DST/NRF Centre
of Excellence at the

Percy FitzPatrick Institute

Annual Report
January – December 2008

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University of Cape Town

Board Members:

Mr M. Anderson (BirdLife SA) Oct-Dec
Mr H. Amoore (UCT, Registrar)
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Prof. P.A.R. Hockey (UCT, Director, PFIAO)
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Mr F. van der Merwe (co-opted)
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Prof. D. Visser (UCT, Chairman, URC)

Contents

The Annual Report may also be viewed on the Percy FitzPatrick Institute's website: http://www.fitzpatrick.uct.ac.za

Director's Report

At the beginning of 2008, I was still fulfilling the role of Acting Director: this situation continued until the beginning of August, when the position was officially confirmed. An unfortunate corollary of having taken almost a year to replace the Institute's Director was that the post I had vacated remained unfilled for the whole of 2008 and a replacement is only likely to be appointed in the first half of 2009. Given that student numbers have been growing and that January 2009 will see the Institute with a corpus of more than 55 postgraduate students and postdoctoral fellows, I must extend my sincere thanks to my staff colleagues who have had to shoulder the additional burdens of supervision during this time of being short staffed.

But let us not dwell on the negatives – 2008 has been a vintage year for the Fitztitute, and there are many 'good news' items to be reported. For example, two of our PhD students who graduated at the end of 2007 subsequently had high accolades poured upon their work. Ross Wanless was awarded the Dean's Medal for the best PhD in the Science Faculty for his study of the interactions between mice and albatrosses at Gough Island. Ross has now moved on to employment as the Seabird Conservation Officer for BirdLife South Africa. Ross's thesis also made waves beyond the borders of Africa, winning third prize in an international United Nations (UNEP-CMS) competition for the best PhD of the year on the conservation of migratory species (against competitors from 18 countries). In the same competition, another of our students, Samantha Petersen, scooped first prize (and a nice big cheque, and a trip to Rome to collect it!) for her study of fisheries bycatch and its conservation implications: well done Sam! Sam is now the Manager of the BirdLife/WWF Resonsible Fisheries Programme. In a somewhat less academic and internationally meritorious vein, I was awarded the Stevenson-Hamilton Award of the Zoological Society of Southern Africa. This award is made (and I quote!) to "persons whom have made outstanding contributions towards the image and awareness of Zoology, especially among the general public".

On other student matters, during 2008 we also secured additional DST/NRF funding to allow us to take on three more postdoctoral fellows from 2009. This is linked to our Centre of Excellence award and will boost both our research and supervisory capacities. When these positions were advertised, the response was far greater than we had anticipated, and some hand-wringing was done before the final offers were made. In 2009, however, the three new positions will be taken up by Timotheé Cook (France), Rowan Martin (UK) and Felix Nchu (Cameroon).

On other Centre of Excellence matters, our performance during the first five years of the Centre will be formally, and internationally, reviewed in March 2009. However, all indications are that the Centre will sail on for at least the next five years. Despite being short staffed for the whole year, we have not fallen behind any of our agreed performance targets: indeed, in all areas other than student demographics, we are well ahead of the game. This, of course, is no cause for complacency and we aim to continue with our 'onwards and upwards' trajectory.

One sad item as regards the Centre will be the departure of our Manager, Penn Lloyd, in January 2009. Penn, his wife Éva and their family are emigrating to Australia's east coast. For the past five years, Penn has managed the Centre and its finances with consummate professionalism and has also contributed extensively to the academic output of the Institute, notably through the Koeberg Study Site. His skills and dedication will be sorely missed. We wish Penn and his family all the best with their future careers.

The Fitztitute's Conservation Biology Programme was launched in 1992. We have always known that the course was successful and have used various proxies to measure such success, such as the number of applicants each year and the conservation jobs to which our students graduated. But nothing beats independent peer review as a substitute for mutual back-slapping! In a study published in the leading international journal *Conservation Biology* in 2007, 315 American Universities were ranked in terms of the impact of their conservation-based research. This was an objective analysis based on the *h-index* of papers published in six top conservation biology journals in 2000-2005. In 2008, a follow-up study published in the same journal analysed the comparative performances of English-speaking, southern-hemisphere universities (in Australia, New

Zealand and South Africa) using the identical methodology. Of the austral universities, UCT ranked top. Of perhaps greater significance, however, was that UCT ranked equal with the fourth-rated of the 315 American universities surveyed (University of California at Santa Cruz), ahead of heavyweights such as Stanford, Yale and Harvard. The Fitztitute is certainly not responsible for all of UCT's conservation publications, but we are confident that the fruits of our labours in the field of Conservation Biology, as well as those of colleagues who teach on the Conservation Biology Programme, have made a significant contribution to this particular feather in UCT's cap.

2008 saw a revamped Conservation Biology (CB) Programme curriculum designed to keep pace with the rapidly changing face of the science of conservation biology. As the class of 2007 closed their thesis-exhausted laptops for the last time, the fresh cohort of students were the first to tackle the new-look, taught component of the course. Feedback from these students was very encouraging and supported our stance that flexibility in course content is of paramount importance.

There is another, less academic statistic that applies to the Class of 2008 – they will have been the last cohort of CB students who had to suffer the old teaching space on the ground floor of the NSLT. Having taught in this space for many years, I have nothing but admiration for their stamina (and that of previous classes). It was cramped, hot and airless, with work benches that were discarded by the Chemistry Department more than a decade ago and an ailing, antediluvian air conditioner that could not be used because it made more noise than the lecturer! All that has now changed – two grants from the University have allowed us to reconfigure the light, airy and much larger upper floor space and provide a flat-screen monitor for each student. Perhaps the old facility can be resurrected as an insomnia research laboratory!

Despite the unquestioned (and quantified) success of the CB Programme, there is the chance that it may have to metamorphose again in the near future, not so much in terms of its content as its complement. This is due to the implementation of NARIC standards. NARIC is the UK national agency "responsible for providing information, advice and expert opinion on … academic … qualifications from over 180 countries worldwide". Masters-level admission to UCT requires a student to have an educational history at least comparable to that of an Honours student graduating from UCT. Most undergraduate curricula in Africa, even four-year courses, fail to negotiate this hurdle. If these standards are to be rigidly applied, the efficacy of the CB Programme in populating countries to the north with qualified Conservation Scientists may be at risk. In December 2008, we were placed in the embarrassing position of having six students whom we had provisionally accepted onto the Programme being refused admission to UCT based on the NARIC criteria. Fortunately, five of these denials were rescinded on appeal: had they not been, the viability of the CB Programme in 2009 would have been in doubt. Whilst the problem is solved for the 2009 cohort, the fate and composition of the 2010 cohort is much less certain and will depend on discussions between the Fitztitute and the Science Faculty early in 2009. We are gravely concerned that inflexible application of NARIC standards could impede UCT's stated goal of being an African centre of excellence and training. Watch this space.

One of the linchpins of our teaching and research activities is the Niven Library. In last year's report I mentioned progress having been made in reinstating exchange journals lost through the privatisation of *Ostrich*. I can now happily report that most of the 'lost' journals are once again on our shelves. This was made possible by the generous donation of *Africa Birds and Birding* as an alternative exchange by the publishing house *Africa Geographic*. Not only does *Africa Geographic* provide the exchanges, they also do all the mailing for us: a big thank you to *AG* from the staff and students of the Institute!

