributions of ticks over the whole of Africa. He is now in the early stages of starting field projects at finer scales to investigate the causes and consequences of heterogeneity in tick occurrences at finer scales. This work will also link to related questions on the linkages between communities of ticks, hosts, and pathogens. The research will be complemented by detailed studies of the comparative physiology of different species from different locations. It will contribute to the agenda of the AHEAD working group for the Greater Limpopo Transfrontier Conservation Area (GLTFCA) as well as to a more informed perspective on the role of ectoparasites in African systems.



Checking a duck trap at Strandfontein. Photo: Graeme Cumming.

Water bird movements and avian influenza

The Percy FitzPatrick Institute of African Ornithology, in partnership with the Onderstepoort Veterinary Institute and WCS, is leading implementation of the southern African component of the USAID-funded GAINS initiative. The goal of the project is to undertake a regional study of the distributions and movements of ducks and the prevalence of avian influenza viruses in wild duck populations in five sites spread across South Africa (Strandfontein in the Cape and Barberspan in Northern Province), Mozambique (still under evaluation; potentially Gorongosa and Lake Chuali), Botswana (Lake Ngami and Makgadikgadi Pans), and Zimbabwe (Lake Chivero and Lake Manyame, near Harare). The primary aims of the

project will be twofold: first, to document the prevalence of influenza viruses (i.e. including but not limited to H5 strains) in wild duck populations in southern Africa; and second, to obtain a better understanding of the regional movement patterns of wild water birds. Samples for influenza testing will be collected from ducks at each site. These data will be supplemented by standardized duck counts, measures of water quality and quantity, and a range of other satellite image-derived measures of habitat type and quality. Individuals of two species, Red-billed Teal *Anas erythrorhyncha* and Egyptian Geese *Alopochen aegyptiaca*, will be tracked using GPS telemetry. The results of the study will contribute to a regional and global understanding of the potential role of wild birds in the epidemiology of avian influenzas, as well as shedding light on patterns of duck movements through the year and the causes of nomadism in duck populations in semi-arid areas.



Researchers handling Egyptian geese. Photo: Graeme Cumming.

Highlights

- Three papers were accepted for publication in 2006; one in *EcoHealth* (Cumming & Guegan 2006) on food webs and disease; one on climate change and ectoparasite distributions in *Global Ecology and Biogeography* (Cumming & Van Vuuren 2006); and one on global biodiversity scenarios and landscape ecology currently in press (Cumming) with *Landscape Ecology*.
- The FitzPatrick Institute has been awarded a grant through WCS and USAID for research on water bird movements and avian influenza. The first year of support will total just under US\$230,000.
- Nicola Okes successfully completed her Honours degree.

Students

Lindy MacGregor (CB MSc, supervisors Graeme Cumming & Phil Hockey) *A social network analysis of anatids, grebes (Podicipedidae) and Red-knobbed Coots (Fulica cristata) at Strandfontein sewage work.s.*

Hannah Thomas (CB MSc, supervisors Graeme Cumming & Phil Hockey) *Understanding the movements of waterbirds in southern Africa: can the long-term ornithological data collection programmes reveal the pattern?*

Nicola Okes (BSc Hons, supervisor Phil Hockey) *Factors influencing range changes of southern African waterbirds.*

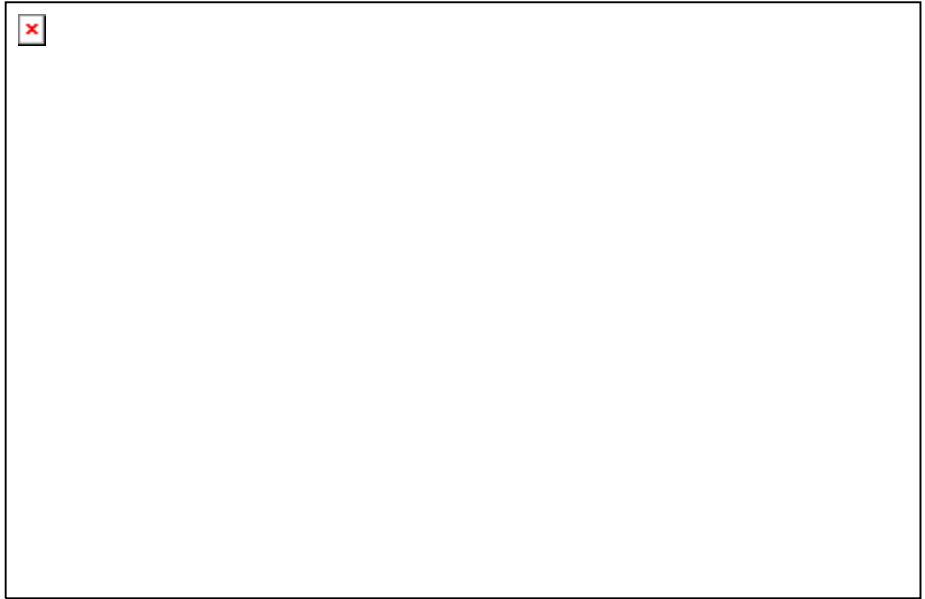
Prof. Graeme Cumming
Is also the leader of the **Spatial
Parasitology and
Epidemiology Programme**

Pattern Process Linkages in Landscape Ecology

Programme leader
Prof. Graeme Cumming

Research team

Assoc. Prof. Jane Southworth (University of Florida, USA)
Assoc. Prof. Grenville Barnes (University of Florida, USA)
Assoc. Prof. Stephen Perz (University of Florida, USA)
Prof. David Cumming (PFIAO and TREP)



The calm of this elephant belies its role as an ecosystem engineer. Photo: Graeme Cumming.

Overview

The earth is currently entering an age that has been termed the anthropocene, a period when human influences dominate natural processes. Most individual anthropogenic impacts occur at relatively small scales, but the combined effects of many people making small-scale changes to ecosystems can cause large-scale change. Humans and other organisms respond to landscape change across a range of scales. The central theme of this research program is to unite fine-scale and broad-scale perspectives in landscape ecology through exploring the connections between landscape pattern and landscape process at multiple scales. We are also interested in the resilience of linked social-ecological systems and the ways in which management and landscape-level changes in ecosystems interact to determine social-ecological resilience to such things as climate change, disease outbreaks, and species loss.

This programme area is one in which both theoretical and practical development are of prime importance. We have identified several focal areas in which research into specific cases will provide more specific ways of developing the necessary theory and should provide insights of broader relevance. These currently include (1) the role of nutrient hotspots in the landscape, and their contribution to community composition and resilience; (2) the spatial relationships between functional and taxonomic diversity; and (3) the influence of connectivity and other spatially-explicit variables on the resilience of linked social-ecological systems. All of this research will feed usefully into attempts to develop more effective, better-informed approaches to ecosystem management and biodiversity conservation.

Nutrient hotspots and community composition

This project is at an early stage. David Cumming, Graeme Cumming and Michael Mills spent five days in November/December visiting Chizarira National Park in



Zimbabwe and collecting preliminary data on large termitaria. Michael Mills will be starting his PhD research in 2007 on the influence of large termitaria on bird communities, focusing on the potential contribution made by termitaria to overall system resilience. We envisage that a number of smaller projects around this theme will be available for honours and coursework MSc students in 2007. Data on wetlands and their ecological influence on duck communities (to be collected through the water bird project described under the spatial parasitology and epidemiology programme) will also contribute to this project theme.