The first few months of 2009 are going to pose some interesting challenges, among them being the selection and appointment of one new academic staff member and a new Centre of Excellence Manager. It also seems certain that we will be evicted from our office and laboratory space in the PD Hahn building (where about half of our students are housed and where large numbers of malodorous dead seabirds are dissected!). The area is needed as part of the revamp of the Chemistry Department. At the time of writing, alternative accommodation has not been finalised. Watch this space too!

2009 will also see a heightening of activities related to the planning of our 50th Anniversary year in 2010. The combination of a global economic recession and the timing of the Soccer World Cup will doubtless add some interesting twists to the anniversary planning process, but as scientists we are supposed to be able to think out of the box…! Some initiatives are already underway, and the early part of 2009 will see an acceleration in the planning process.

In conclusion, I would like once again to thank all Institute staff, academic and support, for going the extra mile during the period of staff shortage we experienced throughout 2008. I would also like to thank all our postgrads and postdocs for their understanding and tolerance of the situation. The research and teaching momentum of the Institute did not falter or stumble during 2008 and all Fitztitute members can take credit for their contributions to this happy state of affairs. I anticipate that by April of 2009 we will once again be firing on all cylinders: personally, I look forward to that! I would also like to extend my thanks to the Head of Zoology, Associate Professor John Hoffmann. His support for policy and strategy decisions that I have taken in my new role as Director has been unflinching, and he has always been more than willing to give of his time and advice when needed. One of these decisions was to invite Dr Jim McNamara, Executive Director of UCT's Development and Alumni Department, to join the Fitztitute Board – a decision endorsed by the Board. I am happy to report that Jim accepted this invitation, and we look forward to welcoming him at the next Board meeting.

Phil Hockey
Acting Director, January-July, Director, August-December 2008

Staff:

Phil Hockey *was appointed Director from 1 August, having acted as Director since September 2007.*
Charlene Jacobs *resigned as COE Secretary and* ***Tania Jansen*** *took over from February.*

Graduates:

PhD: Samantha Petersen *(June 2008)*

MSc: Shannon Hampton *(June 2008);* ***Kathryn Lannas, Zach Vincent*** *(Dec 2008)*

Conservation Biology MSc: *The entire 2007/8 cohort graduated at the June ceremony:* ***Hassan Babiker, Jamshed Chaudhry, Matthew Child, Tessa Hempson, Glynis Humphrey, Grant Joseph, Marisa Lipsey, Gareth Mann, Nicola Okes, Reda Potts, James Puttick*** *and* ***Thuli Wistebaar***

BSc Hons: Alistair Fyfe, Alwyn Lubbe *(Dec 2008)*

External Graduates:

PhD: Lorien Pichegru, Nicola Raihani, Craig Symes

New students:

Postdoctoral Fellows: Doug Loewenthal *(Phil Hockey),* ***Lorien Pichegru, Martim de Melo*** *(Peter Ryan) and* ***Xanic Rondon*** *(Graeme Cumming)*

PhD: Lisa Nupen *(supervised by Peter Ryan)*

MSc: Owen Davies *(supervised by Tim Crowe),* ***Gregory Mutumi*** *(supervised by Graeme Cumming)*

Conservation Biology (CB) MSc: *Eleven students began the CB MSc in January 2008.*

Staff

Director

Hockey, P.A.R. 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 *
Lloyd, P. PhD (Cape Town) Manager, Centre of Excellence
Milton, S.J. PhD (Cape Town) Honorary Professor
Ryan, P.G. PhD (Cape Town) Associate Professor*
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 California, Berkeley
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)
Covas, R. PhD (Cape Town)
Dean, W.J.R. PhD (Cape Town)
Jenkins, A.R. PhD (Cape Town)
Kemp, A. PhD (Rhodes)
Milewski, A. PhD (Murdoch University, W. Australia)
Simmons, R.E. PhD (Wits)

Visiting Scientists

Allen, C. (University of Nebraska, USA)
Costanza, R. (Gund Institute for Ecological Economics, University of Vermont, USA)
Cuthbert, R. (RSPB, England)
Farris, S. (Swedish Natural History Museum, Stockholm, Sweden)
Gaidet, N. (CIRAD, Montpellier, France)
Goloboff, P. (Instituto Superior de Entomología, Argentina)
Grémillet, D. (CNRS, Montpellier, France)
Hatchwell, B. (University of Sheffield, England)
Hole, D. (Durham University, England)
Holt, R. (University of Florida, USA)
Huntley, B. (Durham University, England)
Lopes, R. (CIBIO, Research Center in Biodiversity and Genetic Resources, Portugal)
Willis, S. (Durham University, England)
Virani, M. (Peregrine Fund, Nairobi)
Voelcker, G. (University of Memphis, USA)

Support Staff

Principal Technical Officer

Tobler, C.J. *

Administrative Assistant

Buchanan, H.J. *

Senior Secretary, Centre of Excellence

Jacobs, C. (Jan)
Jansen, T. (Feb-Dec)

Library Staff

Sandwith, M. * (Librarian)
Dalgliesh, S. (Volunteer)

Hans, P. Jan-Sep
Nquayi, N. (Intern) Mar-Oct
Sotashe, N. (Intern) Jan

Departmental/Accounts Assistant
Mansfield, L.F. *

Webmaster
Stander, M.J.

Research Assistants
Aronson, J. Sep-Dec
Cowlin, R. Nov-Dec
Commins, M. Jul
Fyfe, A. Apr-Dec
Ginbot, Z.G. Jul-Dec
Gous, T.A. Mar-Dec
Hagens, Q. Jan-Dec
Hofmeyr, S.D. Jan-Feb
Henry, D.A.W. Jul-Dec
Jaravaza, S. Sep
Lee, A.J. Sep
Mvunle, A. Jul-Dec
Moyo, M. Dec
Nkosi, M.D. Jan-Dec
Stathopoulos, S Nov-Dec
Scholtz, R. May-Dec
Thomas, A. Sep
Wanless, R. May-Jun

* 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.

Students

Post-doctoral Fellows
Bruinzeel, L. PhD (Groningen, The Netherlands), Jan-Mar
de Melo, M. PhD (Edinburgh, Scotland) Oct-Dec
Eising, C.M. PhD (Groningen, The Netherlands), Jan-Mar
Fuchs, J. PhD (MNHN, France)
Loewenthal, D. PhD (Cape Town), Oct-Dec
Pichegru, L. PhD (Strasbourg, France), Apr-Dec
Ridley, A.R. PhD (Cambridge, England)
Rondon, X.J. PhD (Miami University, Oxford, Ohio, USA) Oct-Dec
Techow, N.M. PhD (Cape Town)

Doctoral
Barquete Costa, V.B. MSc (Furd, Rio Grande)
Chaskda, A. MSc (Jos, Nigeria)
Cohen, C. BSc (Hons) (Cape Town)
De Ponte, M. MSc (Cape Town)
Jones, G. MSc (Cape Town)
Kaliba, P. MSc (Cape Town)
Little, I.T. MSc (Cape Town)
Mandiwana, T.G. MSc (Cape Town)
Mills, M. MSc (Cape Town)
Nelson, M. MSc (Vancouver, Canada)
Ngoma, P. MSc (Malawi)
Nupen, L. MSc (Cape Town)
Oatley, G. BSc (Hons) (Cape Town)
Ribeiro, A. MSc (Porto, Portugal)

Masters by Dissertation
Davies, O. BSc (Hons) (Cape Town)
Lannas, K. BSc (Hons) (Cape Town)
Mutumi, G. BSc (Hons) (NUST, Zimbabwe)
Ndlovu, M. BSc (Hons) (NUST, Zimbabwe)
Teroerde, A. BSc (Hons) (Rhodes)
Vincent, Z. BSc (Hons) (Port Elizabeth)

Masters in Conservation Biology 2008
Bewana, A. BSc (Hons) (Cape Town)
Cordingley, J. BSc (Hons) (Newcastle, England)
Ditlhobelo, T. BSc (Hons) (Oklahoma, USA.)
Dures, S. BSc (Hons) (Edinburgh, Scotland)
Hamman, M. BSc (Hons) (Cape Town)
Meek, C. BSc (Hons) (New York, USA)
Menayas, A. BSc (Hons) (Arizona, USA)
Musvuugwa, T. BSc (Hons) (NUST, Zimbabwe)
Mzumara, T. BSc (Hons) (Malawi)
Quayle, T. BSc (Hons) (Aberdeen, Scotland)
Shaw, J. BSc (Hons) (Edinburgh, Scotland)

Masters in Conservation Biology 2007/8
Babiker, H. BSc (Hons) (Juba, Sudan), Jan-June
Chaudhry, M.J. MSc (BZU, Multan, Pakistan), Jan-June
Child, M. BSc (Hons) (Cape Town), Jan-June
Hempson, T. BSc (Hons) (Cape Town), Jan-June
Humphrey, G. BSc (Hons) (Rhodes), Jan-June
Joseph, G. MBChB (Cape Town), Jan-June
La Grange, R. BSc (Hons) (Stellenbosch), Jan-June
Lipsey, M. BA (Middlebury, Vermont, U.S.A.), Jan-June
Mann, G. BSc (Hons) (Cape Town), Jan-June
Okes, N. BSc (Hons) (Cape Town), Jan-June
Puttick, J. BSc (Hons) (Cape Town), Jan-June
Wistebaar, P.N. BSc (Hons) (Fort Hare), Jan-June

Zoology (Hons)
Fyfe, A. BSc (Cape Town)
Lubbe, A. BSc (Cape Town

Externally registered students

Doctoral
Flower, T. MSc (Pretoria) - registered at U.Cambridge
Golabek, K. MSc (Bristol, England) - registered at U. Bristol
Hermann, L. MSc (Pretoria) - registered at U. Pretoria

Masters
Smit, B. BSc (Hons) (Wits) - registered at Wits
Jansen van Rensburg, A. BSc (Hons) Pretoria – registered at U. Pretoria

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.

Prof. Tim Crowe

is an Elected Fellow of the University of Cape Town and the Willi Hennig International Society of Systematic Biology, a member of the International Ornithological Congress Committee and the Board of the South African Biological Information Facility, and a research associate at the American Museum of Natural History in New York. During 2008 he acted as external examiner for undergraduate courses in Conservation Biology at the University of Venda. He is past president of the Wildlife Management Association of Southern Africa and Southern African Society for Systematic Biology and past member and chairperson of the South African Biosystematics Initiative. He has also served on the editorial boards of Cladistics *and* Systematic Biology*.*

Tim co-ordinates the module 'Characterizing Biodiversity' in the Fitztitute's Postgraduate Programme in Conservation Biology. During the year under review, he published five scientific papers and supervised two MSc and four PhD students. He also taught a module to one under-graduate class and gave one popular talk. He refereed nine scientific papers for five different journals, reviewed one research grant application and assessed one local researcher being evaluated by the National Research Foundation. Tim and students Lisa Nupen and Tshifhiwa Mandiwana attended the Symposium of the Southern African Society for Systematic Biology. Lisa and Tshifhiwa presented papers based on their postgraduate research. In October, he attended the XXVIIth meeting of the Willi Hennig Society in Tucuman, Argentina and presented a paper summarising research on the phylogenetic affinities of African gamebirds.

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)
Asst Prof. Rauri Bowie (University of California, Berkeley, USA)

Research team

Dr John Bates (Field Museum of Natural History, Chicago, USA)
Dr George Barrowclough (American Museum of Natural History, New York, USA)
Prof. Michael Bruford (Cardiff University, Wales)
Prof. Adrian Craig (Rhodes University)
Dr Michael Double (Australian National University, Australia)
Dr Christine Dranzoa (Makerere University, Uganda)
Dr Gareth Dyke (University College, Dublin, Ireland)
Dr J. Steven Farris (Swedish Museum of Natural History, Stockholm)
Prof. Jon Fjeldså (Zoological Museum, University of Copenhagen, Denmark)
Dr Jerome Fuchs (PFIAO Postdoctoral Fellow)
Dr Pablo Goloboff (Instituto Superior de Entomología, Argentina)
Dr Jeff Groth (American Museum of Natural History, New York, USA)
Dr Shannon Hackett (Field Museum of Natural History, Chicago, USA)
Asst Prof Bengt Hansson (Lund University, Sweden)
Prof. Martine Hausberger (University of Rennes, France)
Prof. Terry Hedderson (Department of Botany, UCT)
Charles Kahindo (Makerere University, Uganda)
Cecilia Kopuchian (Instituto Superior de Entomología, Argentina)
Assoc. Prof. Graham Louw (Department of Anatomy, UCT Medical School)
Tshifhiwa Mandiwana (Department of Botany, UCT)
Rick Nuttall (National Museum, Bloemfontein)
Dr Colleen O'Ryan (Department of Molecular and Cell Biology, UCT)
Asst Prof. Bret Payseur (University of Wisconsin, USA)
Dr Eric Sande (Makerere University, Uganda)
Prof. Mike Sorenson (Boston University, USA)
Dr Gary Voelker (University of Memphis, USA)

Overview

Systematics and taxonomy underpin all biological sciences. Only once we understand the diversity of organisms and their relationships can we study and conserve them effectively. There is a common misconception that the key questions relating to bird taxonomy and systematics have been answered. In fact, this remains a vibrant field of research that is taking advantage of recent developments in molecular genetics, and combining these findings with rigorous analysis of more traditional lines of evidence including morphology, behaviour and ecology. In particular, rapid advances are being made in understanding the phylogenetic relationships among bird taxa, and we are only just starting to infer the biogeographical factors that have promoted the evolutionary diversification of birds.

Members of this programme tackle a range of projects aimed at discovering and determining the taxonomic status of species, inferring their phylogeographic (within species) or phylogenetic relationships, and identifying and explaining patterns of species' distributions and diversity (biogeography).

Island buntings and finches

Following the excitement in 2007 of publishing a paper in *Science* on the evolution of *Nesospiza* buntings in the Tristan da Cunha island group, work has commenced on testing the two hypotheses that could explain why there is greater similarity between large- and small-billed birds at each of the two islands with buntings – is it a result of

separate evolution at each island, or more recent introgression? Former CB student Martim de Melo found a similar situation between São Tomé Grosbeak *Neospiza concolor* and Principé Seedeater *Crithagra rufobrunnea* as part of his PhD study at Edinburgh University. Martim joined the Fitztitute again as a post-doc in September 2008, and together with CoE-funded student Alex Jansen van Rensburg will work jointly with Paulette Bloomer and Bengt Hansson (Lund University, Sweden) to try to discriminate between these hypotheses. We also shall attempt to identify the genes responsible for bill development to see whether there is evidence of specific selection during the evolution of taxa with different bill sizes. Support has been given by the South African National Antarctic Programme for a field trip to Inaccessible Island to obtain more material in spring 2009.