Michael Mills inspects a small termite mound in Chizarira National Park, Zimbabwe. Photo: Graeme Cumming.

Spatial relationships between functional and taxonomic diversity

Matthew Child completed an honours project comparing spatial patterns of functional and taxonomic diversity. The results, which are based on the Roberts' database and additional beak morphological measurements, indicate that taxonomic richness is not always a good surrogate for functional richness in South African bird communities. We plan to pursue this theme further by increasing the number of birds in the database and further exploring the potential relevance of the results for process-oriented conservation planning.

Spatial influences on resilience

This project is currently being supported by an NSF grant that was awarded to Steve Perz, Grenville Barnes, Graeme

Cumming and Jane Southworth. We are exploring the influence of the (currently under construction) trans-Amazon highway on the MAP (Madre de Dios, Accre, and Pando) area of the Amazon basin, where Bolivia, Brazil, and Peru meet. MAP is an intriguing case study because it includes three areas with similar biophysical templates and vastly different institutions and political ecologies. We have predicted that resilience of Amazonian social-ecological systems will be highest when their physical connectivity is intermediate, because the system receives new inputs from outside but is not overwhelmed by them. As connectivity changes with the construction of the Trans-Amazon highway, we are tracking changes in social systems, household economies, and plant communities. These data will be integrated with time series of land cover change, initially using space for time substitutions, to test whether system resilience changes as connectivity changes. A conceptual framework for the project was published in *Ecosystems* in 2005 (Cumming et al., 2005).

Highlights

- Five papers were published as part of this programme in 2006: one on the need for regional integration of pest management and conservation in *Biological Conservation* (Cumming & Spiesman 2006); one on habitat loss and trophic collapse in *Ecology* (Dobson et al. 2006); one on methods for quantifying spatial and temporal variation in landscapes in *Professional Geographer* (Southworth et al., 2006); and two on trade-offs between ecosystem services and scale mismatches in social-ecological systems in *Ecology and Society* (Rodriguez et al 2006 and Cumming et al. 2006).
- Together with Jon Norberg, Graeme Cumming has been working on an edited volume (currently in the final review stages with Columbia Press) to be titled 'Complexity theory for a sustainable future'.
- Brian Spiesman and Ann George graduated with MSc degrees from the University of Florida.
- Matthew Child and Tali Hoffman successfully completed their Honours degrees at UCT.

Students

Chris Burney (MSc Florida, supervisor Graeme Cumming) *Assessing community responses of bats to urbanization in east-coastal Florida.*

Ann George (MSc Florida, supervisor Graeme Cumming) *Assessing local and landscape impacts on plant community composition in abandoned citrus groves.*

Brian Spiesman (MSc Florida, supervisor Graeme Cumming) *On the community structure of ground-dwelling ants (Hymenoptera: Formicidae) in the sandhills of Florida.*

Matthew Child (BSc Hons, supervisor Graeme Cumming) *Nothing lives for nothing? A spatial approach in assessing the functional richness of the South African avifauna.*

Tali Hoffman (BSc Hons, supervisor Graeme Cumming) *Spatial ecology of the Tokai baboon troop in the Cape Peninsula.*

Dr Jane Turpie's

research and consulting interests incorporate resource economics, conservation planning and estuarine ecology. She teaches the Resource Economics modules of the Conservation Biology MSc and Applied Marine Science MSc courses and teaches applied ecology at second-year level. Jane is on the editorial board of the African Journal of Marine Science and is associate editor of the South African Journal of Wildlife Research. She sits on the steering committees of Water Research Commission projects concerning estuarine ecology, management and economic evaluation. During the review period Jane supervised two PhD and four MSc by dissertation in environmental economics, as well as two MSc Conservation Biology students.

Environmental & Resource Economics, Water Resources and Estuarine Ecology and Conservation

Programme leader

Dr Jane Turpie

Overview

This programme is multidisciplinary, integrating ecological, social and economic research in order to inform policy and decision making relating to the conservation of biodiversity and socio-economic development. The programme has particular emphasis on water and aquatic ecosystems. Projects initiated, ongoing or completed during the review period included an ecological study of the avifauna of intermittently open estuaries, an economic valuation study of Marine Protected Areas along the Cape coast, a valuation study of the Okavango Delta, development of a methodology for integrating ecological, economic and social implications in water resource allocation, development of a detailed protocol for valuing wetlands for various decision-making applications and development of a conservation plan for estuaries of the cold and warm temperate coasts of South Africa.

The value of Marine Protected Areas

This year's CB course Resource Economics project tackled the issue of future expansion of marine protected areas (MPAs) along the Garden Route coast. Existing protected areas comprise the 'no-take' Tsitsikamma MPA, the Robberg MPA which is partially open to recreational angling, and the Goukamma MPA which is open to recreational angling. A total of 150 groups representing 568 visitors were sampled within the three sites, and a further 381 respondents were interviewed at various localities along the Garden Route. As well as establishing the costs of maintaining the MPAs, the study estimated the opportunity costs in terms of recreational and commercial fishing, the benefits to surrounding fisheries, the recreational value and the existence value of these areas. Changes in these values were estimated for different scenarios, ranging from opening up fishing areas in Tsitsikamma to expanding the MPA system. In general the benefits of protection outweigh the costs.

Economic value of the Okavango Delta

The Okavango Delta generates an estimated P1.03 billion in terms of gross output, P380 million in terms of direct value added to gross national product (GNP) and P180 million in resource rent. The direct use values of the Okavango Delta are overwhelmingly dominated by the use of natural wetland assets for tourism activities in the central zone. Households in and around the delta earn a total of P225 million per year from natural resource use, sales, salaries and wages in the tourism industry, and rents and royalties in Community Based Natural Resource Management arrangements. The total impact of the direct use of the resources of the Ramsar site is estimated to be P1.18 million in terms of contribution to GNP, of which P0.96 million is derived from use of the wetland itself. Thus the Ramsar site contributes 2.6% of the country's GNP, with the wetland contributing most of this (2.1%). The multiplier effect is greater for the formal sector than for the poorer components in society, because the former activities have greater backward linkages and households are primarily engaged in subsistence activities. The natural capital asset value of the Ramsar site is estimated to be about P3.9 billion, of which the Okavango Delta is worth P3.4 billion. Management of the Okavango Delta Ramsar site will need to strike a balance between meeting the needs of the people living in and around the delta and generating its important contribution to the national economy. Local people derive roughly equal benefits from natural resources and from tourism, the latter being slightly higher. However, there is an important difference in the form that these benefits take. Natural resources provide subsistence value which contributes to peoples' livelihoods, as well as some cash income. Perhaps more importantly, they have the capacity to provide a safety-net for households that suffer shocks and



provide a risk-spreading mechanism for poor households that are vulnerable to the vagaries of environmental variability. Tourism, on the other hand, generates hard, reliable cash income to households, providing the type of income that most households aspire to. Tourism also makes a substantial contribution to Botswana's GNP, which in turn provides more revenue and social security to households all over the country.



The Okavango delta contributes over 1 billion Pula to Botswana's economy, some 2.1% of GNP. Most of this is from tourism involving high priced camps such as Mombo (above), at \$1200ppn. Photo: Jane Turpie.