Evolution among central Africa's forest fauna

Potiphar Kaliba's PhD research examines the biogeography, phylogeography and genetic diversity among selected bird and mammal taxa throughout the Malawi Rift. The aim is to assess whether there are common patterns in relationships across the geographical region from southern Tanzania (Rungwe Mountains) through Malawi (Misuku Hills, Nyika Plateau, Ntchisi Highlands, Mount Zomba and Mount Mulanje) to northern Mozambique (Mount Namuli). Patterns of diversification among taxa that are confined to highland forests will be compared with more widespread, woodland species. The major progress in 2008 was the analysis of samples at the Museum of Vertebrate Zoology, UC Berkeley, with both nuclear and mitochondrial markers sequenced for three forest species (Stripe-cheeked Greenbul *Andropadus milanjensis*, Malawi Batis *Batis dimorpha* and Delectable Soft-furred Mouse *Praomys delectorum*) and one woodland species (Black-backed Puffback *Dryoscopus cubla*). A second trip to Berkeley will be required to sequence additional taxa.

Martim de Melo and Pedro Martins attract an audience while working with netted birds in Kanjonde, Angola. Photo: Fábio Olmos.

A new project started in 2008 is a study of the affinities of selected forest species in the Angolan scarp forests. These forests, home to a number of restricted-range and threatened species, form an intriguing outlier to the Afromontane forests that extend from the Cape up the eastern side of Africa to Ethiopia and the Albertine Rift. Post-doc Martim de Melo visited the region in November 2008 as part of a BirdLife-sponsored expedition to collect samples. As a Portuguese national, Martim is well suited to working in Angola, and brings a wealth of relevant experience from his PhD study on the evolution of birds on the Gulf of Guinea islands.

The Gabela Bush-Shrike Laniarius amboimensis *is confined to a small part of the Angolan scarp forest. Blood samples were obtained from this species for the first time during Martim de Melo's field trip. Photo: Fábio Olmos.*

Gamebirds

The year under review started off with another bang with the news that the conclusions of the paper featured in the annual report two years ago on the phylogenetics of gamebirds *Aves: Galliformes* had been challenged again in another critique submitted to the journal *Cladistics*. The key challenge once again concerns the placement of fossils on the published tree and their use to calibrate molecular 'clocks'. Like Gerald Mayr's critique (see last year's report), Daniel Ksepka from the American Museum of Natural History in New York, maintains that the 54 million-year-old fossil *Gallinuloides wyomingensis* should be placed at the base of the gamebird tree. Crowe and other team members place it much higher up in the tree. This disagreement is serious in that the higher placement is crucial to Crowe *et al.*'s conclusion that gamebirds evolved in the Southern Hemisphere (promoted by the breakup of the supercontinent Gondwana) before the Cretaceous-Tertiary Event (the collision of a large meteor with Earth 65 million years ago, leading to the extinction of most dinosaurs and ancient birds). During the course of the period under review, a rebuttal by Crowe and team member Gareth Dyke to Mayr's earlier criticism was published in *Cladistics*, refuting it decisively, primarily because Mayr offered little evidence in favour of his hypothesis. Ksepka's challenge is more serious in that he compared *Gallinuloides* with *Paraortygoides messelensis*, a truly basal galliform fossil, and concluded that

Assoc. Prof. Paulette Bloomer

is based at the Department of Genetics, University of Pretoria. She is the president of the Southern African Society for Systematic Biology and continued to serve on the IUCN Specialist Group on Afrotheria*the Yellowfish Working Group Scientific Advisory Panel and the SABI steering committee. During 2008, Paulette supervised one post-doctoral fellow, 8 PhD and 8 MSc students, including two CoE students (one new full-time MSc and one ongoing CoE part-time PhD student). She refereed one ornithological paper for Molecular Phylogenetics and Evolution, was external examiner of one MSc dissertation and one PhD thesis, and assessed two local researchers being evaluated by the National Research Foundation. Paulette and two of her students attended the 9th Symposium of the Southern African Society for Systematic Biology, where she was a co-author of three oral presentations. She was on the organising committee for the 20th Biennial Congress of the South African Genetics Society and her whole research group attended the meeting (she was author/co-author of nine contributions). CoE PhD student Lucille Hermann presented a paper on avian speciation while MSc student Alex Jansen van Rensburg presented a poster on her honours degree research.*

Asst Prof. Rauri Bowie

is based at the Museum of Vertebrate Zoology and Department of Integrative Biology at the University of California, Berkeley. He is an editor of the bird journal Ibis, an Associate Editor for the bird journals Ostrich and Emu, as well as for the journal BMC Evolutionary Biology. During the review period he supervised or co-supervised one MSc student, 16 PhD students and three post-doctoral fellows. Five of his students presented papers of which he was co-author at international and local conferences. Rauri gave three talks to different interest groups, reviewed 82 papers for 18 journals and his lab published 21 papers.

they are related. Tim and Gareth will examine Ksepka's results and conclusions in detail during 2009.

Tshifhiwa Mandiwana-Neudani completed the data collection and molecular/ vocalization analyses necessary for her PhD research on francolins (*Francolinus*, *Scleroptila*, *Peliperdix* and *Dendroperdix* spp.) and spurfowls (*Pternistis* spp.). During Dec 2008 and Jan 2009, she worked with Rauri Bowie and his team to complete molecular analyses for the phylogeographic (within-species) analyses of the Grey-winged Francolin *Scleroptila africanus*. She added one more component to her research by investigating the syringeal (avian voice box) anatomy to determine potential differences that might account for striking call variation between francolins and spurfowls. Key collaborators on this are Graham Louw (UCT Medical School) and Cecilia Kopuchian (Instituto Superior de Entomología, Argentina).

Callan Cohen's study suggests that pratincoles, like this Common Pratincole Glareola pratincola*, are a derived group nested among the coursers. Photo: Peter Ryan.*

Bustards, Pratincoles and Coursers

Callan Cohen visited Rauri Bowie's lab at UC Berkeley to conduct the balance of the molecular research needed to complete his PhD research. He has obtained sequence data for a large number of nuclear and mitochondrial genes for most species of bustards as well as representatives of the main groups of pratincoles and coursers. He is currently analyzing the results, and will submit his PhD in 2009. One surprising finding was that pratincoles were nested within the coursers. Callan has also produced a draft manuscript on a project investigating two enigmatic gamebirds, the Stone Partridge *Ptilopachus petrosus* (a small gamebird confined to the arid savannas north of the central African rainforests) and Nahan's Francolin *Francolinus nahani* (a bird of pristine tropical rainforest).

African White-eyes (*Zosterops* spp.)

Graeme Oatley's PhD research on the systematics of sub-Saharan African *Zosterops* is using a combination of molecular and organismal data to reassess the systematics of this notoriously taxonomically complex genus. Morphological analyses support the recognition of four evolutionarily significant units (ESUs) that may be discriminated according to the colour of underparts, but preliminary DNA analysis using both mitochondrial and nuclear DNA reveals the presence of only three ESUs. Further work will include an analysis combining morphological, molecular and vocalization data to reconcile this discrepancy in the number of ESUs. A fine-scale investigation of relationships between ESUs that may be undergoing speciation also is underway

using microsatellite primers developed specifically for this study. Further specimens from the potential hybrid zone between *Zosterops pallidus* and *Z. virens virens* in the Free State need to be collected before lab work can be completed. Preliminary model-based analyses have been completed that will help determine the effects of environmental and climatic conditions on the distributions of *Zosterops* taxa in southern Africa.