The influence of freshwater flows on estuaries and their avifauna

Following analysis of long term data on several large estuaries, a year of regular count data were collected on four small intermittently open estuaries in the Eastern Cape during closed and open phases. Data analysis commenced to investigate why the avifauna responded differently in the four systems.

Integrating economics into water resource allocation

Valuation studies were conducted on the Olifants-Doring, Kromme and Seekoei catchment areas to estimate the economic implications of changing freshwater flows under different water management scenarios. In the case of the Olifants-Doring, the cost of ecosystem degradation cannot compete with the benefits from additional irrigation water supply, even when the nursery value of the estuary is taken into account. On the Kromme and Seekoei, ecological values are sufficiently high that they may have a significant influence on water allocation decisions. In a separate project, a draft ecological-economic model was constructed of the East Kleinemonde estuary as a potential tool for use in scenario analysis for this kind of decision-making. This will be completed in 2007 following the completion of a number of ecological and economic studies on the estuary.

Development of an integrated conservation plan for the estuaries of the Cape Floristic Region

Analysis of comprehensive fish data (collected over several years) for 12 estuaries suggested that the data collected during a rapid survey of all estuaries were sufficiently reliable to use as the basis of a conservation planning exercise. Analyses of fish and bird data shows that the currently-accepted classification of estuaries is not appropriate for conservation

planning, and a more biologically-based system needs to be used. Fish communities tend to be defined by estuary size and the subtropical subtraction effect, with smaller systems containing subsets of larger systems. Two main types of larger estuaries were recognised for birds, with communities on sandier and smaller systems forming subsets of these. Takalani Maswime's CB MSc thesis attempted to predict the recreational value of estuaries based on physical and locational characteristics. Analysis of economic characteristics is still underway.

Students

Peter Ngoma (PhD, supervisor Jane Turpie) *Valuation of inland fisheries in the Zambezi Basin: The case of Lower Shire and Kafue floodplain fisheries.*

Hugo van Zyl (PhD, co-supervisors Jane Turpie & Tony Leiman) *The use of property value approaches to value urban aquatic environments: case studies and their management implications for Cape Town.*

Duan Biggs (MSc, co-supervisors Jane Turpie & Christo Fabricius) *What makes community-based avitourism fly? An institutional perspective.*

Ruth Parker (MSc, co-supervisors Jane Turpie & Mark Botha, Botanical Society of South Africa); *Incentives and disincentives for conserving renosterveld remnants: what are the potential effects of the Property Rates Act [No 6 of 2004] on the conservation of Renosterveld?*

Anja Teroerde (MSc, supervisor Jane Turpie) *The influence of mouth dynamics on the avifauna of intermittently open estuaries.*

Helen Gordon (CB MSc, supervisor Jane Turpie) *The relationship between rural income and natural resource use: implications for development of the Kavango-Zambezi transfrontier conservation area.*

Takalani Maswime (CB MSc, supervisor Jane Turpie) *The opportunity costs of conserving estuaries in the CAPE planning region: a study of property values.*

Noah Scovronick (CB MSc, supervisor Jane Turpie) *Economic claims for transboundary conservation: reality or rhetoric? A case study of the Kgalagadi Transfrontier Park.*



Deciding on the conservation status of estuaries will involve tradeoffs between use values which increase with development, and indirect (ecosystem service) and non-use (existence) values which increase with conservation. The latter values are linked to scenic beauty as well as biodiversity. Photo: Jane Turpie.

Dr Rob Simmons

is also co-leader of the **Raptor Research Programme**.

Dr Phoebe Barnard

coordinates the national *Birds and Environmental Change Partnership* at the South African National Biodiversity Institute, and co-founded the joint SANBI-UCT programme on *Climate Change and Birds*. She also plays a modest collaborative role in Sue Milton's and Richard Dean's *Land Use and Biodiversity Programme*. Phoebe is on the editorial board of *Biology Letters* and *Animal Conservation*, is active in the *Society for Conservation Biology*, and mentors young scientists nationally and across Africa. Formally, she supervises two PhD students, collaborates with two postdocs and oversees the work of SANBI's summer interns in the *Birds and Environmental Change Partnership*. Her interests include applying insights from behavioural, population and evolutionary ecology to conservation biology, and how species will cope with global change challenges in real-world, fragmented landscapes.

Climate Change Vulnerability and Adaptation

Programme leaders

Dr Rob Simmons

Dr Phoebe Barnard (Birds & Environmental Change Partnership, SANBI)

Research team

Dr Res Altwegg (Avian Demography Unit, UCT; SANBI)

Dr Richard Dean (PFIAO)

Dr Barend Erasmus (University of the Witwatersrand)

Dr Wolfgang Küper, (Universität Bonn, Germany)

Dr Jon Lovett (York University, UK)

Dr Andrew McKechnie (PFIAO; University of the Witwatersrand)

Dr Guy Midgley (Global Change & Biodiversity Programme, SANBI)

Dr Jeff Price (California State University at Chico, USA)

Dr Terry Root (Stanford University, USA)

Prof Stephen Schneider (Stanford University, USA)

Dr Colleen Seymour (PFIAO; SANBI)

Dr Rachel Warren (Tyndall Centre, University of East Anglia, UK)



European Swallows. Photo: Phoebe Barnard.

Overview

There are few greater challenges facing biodiversity today than that posed by anthropogenic climate change. While barely six years ago, climate change was still regarded as a peripheral and controversial issue, the international scientific consensus on its magnitude, causes and types of consequences is now virtually complete. Climate change impacts on southern African biodiversity are expected to be highly significant. Africa is widely accepted to be the continent most vulnerable to climate change, and least equipped to adapt to it. Nonetheless, its biodiversity science community lags badly behind those of the northern hemisphere and Australia in understanding these impacts.

Even more worryingly, climate change impacts are increasingly understood to be exacerbated by other global change drivers, such as land use change, biotic invasion and desertification. These other drivers have already significantly altered southern African ecosystems, and the ways in which they compound the impacts of climate change are complex and often difficult to predict in detail. The magnitude and pace of these problems demands a concerted research response, coupled to concrete tools for conservation planners, policy policymakers and habitat managers.



Together with the South African National Biodiversity Institute's (SANBI's) Birds and Environmental Change Partnership, based in the Global Change and Biodiversity Programme at Kirstenbosch, the PFIAO thus established in 2005/06 a programme focusing on the vulnerability of bird species to climate change, and other drivers of environmental change which worsen its impacts. The scientific research work is done jointly by the PFIAO, Avian Demography Unit of UCT, and SANBI, with international partners. The policy and planning translation is undertaken mainly by SANBI with partners' inputs.

species predicted an average 40% range loss, but only one species, Blue Swallow *Hirundo atrocaerulea*, is currently on South Africa's Red Data List. We use demographic and spatial models to analyse long-term datasets, and will establish new long-term studies of carefully chosen species. Drs Wilfried Thuiller and Res Altwegg are developing advanced bioclimatic envelope and demographic modeling techniques, which we will combine in more sensitive analyses.