Southern African Cisticolas

Modern taxonomy aims to identify units of biodiversity that represent biologically legitimate entities that may be of use in conservation biology, evolutionary biology, ecology and other related fields. Cisticolas are a diverse group of small, almost exclusively African passerines. They are also notoriously difficult to identify due to their highly conserved (very similar) plumage and structure, with geographic differences within species often as variable as those between species. This has resulted in confusion about relationships within the genus and its constituent taxa. For her 2007 MSc CB project, Lisa Nupen incorporated multiple independent sources of evidence (morphology, genetics, behaviour, life-history and ecology) to delineate the taxonomic boundaries within and between five putative species of southern African cisticolas. She found that many of the existing subspecies of *Cisticola* do not stand up to rigorous taxonomic investigation, although her molecular analyses did not include samples from all named subspecies. This preliminary study (the results of which were summarized in a paper presented at last year's meeting of the Southern African Society for Systematic Biology) is the first to consider molecular evidence in the classification of the taxa investigated. Further research with increased taxon sampling and molecular evidence (nuclear genetic markers) needs to be conducted before the taxonomy and evolutionary history of this genus can be fully understood. This will be conducted during 2009-2010 by Owen Davies, a new MSc student.

Bar-throated Apalis

The Bar-throated Apalis *Apalis thoracica* is widely distributed in Afromontane forests and adjacent woodland and thickets in southern and eastern Africa. It exhibits extensive geographic variation, with 21 subspecies and several putative species recognised (including the threatened Yellow-throated Apalis *A. flavigularis*, Namuli Apailis *A. lynesi* and Taita Apalis *A. fuscigularis)*. One of the aims of Lucille Hermann's PhD research under the supervision of Paulette Bloomer and Peter Ryan is to elucidate the intra-specific patterns of genetic diversity in this complex. A clear genetic divergence has been identified between the more northerly subspecies and the six most southerly subspecies, with a contact zone in KwaZulu-Natal. However, more thorough sampling is still needed in KwaZulu-Natal, firstly to elucidate accurately the contact zone between the northern and southern African groups and secondly to determine the processes present within this contact zone. There are strong indications of an ancient northerly migration along the Afromontane archipelago progressively giving rise to the more northerly subspecies. This hypothesis can now be tested in light of recent systematic studies. The patterns of genetic diversity among the three subspecies from eastern Africa, *griseiceps*, *uluguru* and *murina* are also being investigated in collaboration with Prof Jon Fjeldså. These subspecies are closely related, with *uluguru* being the most genetically diverse. Of the taxa of conservation concern, *fuscigularis* and *lynesi* represent unique genetic lineages, but their species status is not supported by the available mitochondrial and nuclear genetic markers. Progress has been slowed by a lack of suitable nuclear markers. Five genes that previously have proven to be useful in passerine studies have failed to show any significant genetic divergence in this complex.

African Black Oystercatchers

During 2008, microsatellite markers were used to examine the phylogeography of the African Black Oystercatcher *Haematopus moquini*. Three loci previously developed for the European Oystercatcher and 12 loci identified by Dalemari Swanepoel (Hons 2006) and Paulette Bloomer were tested for variation among 60 oystercatchers from three sites (East London, Saldanha Bay and Possession Island, Namibia. Preliminary analyses indicate a homozygous excess in the east of the species range: this accords with conclusions from other sources of evidence that colonisation of the east coast is fairly recent. During 2009, University of Pretoria post-doc Dr Timothy Bray will investigate population structure and gene flow patterns in this *Near-threatened* shorebird.

Comparative phylogeography of southern African birds

This project, spearheaded by Rauri Bowie, Tim Crowe, Jerome Fuchs and several PhD students, aims to describe the phylogeographic patterns of 11 co-distributed southern African bird lineages. The goal is to test for common responses to landscape changes resulting from climatic oscillations during the Plio-Pleistocene (3.6 mya until present), e.g. fragmenting or merging, shrinking or expanding. In particular, we are interested in:

- assessing whether currently recognized subspecies represent distinct evolutionary lineages;
- inferring the number and location of potential refugia that allowed populations to survive during climatic oscillations;
- assessing if population fluctuations were concomitant across taxa, corresponding to periods with marked climatic change; and
- characterising the genetic structure of contact zones (i.e. are there distinct gene pools on each side of ecotones?), and estimating the movement of alleles across these zones.

The study uses up to 20 independent loci (mitochondrial, autosomal and Z-linked), taking advantage of the development of molecular markers for non-model organisms and high-throughput molecular techniques that have been optimised in

Rauri's lab (e.g. genotyping SNPs). Analysis of the data will use recently developed tests based on coalescence theory.

Our preliminary results indicate a lack of concomitant genetic structure across South Africa. Some species are highly structured (e.g. Fork-tailed Drongo *Dicrurus adsimilis* and Karoo Scrub-Robin *Cercotrichas coryphaeus*), whereas others are genetically homogeneous (e.g. Common Fiscal *Lanius collaris*). Even in cases where strong genetic structure is observed, barriers to gene flow between populations seem to vary among species. For example, we observe a strong genetic break for Fork-tailed Drongo north and south of the Swartberg Mountains, whereas Karoo Scrub-Robins show no differentiation in this region, but are strongly structured across the Knersvlakte. This suggests that species responded differently, both in time and space, to the climatic oscillations that occurred during the Plio-Pleistocene. A more accurate picture will emerge during the course of 2009 as further genetic markers are analyzed and sample coverage is extended.

In addition to these specific projects, Paulette Bloomer is in the process of testing some new nuclear primers that may be of considerable value to molecular phylogenetic research.

Fork-tailed Drongos Dicrurus adsimilis *show strong genetic differentiation between the Great Karoo and the Southern Cape. Photo: Peter Ryan.*

Highlights

- Tshifhiwa Mandiwana was awarded the prize for the top paper presented by a PhD student at the Symposium of the Southern African Society for Systematic Biology.
- Shannon Hackett (senior author), Rauri Bowie and John Bates were co-authors of a paper in the journal *Science* that provides the most thorough investigation to date of the higher-level phylogenetics of birds.
- Tim Crowe hosted a workshop on advanced phylogenetics at UCT attended by 26 participants representing a range of institutions from throughout South Africa. The workshop was run jointly by research team members Drs Pablo Goloboff and Steve Farris, developers of TNT, the leading parsimony-based program used in phylogenetic analysis.
- Paulette Bloomer hosted a workshop on phylogenetic hypothesis testing using the software package HyPhy presented by Dr Sergei Kosakovsky-Pond (University of San Diego, USA). Tim Crowe and Lucille Hermann also attended the workshop.
- During 7-12 September, Tim Crowe, Peter Ryan, Lisa Nupen and Owen Davies participated in the 12th Pan-African Ornithological Congress held at Goudini Spa, Western Cape, and presented results from a range of their systematic research projects.