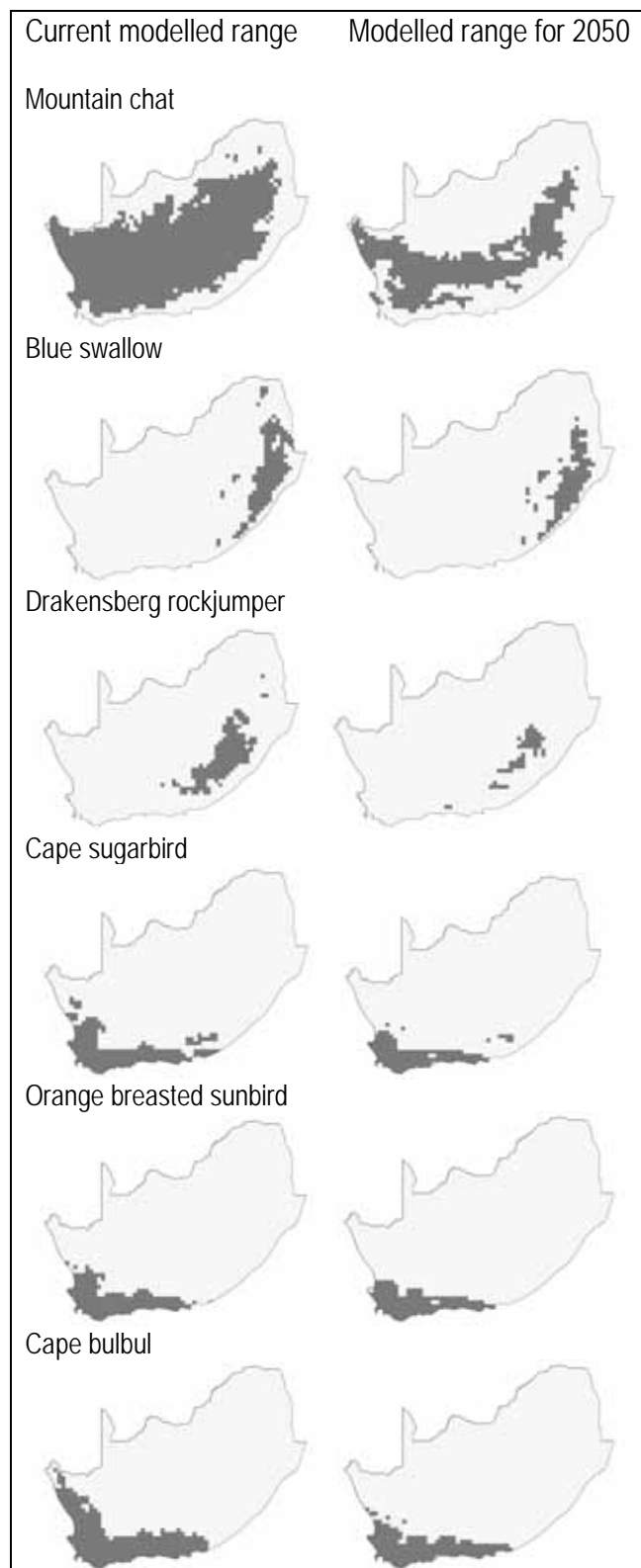
Cape Sugarbird – proteoid fynbos interactions will be under scrutiny through the lens of climate change. Photo: Ingvar Grastveit and Stein Byrkjeland.

Key themes and questions

It is critical that conservation management responses to climate change are focused, well-informed by solid research, achievable and cost-efficient. Our approach therefore relies on a hierarchy of questions, from basic to applied.

Which species are most vulnerable, and why?

Which ecological, behavioural and life history traits influence birds' vulnerability to range changes? Our initial analysis of six



Research Programmes & Initiatives

How do differences in vulnerability affect populations?

Large-scale range shifts on their own are a very incomplete way of understanding impacts. We need to establish how populations are affected in detail – which individuals or age classes suffer most and why; how breeding, migration and other activities are affected; and whether normal activities carry increased costs (e.g. energetics) and risks (e.g. predation) for individuals as the climate changes. This work is constrained by the availability of long-term population datasets, but a series of collaborative manuscripts is emerging.

What are the risks for threatened, small and peripheral populations?

In a series of planned analyses, we will look in particular at threatened and restricted-range species, including montane endemics, species mutualists such as pollinators, and Red Data species to analyse impacts on these birds and the species which depend on them. Cape sugarbirds *Promerops cafer* and proteas, particularly along their range limits, are an example of this. Considerable new fieldwork is needed to address this effectively.

The potential influence of climate change on southern African vultures and passerines

Recent surveys of two threatened mountain-dwelling vultures (Bearded *Gypaetus barbatus* and Cape Vulture *Gyps coprotheres*) suggest that factors other than poisons and habitat change may help explain population declines. We tested the hypotheses that climate change would negatively influence lower-latitude colonies before higher ones, lower-altitude sites before higher ones, and north-facing cliffs before south-facing ones. All predictions were supported for both species. In Lesotho, low-altitude sites are being abandoned and birds are retreating to high-altitude sites. Colonies in Namibia and Zimbabwe have gone extinct as breeding colonies in the last 2 decades when temperatures have climbed most rapidly. Behavioural observations of birds on north-facing cliffs also indicate widespread shading of chicks.

Further BIOTA-funded studies by Rob Simmons will assess the relative impact of climate and habitat change on Namibian passerines across a rainfall gradient.

How can conservation planning, policy and management respond to these challenges?

Finally, in work led by SANBI, the results of climate change research will be increasingly fed into the science-policy interface – through uptake of data in State of the Environment (SoE) reports, biodiversity indicators, and contributions to species and habitat management planning. Although this component is still in its infancy, long-term datasets and large-scale projects (such as the 2nd Southern African Bird Atlas Project and its successors) which can inform public policy are being secured financially by SANBI. The goal is to track southern Africa's bird species over time and space and provide baselines and snapshots of environmental change. Such work

is badly needed to shape and strengthen appropriate conservation strategies for the future.



Phoebe Barnard and young colleagues ringing passerines in central Namibia. Photo: Rob Simmons.

Highlights

- During 2006, in this new programme 2 papers were published, 1 book chapter and 2 semipopular articles. A further 3 papers are in press.
- Rob Simmons received an NRF research rating (C1).
- Three of the world's leading climate change researchers made a joint visit to UCT and SANBI to help design the programme's research framework. Drs Jeff Price and Terry Root, Prof. Stephen Schneider from California State University and Stanford University participated in two days of research brainstorm and seminars, some at the FitzPatrick Institute.



External/Contractual lecturers

Prof. John Hoffmann (Zoology Department, UCT)

Rainer Krug (University of Stellenbosch)

Prof. Sue Milton (University of Stellenbosch)

Prof. Norman Myers (Oxford University)

Dr Colleen O'Ryan (Molecular and Cell Biology Department, UCT)

Prof. Dave Richardson (University of Stellenbosch)

Dr Tony Starfield (University of Minnesota)

Prof. Christian Wissel (University of Leipzig)

Conservation Biology Masters Programme

Course co-ordinators

Dr Peter Ryan
Prof. Tim Crowe



The 2006 class being instructed in the finer points of biocontrol by Prof. John Hoffmann. Photo: John Burnside.

The 14th cohort of Conservation Biology students completed their projects early in 2006, with 10 of 11 students graduating in June 2006. The final student handed in late and failed to graduate in December 2006 because the revisions required of her project were still outstanding. The 15th cohort started in January 2006, comprising 14 students from seven countries. Happily, all 14 survived the coursework component of the programme, and at time of writing most had completed their individual research projects, but some are outstanding.

2007 promises to be something of a watershed year for the programme. Following on Andrew Balmford's review of the course in 2005, David Cumming kindly undertook a review of the course content, delivering his report in mid 2006. This stimulated some vigorous debate and has led to a two-day planning workshop to be held in March 2007. The invited delegates will be a mix of academics and practitioners, and include experienced ex-CB students who now play a leading role in various conservation organisations. The workshop should ensure that the course remains among the leading intensive post-graduate conservation programmes in the world.

We are extremely grateful to the many people who contribute to the ongoing success of the programme. Foremost among these are the module leaders, many of whom are based outside the Fitztitute: John Hoffmann, Rainer Krug, Sue Milton, Norman Myers, Colleen O'Ryan, Dave Richardson, Tony Starfield, and Christian Wissel. Colleen O'Ryan will not be teaching on the course in 2007, in part because she is expecting her first child; we wish her well in her new adventure! Many other people contribute through guest lectures or practicals. The programme also couldn't run without the sterling support of the Fitz and Zoology support staff, especially Meg Ledebouer who handles umpteen queries from potential students, and Hilary Buchanan who administers the project examination process as well as handling numerous administrative and domestic arrangements for the newly-arrived foreign students.

Conservation Biology projects: 2006/07

Bird, Matthew: *The influence of biotope on invertebrate assemblages in Lentic environments: a study of two perennial alkaline wetlands in the Western Cape, South Africa.* Supervisors: J. Day, H. Malan & L. Day.

Boundja, Patrick: *Patterns of elephant impact on woody plants in the Hluhluwe-Umfolozi Park, KwaZulu-Natal, South Africa.* Supervisor: J. Midgley.

Burnside, John: *Effect of maternal age on fecundity in White Stumpnose, Rhodosargus globiceps (Pisces: Sparidae) and its implications for fisheries management.* Supervisors: C. Attwood & J. Field.

Daniels, Fahiema: *Does protecting threatened ecosystems conserve threatened plant taxa: A case study from the Cape Floristic Region.* Supervisors: T. Rebelo & D. Raimondo.

Gordon, Helen: *The relationship between rural income and natural resource use: implications for development of the Kavango-Zambezi transfrontier conservation area.* Supervisor: J.K. Turpie.



The 2006 class on a fieldtrip with Prof. Sue Milton in the Swartberg Pass. Photo: John Burnside.

Hill, Helen: *Patterns of seabird attendance at commercial trawlers targeting hake Merluccius spp. off South Africa. : implications for conservation.* Supervisors: P.G. Ryan & B.P. Watkins.

Jenkins, Julia: *Are Black Harriers indicators of Renosterveld fragment quality? Conservation implications for a threatened species in a fragmented habitat.* Supervisors: R. Simmons & M.A. du Plessis.

MacGregor, Lindy: *Predicting the spread of avian influenza: the use of social network analysis among waterfowl.* Supervisors: G.S. Cumming & P.A.R. Hockey.

Musangu, Mwema: *The effect of Great White Pelican predation on breeding seabirds at Dassen Island, South Africa.* Supervisor: P.G. Ryan

Nupen, Lisa: *Investigation of the taxonomic boundaries within five species of southern African cisticolas using ecological, morphological and molecular evidence.* Supervisors: T.M. Crowe & R.C.K. Bowie.



Mwema Musangu conducting a user survey on the Southern Cape Coast. Photo: John Burnside.

Raharinjanahary, Dimby: *Impact of Argentine Ants (Linepithema humile Mayr) on saproxylic invertebrates in Afromontane forest and pine plantations of the Cape Peninsula (South Africa).* Supervisor: M. Picker.

Schultz, Pippa: *Does bush encroachment impact foraging success of the critically endangered Namibian population of the Cape Vulture Gyps coprotheres?* Supervisors: R. Simmons & L.G. Underhill.

Shelton, Jeremy: *The effect of introduced largemouth bass on Cape galaxias abundance and microhabitat selection.* Supervisors: J. Day, C. Griffiths & S. Marr.

Thomas, Hannah: *Understanding the movements of waterbirds in southern Africa: can the long-term ornithological data collection programmes reveal the pattern?* Supervisors: G.S. Cumming & P.A.R. Hockey.



The 2006 class with Profs Tim Crowe, Norman Myers, Graeme Cumming; Assoc. Prof. Peter Ryan and Mrs Meg Ledebor at the start of their course. Photo: Chris Tobler.



Librarian

Margaret Sandwith

Intern

Nomonde Sotashe

Volunteers

Des Loubser

Sally Dalgliesh



Des Loubser



Sally Dalgliesh



Nomonde Sotashe

Niven Library

Overview

In March 2006 an alert service to the most recent issues of a selection of relevant journal titles was initiated in consultation with staff and students of the Fitzitute and Zoology. The service is also distributed by e-mail to a number of off-campus research associates. This has proved to be a great success particularly in the way it allows researchers to gather information independently. This has impacted on the provision of papers and PDFs to staff and students. Dependence on the library and the librarian has dropped considerably as participants to the service are able to immediately access full-text papers and do not require the library as an intermediary.

A one year intern post was established in the library during 2006 using capacity building funding from the Table Mountain Fund and the WWF-SA. The main responsibility of the intern is the building of an on-line Fynbos Ecology database as part of the CAPE initiative which has been launched as an alternative database on the Niven Library server.

Space for the growing collection remains a concern as the quotes for compact storage were high and funding has not yet been identified to provide for this short-term solution.

Staff and staff development

Volunteer staff

Des Loubser: Since 1994 Des has ably managed the reprint request service for the Fitzitute. During this time he has watched the partial demise of a service which provided hard-copy reprints posted to all corners of the world and the emergence of an e-mail/PDF service. Because of ready-access to electronic journals which provide full-text PDFs, even this service has dropped off. When Des first started in the Niven Library in 1994 the Fitzitute was posting 1016 reprints to 91 countries, during 2006 this figure (including the provision of PDFs) had dropped to 165 reprints to 29 countries. After a period of 12 years Des Loubser retired from his volunteer position because of ill-health. The Fitzitute thanks Des for his dedicated voluntary service over such a long period.

Sally Dalgleish: Sally has worked for many years on data-capture for the Richard Brooke Reprint Collection. During 2006 she took on the challenge of working completely in the electronic realm, becoming a true cyber-library volunteer. PDFs are copied to a CD, from which catalogue records are created which in turn are saved to a text file. These are then uploaded to a growing PDF catalogue. The era of the paperless library is encapsulated in this project.

Internship

Nomonde Sotashe: During 2006 Nomonde graduated with a B.Bibl. from the University of the Western Cape making her a qualified librarian. Previously a volunteer in the Niven Library in 2005, Nomonde started working as the CAPE Intern in the Niven Library during 2006 in charge of the development of the Fynbos Ecology database. The mentorship programme also involves learning the general routines required for the running of a specialist natural sciences library and acting as leave substitute for the Niven Librarian.