Students

Callan Cohen (PhD, supervisors Tim Crowe & Rauri Bowie) *The evolution and biogeography of Africa's arid zone birds.*

Lucille Hermann (PhD Pretoria, supervisors Paulette Bloomer & Peter Ryan) *Comparative phylogeography of forest avifauna.*

Potiphar Kaliba (PhD, supervisors Rauri Bowie & Tim Crowe) *Faunal turnover between east and southern African birds and small mammals: is Malawi the geographical break?*

Tshifhiwa Mandiwana-Neudani (PhD, supervisors Tim Crowe & Rauri Bowie) *Taxonomy, phylogenetics and biogeography of francolins and spurfowls.*

Graeme Oatley (PhD, 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.*

Owen Davies (MSc, supervisors Tim Crowe, Peter Ryan & Rauri Bowie) *Taxonomy, phylogenetics and biogeography of cisticolas.*

Alex Jansen van Rensburg (MSc, supervisors Paulette Bloomer, Peter Ryan & Bengt Hansson) *Landscape genetics and adaptive variation of* Nesospiza *buntings.*

Reda Potts (CB MSc, supervisors Tim Crowe & Terry Hedderson, graduated June 2008) *Phylogenetic diversity in selected southern African birds as a means of prioritizing areas for conservation action.*

Acknowledgements

The National Research Foundation, Department of Science and Technology and French Centre National de la Recherche Scientifique (National Centre for Scientific Research) 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, and long-running studies on Sociable Weavers and Ant-eating Chats. He serves on the Steering Committee of SAFRING.

During the review period, he supervised one MSc and two PhD students and examined one MSc dissertation. He also authored one paper, peer-reviewed 13 manuscripts for local and international journals, and reviewed one NRF rating.

Life-history Strategies

Programme leader:
Dr Penn Lloyd

Research team:
A/Prof. Rauri Bowie (University of California, Berkeley, USA)
Prof. Phil Hockey (PFIAO)
Dr Ricardo Lopes (University of Porto, Portugal)
Prof. Thomas Martin (University of Montana, USA)
David Nkosi (field assistant)
Âkos Pogány (Eotvos Lorand University, Hungary)
Dr Rob Simmons (PFIAO research associate)
Dr Claire Spottiswoode (Cambridge University, England)
Dr Tamas Szekely (Bath University, England)
René van Dijk (Bath University, England)

Overview

Life-history strategies describe the anatomical, physiological and behavioural adaptations that control how individuals invest in reproduction and self-maintenance in response to prevailing 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, long-term pair bonds, and a greater propensity for cooperative breeding, with the opposite expression at the fast end. The South African 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.

A single Karoo Scrub-Robin Cercotrichas coryphoeus *helper more than doubles the breeding success of the breeding pair it assists. Photo: Philipp Becker.*

Environmental and life history influences on population genetic structure

Ângela Ribeiro made substantial progress in the second year of her PhD project on the influences of geography, life history, and past climate and geological changes on population genetic structure at a range of spatial and temporal scales in endemic southern African robin species. At a broad spatial scale, genetic data from populations sampled across the southern African range of selected species will be integrated with Geographic Information System (GIS) data on geomorphology and climate to plot genetic boundaries in space. This should identify current environmental barriers to dispersal and gene flow between populations and therefore their influence on current population structure. At a broad temporal scale, the study will examine the

influence of Plio-Pleistocene climatic oscillations in shaping genetic variability in forest- versus arid-adapted species. At finer spatial and temporal scales, the project will examine how life-history differences between cooperative and non-cooperatively breeding species influence local genetic structure and behavioural ecology.

A wide-ranging field trip in April collected additional samples from Namaqualand, southern Namibia and the Northern Cape, to add to samples collected last year from the rest of South Africa with the help of several enthusiastic bird ringers around the country. With the sampling now mostly complete, Ângela spent the rest of the year working in Rauri Bowie's molecular lab at UC Berkeley, starting the painstaking process of sequencing the samples. She presented a poster on some initial results at the *Evolution 2008* conference in Minneapolis on 20-24 June, and had a primer note paper reporting on the microsatellite development accepted by *Molecular Ecology Resources*.

Parasite transfer as a cost of group living in cooperatively breeding birds

Birds that live in groups derive many benefits from group living, including improved vigilance against predators when feeding. However, group living can also have its drawbacks. Rubbing shoulders with more than just its partner can increase a bird's risk of contracting parasites and diseases. This leads to the prediction that group-living birds will be exposed to parasites more frequently and should invest more in developing immune defences against parasites than pair-breeding birds. Claire Spottiswoode published an article in *Behavioural Ecology and Sociobiology* testing this prediction among African birds. She measured the strength of the immune reaction to an experimental injection of plant protein in 48 pair-breeding and 18 cooperatively breeding species. The average immune response was significantly higher in cooperatively breeding species, suggesting that they have indeed been selected to invest more resources in immune defences against parasites than pair-breeding species.

The importance of territory and male quality to female investment decisions

Adams Chaskda completed the second field season of his PhD study using the Bar-throated Apalis *Apalis thoracica* population at Koeberg Nature Reserve to examine three inter-related questions: (1) does variation in territory quality affect individual fitness; (2) is the size of a male's black breast-band a reliable indicator of territory and/or male quality, i.e. does it function as a 'badge of status'; and (3) do females adjust their investment in reproduction on the basis of territory and male quality? This year he focused on capturing all apalis pairs occupying 40 territories in the study area to colour-ring, measure and photograph them, plotting territory boundaries, measuring territory quality by means of vegetation surveys and invertebrate sampling, measuring female investment in clutch size, egg size and nest attentiveness, and measuring male investment in feeding the female during incubation and the nestlings. Next season he plans to perform an experiment that will manipulate the size of the breast-band of males and then measure female responses to the manipulation.

Students

Adams Chaskda (PhD, supervisors Phil Hockey & Penn Lloyd) *Is territory quality the coded message in the breast-band of the male Bar-throated Apalis?*

Ângela Ribeiro (PhD, supervisors Penn Lloyd, Rauri Bowie & Ricardo Lopes) *Unravelling temporal and spatial genetic patterns among southern African robins.*

Acknowledgements

ESKOM, particularly Gert Greef and Graeme Fick, for research facilitation at Koeberg; Elton le Roux (SANParks), Dawie de Swardt (National Museum, Bloemfontein), Joseph Heymans, Kobie Raijmakers and Colin Williams for assistance in the field and collection of samples; the AP Leventis Foundation for fellowship support to A. Chaskda and the Fundação para a Ciência e Tecnologia, Portugal for fellowship support to Â. Ribeiro; Ezemvelo KZN Wildlife (Nerosha Govender, Ricky Taylor), SANParks (Rod Randall, Hugo Bezuidenhout), Northern Cape Nature Conservation (Marietjie Smit), Namibian Ministry of Environment & Tourism (Mr Tuahengo), Cape Nature (Hilton Westman), and SAFRING (Dieter Oschadleus) for assistance with research permits.

The tongensis *subspecies (left) of Brown Scrub-Robin* Cercotrichas signata *is 15% smaller than the nominate race (right), with a white, not brown, sub-moustachial stripe. Initial molecular analyses by Ângela Ribeiro suggest that the two are genetically quite distinct. Photos: Penn Lloyd.*

Dr Mandy Ridley

is a postdoctoral researcher. She is the principal investigator of the Southern Pied Babbler Research Project located at the Kuruman River Reserve in the southern Kalahari. In addition to undertaking her own research, Mandy oversees all research conducted on the project as well as the maintenance of project databases. In 2008, Mandy supervised two PhD students, one MSc student and two Honours students. In addition, she participated in convening the weekly postgraduate seminars held at the Institute. During the review period Mandy authored or co-authored six papers in international journals, wrote one book review, attended two international conferences, reviewed one grant application, and peer-reviewed 14 manuscripts. Mandy was also awarded two international grants for her research.