Library development

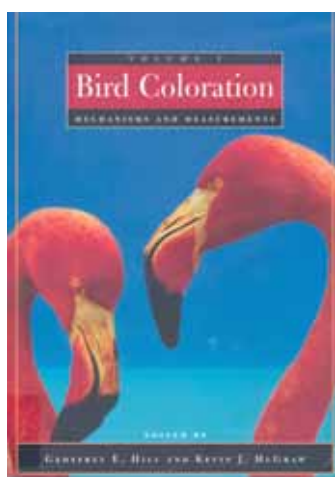
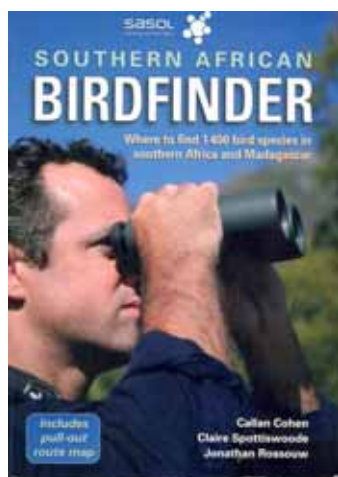
Collection management

Reprints: A policy of storing PDF copies of all articles requested by staff as well as capturing relevant articles from current journal alerts has resulted in a growing electronic reprint collection. The current count of PDFs stands at 3833 [2351]. Unfortunately the previous arrangement of making these available for the use of staff and students of the Fitzitute and Zoology on a LAN share-drive became constrained

by space limitations. An alternative solution has yet to be found.

New Books: New books acquired by donation, purchase or through book reviews during the period under review amounted to 206 titles. Some significant titles are:

- Francois Levallant and the birds of Africa
- Raptors of the world, a field guide
- Handbook of the birds of the world Volumes 10-11
- Handbook of Australian, New Zealand and Antarctic birds Volumes 6 - 7
- Southern African birdfinder, where to find 1400 bird species in southern Africa and Madagascar
- AGRED's gamebirds of South Africa, field identification and management
- Bird coloration, 2 volumes
- The Howard and Moore complete checklist of the birds of the world, 3rd edition
- Nature's flyers, birds, insects, and the biomechanics of flight
- The birds of Malawi, an atlas and handbook
- Fynbos fynmense, people making biodiversity work
- Beginner's guide to birds of Botswana
- Conserving bird biodiversity, general principles and their application
- The annual cycle of the Curlew Sandpiper *Calidris ferruginea*
- Pipits of southern Africa, the complete guide to Africa's ultimate LBJ's
- Environmental law in South Africa, 2nd edition



Upgrading the Niven Library System

The CDS/ISIS database has now been running effectively for 18 months and the number of databases includes the following:

- Niven Library Catalogue
- Museum Annals Index (under development)
- Fynbos Ecology Database
- PDF Catalogue

A solution for linking the electronic journals and the full-text articles remains to be implemented.

Use of the Library

Table 1. Niven Library stock circulation over the past four years

	2006	2004/05	2003/04	2002/03
Monographs	410	438	519	409
Reprints	60	82	83	155
Theses	24	42		
Journals	298	345	278	
Audio Visual	15	9	7	
Total	807	916	887	564

Document Delivery

Table 2. Niven Library inter-library loans over the past four years

	2006	2004/05	2003/04	2002/03
Items requested (by staff/students)	95	166	95	154
Items supplied	91	485	403	365
Requests not satisfied	4	35	24	13

Cash redeemed from coupons received in payment for inter-library loans totalled R1750.00 [R3179.45] [R1257.50].

Reprint requests

During 2006 there were 165 [211] [275] [178] requests for reprints of the Percy FitzPatrick Institute's staff publications, many of these were e-mail requests and where possible PDFs were supplied with a consequent saving on postage.

Table 3. Requests for PFI/O Reprints

	2006	2004/05	2003/04	2002/03
Number of reprint requests	165	211	275	178
Number of countries	29	21	37	38

The breakdown by countries is: Argentina 2 (11), Australia 3(4), Belgium 1(3), Brazil 4(1), Canada 1(3), Czech Republic 2(3), France 5(6), Germany 4(5), India 3(7), Iran 2(0), Italy 1(2), Kenya 5(0), Netherlands 3(2), New Zealand 1(1), Paraguay 27(0), Poland 1(7), Portugal 1(14), Seychelles 1(0), Singapore 1(0), South Africa 55(59), Spain 6(5), Sweden 1(1), Switzerland 3(0), Tenerife 6(0), Ukraine 1(1), United Kingdom 4(10), United States of America 18(24), Uruguay 2(0), Zimbabwe 1(0).

Staff members of the FitzPatrick Institute continue to send reprints of their papers to colleagues around the world known to be interested in the topics concerned. Reprints are also given out on request to visitors to the Niven Library.

Cash photocopying

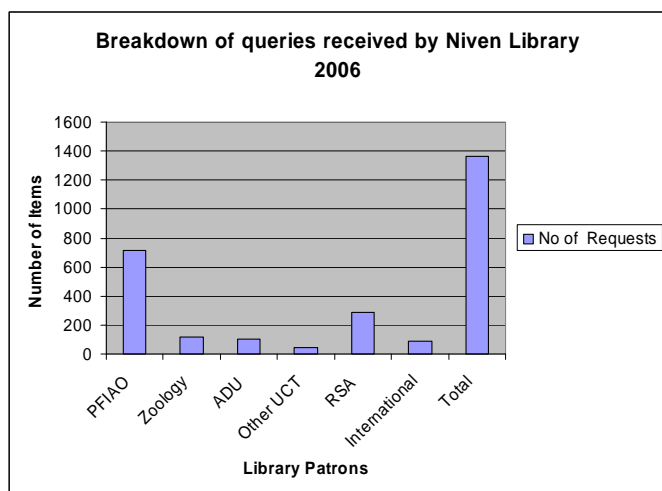
The cash photocopy facility in the library was used by persons without a photocopy code, many of these were undergraduate



students or library visitors from other parts of campus or beyond. Approximately 7844 [11564] copies with a cash value of R2745.40 [R4047.40] were made during the period under review. The charge for photocopying remained constant at 35c per page. The drop-off in photocopying is attributed to the availability of electronic journals which enable printing rather than photocopying of articles.

Research requests

A total of 1363 [2875] requests for information were received during the period under review, with 52% of these requests generated by staff and students of the Fitzitute. 634 [907] PDF or JPG files were supplied by e-mail to users locally, nationally and internationally. 258 [889] hard copy articles were supplied, by far the greater proportion to users in the Fitzitute, Zoology, ADU and elsewhere on the UCT campus. In addition 108 [358] literature searches were compiled and e-mailed to users. Other usage of the library was for verification of information, the supply of URL's and e-mail addresses and numerous other general queries. The Library received 717 [1463] [400] [285] research requests from the staff and students of the PFIAD, 117 [315] from Zoology staff and students and 101 [98] from ADU staff and students. Requests for information were also received from elsewhere on the UCT campus, and both nationally and internationally.



Requests for information

Requests for information over and above interlibrary loan requests were received from the following National and International organisations and individuals.