Cooperative Breeding and Sociality in Birds

Programme leader:
Dr Mandy Ridley

Research team:
Jonathan Barnaby (Uppsala University, Sweden)
Dr Matthew Bell (Cambridge University, England)
Quentin Hagens (Research Assistant)
Dr Ben Hatchwell (Sheffield University, England)
Eric Herrmann (Northern Cape Nature Conservation)
Prof.Phil Hockey (PFIAO)
Dr Linda Hollen (Bristol University, England & Zurich University, Switzerland)
Dr Penn Lloyd (PFIAO)
Erin Love (Field Assistant)
David Nkosi (Field Assistant)
Dr Andrew Radford (Bristol University, England)
Dr Nicola Raihani (Cambridge University, England & Institute of Zoology)
Rebecca Rose (Field Assistant)
Helen Wade (Field Assistant)

Overview

Cooperative breeding behaviour occurs in group-living species. Some individuals delay their own breeding attempts well beyond the age of sexual maturity and instead help to raise the young of others. This unusual social structuring has long been an active area of behavioural ecology research worldwide. This is primarily because of the challenges that such breeding behaviour poses to evolutionary theory, but also because of the diversity of cooperative breeding systems and the inability to find a consistent, unifying theory that can explain the occurrence of such behaviour alongside species with uniparental or biparental brood care. At the Fitztitute, we are conducting research on patterns of cooperative breeding behaviour in a number of very different bird species, ranging from 4 kg Southern Ground-Hornbills *Bucorvus leadbeateri* in the eastern savannas down to 20 g Karoo Scrub-Robins *Cercotrichas coryphoeus* in western coastal shrublands, with the aim of providing a broad and considered approach to the many unanswered questions regarding the causes and consequences of cooperative breeding behaviour. The objectives of cooperative breeding research at the Institute remain: (a) to uncover the factors that lead to the occurrence of different kinds of cooperative breeding behaviours; (b) to use experimental manipulations to determine the benefits of sociality and how changes in the cost/benefit ratio of such behaviours affect the degree of sociality; (c) to test current theoretical models on the occurrence of cooperative breeding using empirical data from a broad range of cooperative breeders; (d) to investigate the ecological factors underlying patterns of reproductive investment within groups and the proximate causes of variation in the degree of help provided by non-breeding adults; and (e) to determine the life-history benefits of cooperative *vs* non-cooperative breeding.

However, we are also branching out into novel areas in cooperative breeding research. Specifically, we are researching how the occurrence of cooperative breeding can allow some of the long-established, yet poorly explored theories in behavioural ecology to be tested. For example, parent-offspring conflict, maternal effects and sexual selection research has been confined almost exclusively to uniparental or biparental breeding systems. Cooperative breeding systems have almost never been used to test the theories developed from such research, yet they are likely to provide important insights into the generalities of commonly held ideas surrounding these fundamental concepts. For example, maternal investment in young is likely to be affected by the presence of helpers in cooperative breeders, influencing

the importance of maternal investment for offspring fitness. As another example, intra-sexual competition for mates is likely to be more intense in cooperative breeders due to scarcity of breeding opportunities compared to uniparental or biparental systems. Resultant competition is likely to have a strong influence on patterns of sexual selection and reproductive conflict. As our team grows, the cooperative breeding unit plans to tackle these questions with novel approaches and highly tractable study species.

Southern Pied Babbler Turdoides bicolor *nestlings are all ringed at 11 days post-hatching, just after their pin feathers break. Broods typically comprise 2-3 young. Photo: Nicola Raihani.*

Southern Pied Babbler Research Project

The Southern Pied Babbler Research Project, located at the Kuruman River Reserve in the southern Kalahari, Northern Cape, is involved in research into population dynamics, behavioural and evolutionary ecology, bioacoustics, and cognition. The Southern Pied Babblers *Turdoides bicolor* at the study site are all colour-ringed and fully habituated to observation within a few metres. Research at the project continued in 2008, with the addition of a new postdoctoral researcher (Dr Linda Hollen, Bristol & Zurich Universities) and several new field assistants. It is with a sad but proud heart that we saw Nicola Raihani leave the project after successfully receiving her PhD from Cambridge University with flying colours, but we hope to see her back at the project in the future.

In contrast to the dry summer of 2006/2007, the 2007/2008 summer was a bumper season for rain and babbler breeding success was correspondingly high. Surprisingly, this did not result in groups fragmenting into smaller groups and re-occupying some of the territories left vacant by groups that went extinct during the 2006/2007 drought. Groups simply increased in size with the addition of well-fed youngsters. Interestingly, two groups exhibited intense reproductive conflict. Martha Nelson's genetic research subsequently revealed that in both of these groups the outcome was clutches of mixed parentage, something thought to happen very rarely in babblers. This has provided an interesting insight into reproductive conflict and resolution in this species. We also had only our second case of a cuckoo chick being raised by a babbler group. Unfortunately, this chick died only one week post-fledging along with its babbler broodmate, so we were unable to record parental behaviour towards the brood parasite in detail. We also said farewell to our longest living babbler when a dominant nine-year-old female disappeared, presumed dead, at the end of 2008. She and her breeding partner had bred together successfully since 2003 and had produced more than 40 offspring, many of which have dispersed and become dominant in other groups at the study site. The 2008/2009 breeding season started with little rain and high predation rates, leading to very low breeding success despite high breeding frequency resulting from high food abundance linked to the previous wet season.

Research at the Kuruman River currently focuses primarily on the following topics:

Mate choice: In many cooperatively breeding species, social groups contain a dominant pair who monopolise breeding opportunities. This often creates a power dichotomy that can result in fierce battles between breeders and mutinous subordinates. Moreover, the dominant male's quality may strongly influence group stability, productivity and ability to defend territory borders: females should therefore compete aggressively for access to the best males. Female Southern Pied Babblers battle with one another throughout their lives, divorcing their partners, usurping their neighbours and forming deadly coalitions in attempts to gain access to the best males. There is growing evidence that females assess the quality of both their rivals and their potential partners before embarking on costly fights, but it remains unclear exactly how they do so. We hypothesise that females assess their options by employing a series of tactics that provide them with the maximum amount of information while incurring the minimum amount of risk. These include long-distance assessment via vocalisations, and using a 'safety-in-numbers' tactic by initiating inter-group interactions at territory borders to back up their vocal assessment of neighbouring males and rivals with visual assessment. By spearheading small forays into rivals' territories, females could further assess their own potential coalition support. We aim to investigate precisely which vocal and visual cues are used by females when assessing males and rivals, determine how fiercely females are willing to battle for a 'sexy' male, and how this affects their condition, longevity and, ultimately, reproductive success.