Bird NGOs: Tropical Birding, BirdLife Zimbabwe, R.S.P.B., Global Owl Project

Conservation NGOs: SANBI, Nature Conservation Namibia, SANParks, Endangered Wildlife Trust, Johannesburg Zoo

Government affiliations: City of Cape Town Department of Environment & Tourism, Cape Nature, Department of Agriculture, eThekweni Municipality, Northern Cape Department of Tourism, Environment & Conservation

Private Companies: Bushwise Safaris Mpumalanga, Three Peaks Wine, Senes Consultants Canada, South African Agency for Science & Technology, Byrnes-Dolphin B&B, Africa

Wildlife Films, Afrosearch, Christison Rare Books

Museums: Delaware Museum of Natural History

Schools: Uplands College White River, St. Mary's School Kloof, Damelin Mowbray

International Universities: Hull University UK, Université Pierre et Marie Curie, University of Zimbabwe, Brown University USA., University of Groningen Netherlands

International Organizations: Polish Academy of Science, Wellington Zoo New Zealand, USGS National Wildlife Health Center

International Libraries: National Zoological Park Library Smithsonian Institution, Ornithological Library Paraguay

Some Individual queries: Rupert Lorimer, Barry A. Schwartz USA, Christine Hanel, Faansie Peacock, Sébastien Berthaut-Clarac France, Hans Zimmermann Germany

Acquisitions and collection building

At the end of December 2006 the bibliographic records on the OPAC system totalled 45861 [44105] [41834]. The numbers of individual items received in the Niven Library are shown below:

Table 4. Niven Library acquisitions over the last four years

	2006	2004/05	2003/04	2002/03
Monographs	206	194	108	145
Journals	597	819	520	629
Newsletters	294	474	304	465
Reprints	63	2182	1078	754
PDFs	1482	2351		
AudioVisual	5	8		

Books added to the collection were ordered by members of the Percy FitzPatrick Institute, donated books and review books for Ostrich. The Zoology Dept, AFRING, Avian Demography Unit and the African Seabird Group continued to donate their exchange journals. Pat Morant continues to be a major benefactor of the Niven Library donating useful and popular scientific titles to the Niven Library which have quite a following in readership, particularly titles about evolution.

Donations

We acknowledge with thanks donations from the following: African Seabird Group, Avian Demography Unit, Andrew Balmford, Aldo Berruti, BirdLife Limpopo, George Branch, Callan Cohen, John Cooper, Woody Cotterill, Adrian Craig, Tim Crowe, Bob Dowsett, Françoise Dowsett-Lemaire, Morné du Plessis, Endangered Wildlife Trust, Jan Glazewski, Peter Hancock, Alison Harding, Phil Hockey, Ulf Johansson, Georgina Jones, U. Köppen, Penn Lloyd, Sue Milton, Coleen Moloney, Pat Morant, Norman Myers, Deon Nel, Dieter Oschadleus, Tom Peschak, Peter Ryan, AFRING, SANBI, Trevor Sandwith, Kabelo Senyatso, Colleen Seymour, Clair Spottiswoode, Walter Stanford Bequest, Richard Stephenson, Craig Thom, Jane Turpie, Les Underhill, K.H. Voous Bequest, Tony Williams, James Winstanley, Zoology Department (UCT).

Scientific Publications 2006

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Appendix 2 Seminars 2006

January 31: **Dr Jim Dale**, Max Planck Institute for Ornithology. *Carotenoid-based signals of quality: where's the cost?*

March 9: **Dr Wayne Delport**, PFIPO, University of Cape Town. *Bugs, birds and bacteria: inference of process from the spatial and temporal distribution of genes.*

March 23: **Duan Biggs**, PFIPO, University of Cape Town. *Institutions, economics and benefits of community-based avitourism.*

March 30: **Dr Andy Radford**, University of Cambridge. *Shouting about food: foraging vocalisations in social birds.*

April 5: **Corrie Schoeman**, Zoology, University of Cape Town. *The influence of competition on the community structure of insectivorous bats and birds.*

April 12: **Dr Ulf Johansson**, University of Stellenbosch. *Bugs, birds and bacteria: inference of process from the spatial and temporal distribution of genes.*

May 16: **Dr Greg Cunningham**, PFIPO, University of Cape Town. *Field studies of olfactory sensitivities of procellariiform chicks: these babies can smell.*

May 31: **Dr Res Altwegg**, Avian Demography Unit, University of Cape Town. *Sources of fitness variation in various birds and its consequence for population dynamics.*

July 04: **Prof. Mike Brigham**, University of California, USA. *Goatsucker heterothermy: the enigma of 'feathered bats'.*

August 29: **Dr Tamas Szekely**, University of Bath, UK. *Sexual conflict over parental care.*

September 19: **Prof. Steven Schnieder**, **Dr Terry Root**, Stanford University and **Dr Jeff Price**, California State University, Chico, USA. *Attributing biodiversity impacts and adapting conservation management to a changing climate.*

September 22: **Jerome Fuchs**, Museum National d'Histoire Naturelle. *Comparative biogeography of Old World forest birds: towards an understanding of the timing of formation of the major biogeographic realms.*

October 24: **Helen Withers**, Cambridge University. *Food calls to nesting birds: covert communication.*

November 2: **Dr Noah Owen-Ashley**, Wildlife biologist, North Slope Borough, Barrow, Alaska. *Contribution of endocrine mechanisms upon evolutionary paradigms in seasonally-breeding birds.*

November 13: **Bernard Coetzee**, University of Pretoria. *The current and future threats to the terrestrial Important Bird Areas (IBAs) in South Africa.*

November 14: **Prof. James Fullard**, University of Toronto, Canada. *Auditory degeneration in bat-released insects: hear today, gone tomorrow.*, and **Dr John Ratcliffe**, Cornell University, USA. *Predation by bats.*

December 05: **Prof. Tim Birkhead**, University of Sheffield, UK. *Sexual selection and sperm design.*



Appendix 3 Biodiversity Academy Report



DST/NRF Centre of Excellence
at the
Percy FitzPatrick Institute

The 1st Biodiversity Conservation Academy, 16-20 January 2006

The first Biodiversity and Conservation Academy, a joint venture between the DST/NRF Centres of Excellence in Invasion Biology (CIB) and Birds as Keys to Biodiversity Conservation at the Percy FitzPatrick Institute, was held at the Potberg Environmental Education Centre of De Hoop Nature Reserve on 16-20 January 2006.



The Academy was attended by 15 students selected through a competitive application process open to undergraduate students (2nd-4th year of B.Sc.) from all South African universities. They joined eight academic and support-staff of the two Centres, including the directors, Profs Steven Chown and Morné du Plessis. Seven of the students were from historically disadvantaged backgrounds. The 5-day programme of the Academy immersed students in an intensive series of theoretical, practical and philosophical discussion and field-work sessions on biodiversity conservation. The aim was to

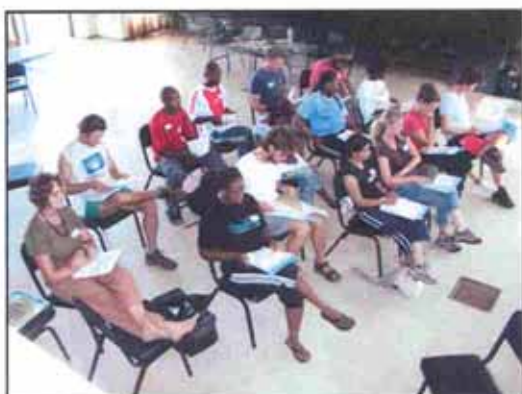
improve student appreciation for the complexity of biodiversity, sharpen their understanding of the skills required to assess it, and broaden their knowledge of the theory and practice of conservation in a South African context.

There were no formal lectures. Instead, after a brief introduction to a topic, Academy staff led an informal discussion, guiding the discussion with questions, and actively encouraging questions and answers from all participating students. Students were frequently split into three groups to work on specific problems, questions and field work activities. They subsequently convened again for a general report-back and further discussion. Students were also given a number of pertinent readings to help guide their thinking. Evenings were spent relaxing and chatting around a circular campfire seating area.



Day 1 - Monday

After travelling through from Cape Town and Stellenbosch, the programme kicked off mid-morning with a session on getting to know the various levels of biodiversity, from genes to ecosystems, to tackle the question “What is Biodiversity?”. An introductory session on the factors that determine bird community diversity, structure and migration tendency then followed, to serve as a background for the early-morning bird surveys. The final session of the day focussed on approaches to measuring biodiversity, with the students prompted to think critically about the influence of scale and experimental design in measuring biodiversity. This set the foundation for the main activities of the second day.



Day 2 - Tuesday

Introduced to the field routine that was followed for the rest of the week, groups departed at 5:30am to conduct an hour-long survey of bird diversity and abundance in each of three habitats that differed in vegetation structural diversity.



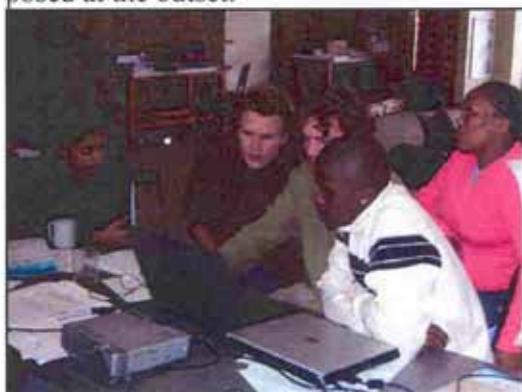
After breakfast, students debated and finally settled on an appropriate experimental design for measuring the effects of alien plant invasion on plant diversity and evenness in such a way that it could also examine the influence of spatial scale of sampling on the measures of biodiversity. After a brief lunch, groups gathered together the equipment they thought they might need, before travelling into the field for the rest of the day to conduct their vegetation surveys. This involved identifying and counting all plants within a standardised series of sampling plots.





Day 3 – Wednesday

An overcast and rainy day put paid to the early-morning bird survey, so the group got an unexpected lie-in. After a hearty breakfast, groups got together to work up their vegetation survey data in spreadsheets and summary graphics to address the various questions they had posed at the outset.



Towards the end of the day, each group presented their results to the Academy in a report-back session. A final discussion focussed on the lessons learned from the 2-day exercise. The day finished with an evening excursion to limestone fynbos, to view the dramatic species turn-over between adjoining mountain and limestone fynbos types.

Day 4 – Thursday

Making up for field time lost the previous day, groups got away at 5:30am to conduct two back-to-back bird surveys. Returning for a late breakfast, staff and students convened to identify the questions to be addressed with the bird survey data. Groups then split up to work up their data independently, before finally re-convening for a report-back presentation by each group. To round off a long day's work, we all trooped off to the coast in the late afternoon, to swim,

explore the De Hoop dune-fields, or track down Oystercatcher chicks.

Day 5 – Friday

The last day of the Academy saw another early start, as we opened lines of mist-nets soon after 5am to capture birds around the education centre. This gave students hands-on experience with handling birds, as they learned to remove the birds from the nets for ringing and subsequent release. Below, Thulisile Jaca admires the long tail feathers of a male Cape Sugarbird she has just removed from a net.



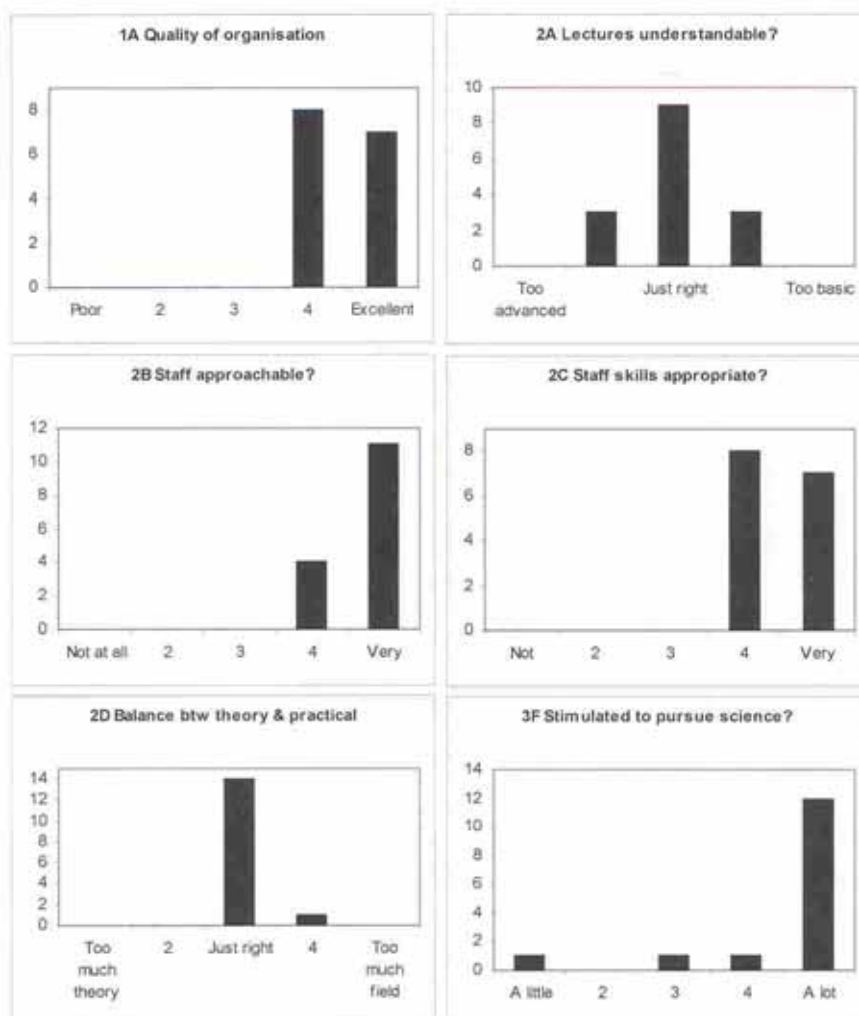
After a break for breakfast and reading time, we reconvened for an informal discussion focussed on how various basic science research fields can inform biodiversity conservation. The Academy was then rounded off with a presentation by Prof. Steven Chown on how the Centres of Excellence fitted into the South African research environment, and tips on how students should investigate a variety of research fields and potential supervisors to identify their primary interests and properly plan their postgraduate education.

After another excellent lunch rustled up by CIB support staff, we bade farewell to new friends and a thoroughly stimulating teaching environment to journey back to our normal work and study routines.

with experimental design and field work. They also found their extensive interactions with Academy scientists especially stimulating.

Student evaluation of the course

Before departure on the last day, all 15 student participants were asked to evaluate their experience of the Academy. The responses were overwhelmingly positive (see graphed responses to coded questions below), with many requests to make the Academy a week longer. Students particularly enjoyed the course content and teaching approach, blending theory





Financial Report

The Financial Report is available on request from the Percy FitzPatrick Institute.