Social learning: Social learning, defined as 'learning that is influenced by observation of, or interaction with a conspecific or its products', can result in the transmission of information (e.g. foraging skills or vocalisations) through a population, resulting in homogeneity of behaviour extending beyond the period of interaction. Such processes could result in simple 'cultures' being maintained in natural populations. The idea that animals can exhibit such 'culture' has been challenged for many years because definitions of culture are predominantly anthropocentric. Recent research has pointed out that only increased understanding of the mechanisms, causes and consequences of social learning can lead to an end to the

debate over the existence of animal cultures. Research into such cultures in wild populations is still novel and more work is needed to shed light on the evolutionary pressures that may cause and maintained them, possibly enlightening us on the evolution of human culture itself.

For an individual to perform a non-innate a task it must learn how to do it. This can happen in one of two ways - trial and error learning or learning from others, also known as social learning. Information and skills gained through own experience tend to be reliable but can be expensive to attain, whereas those learned from others tend to be less reliable but are also relatively inexpensive to acquire. Transfer of information from a knowledgeable to a naïve individual allows the learning of information in a reduced period of time and with reduced costs to the receiver. Social learning could thus provide a useful mechanism for gaining fitness benefits, such as increasing the efficiency with which an individual finds food. Foraging ability can have very significant fitness consequences because body condition often affects both attractiveness to mates and fighting ability. Thus, in species such as the Southern Pied Babbler, where we have shown that the maintenance of body mass has important fitness benefits, it is likely that the efficient transfer of foraging skills via social learning confers significant benefits during adulthood. Because social learning is an efficient way of transferring skills and information it is likely to lead to young becoming independent foragers faster, enabling them to contribute to group benefits, such as guarding, at an earlier age. This in turn would confer benefits on the individuals from which they learned as well as to themselves. In 2009-2010 we plan to use a series of experiments to determine the occurrence, and importance of social learning and culture in Southern Pied Babblers.

Reproductive conflict and group stability: There is increasing evidence that reproductive conflict leads to decreased group productivity. The most productive groups in our population are those that comprise an established pair and their retained offspring. Death, dispersal and situations where two or more females can potentially breed with the dominant male, result in breeding disruption, i.e. nest desertion, intra-sex aggression, delayed onset of breeding and infanticide. Martha and Mandy plan to use current data and theoretical modelling to determine the benefits of subordinate reproduction versus the costs of group disruption. They will use this to test current models predicting when subordinates should disperse as against when they should stay at home to help raise future young.

Individual patterns of helping behaviour: Continuing on data collection from previous years, Mandy is studying causes of individual variation in helping behaviour in terms of the costs and benefits of such behaviour. Included within this research is a focus on sex-biased preferential care, where individuals may prefer to care for the sex that will provide them with the greatest benefits in the future.

Project outputs: In 2008, members of the Southern Pied Babbler Research Project published eight papers in international peer-reviewed journals and gave six talks at international conferences. Research from the project received extensive coverage in international media, including appearances on radio, magazines, newspapers and online scientific fora. One film crew visited the study site to film aspects of Southern Pied Babbler behaviour.

Mandy Ridley spent a year habituating Southern Pied Babbler Turdoides bicolor *groups in the Kalahari (above) to the point that the birds queue up to be weighed on request (below)! Photos: Phil Hockey.*

Karoo Scrub-Robin Research Project

2008 was the final year of monitoring the reproductive effort, success and survival of a colour-marked population of Karoo Scrub-Robins occupying 100 territories at Koeberg Nature Reserve, situated in coastal shrublands to the north of Cape Town. The first manuscript outlining the nature of cooperative breeding in this species has now been accepted by *Journal of Avian Biology*. Helpers (usually one, but occasionally 2-3) occurred on 15% of territories, and are invariably male offspring from a previous breeding season. Helpers contributed to multiple components of breeding performance. Firstly, they assisted the breeding male in feeding the incubating female, increasing the rate at which she received food. This increased provisioning rate to the incubating female led to greater female nest attentiveness during incubation. Secondly, nest predation was substantially lower among pairs breeding with a helper,

resulting in a 74% increase in the probability of nest survival (compared to pairs without helpers). Thirdly, helper contributions to offspring provisioning increased nestling feeding rates, resulting in a fewer nestlings starving to death and increased nestling mass. Heavier nestlings had a substantially greater chance of surviving the first three weeks after leaving the nest. Controlling for female age and habitat effects, annual production of fledged young was 130% greater among pairs breeding with a helper, and was influenced most strongly by increased nest survival, despite important helper effects on offspring provisioning. Females breeding with a helper laid larger clutches than unassisted pairs, supporting the prediction of increased female investment in reproduction in response to helper benefits. Penn Lloyd presented a paper on this work at the Pan-African Ornithological Congress in September.

PhD student Ângela Ribeiro is currently using the database of blood samples from the Karoo Scrub-Robin study to investigate the influence of fine-scale population genetic structuring on mating strategies in this species (see under Life-history Strategies programme). Rauri Bowie (UC Berkeley) has now nearly completed sexing the broods of offspring to expand upon an earlier Honours student project testing whether there is any skewing of primary sex ratios towards the helping (male) or dispersing (female) sex.

Ant-eating Chats

Jonathan Barnaby (Uppsala University, Sweden) started a PhD project on cooperative breeding and sociality in the Ant-eating Chat *Myrmecocichla formicivora* population at Benfontein, Kimberley that the Fitztitute has been monitoring and colour-banding since 2003. Ant-eating Chats are facultative cooperative breeders in which the decision to delay breeding (and be a helper) is apparently made based on prevailing environmental conditions. However, the genetic relatedness between breeders and helpers remains unclear. An MSc student at Uppsala will be analysing the existing database of blood samples collected by Fitztitute staff from nearly 100 family groups and their complete broods of offspring. This analysis aims first to unravel the species' mating system before investigating the opportunistic nature of cooperation during the breeding season in this species. In addition to the blood sample data bank, the Fitztitute has made a research vehicle available to the project and will be associated with publications emanating from the research.

Green Wood-Hoopoes

No active fieldwork is currently being conducted on Green Wood-Hoopoes *Phoeniculus purpureus*. However, Andy Radford and collaborators continued extracting detailed information from the long-term database collected by Morné du Plessis. This database contains nearly 30 years of detailed information for the groups breeding at Morgan's Bay in the Eastern Cape Province and it is hoped that it will continue to provide useful data for further detailed analyses of breeding behaviour in this species. Andy produced a high-profile paper that described the occurrence of affiliative behaviours (allo-preening) between group members following territorial conflicts. He showed that the duration and outcome of territorial conflicts influenced subsequent allopreening behaviour and suggested that this may be because dominants encourage subordinates to participate in future conflicts. This paper provides one of the first detailed studies of the behavioural consequences of territorial conflict in a cooperative bird.

Cooperative breeding in the Sociable Weaver

During 2008 an MSc student from the University of Montpellier, Anne-Sophie Deville, completed her thesis on the effects of helper presence on breeder and juvenile survival in the Sociable Weaver *Philetarius socius* under the supervision of Rita Covas, Claire Doutrelant and Arnaud Gregoire (CNRS, France). She found that females, but not males, improved their survival when breeding with the assistance of helpers. Since both females and males reduce their feeding effort in the presence of helpers, this suggests that females may reduce their reproductive investment in another, as yet undiscovered way. The hypothesis we are testing is that females with helpers reduce their investment in eggs because the additional food provided by the helpers compensates for the smaller or poorer quality eggs. Hence we returned to the field to measure egg size and collect one egg per clutch to compare the nutritional and physiological contents of eggs from clutches laid by females in pairs or in groups. The study will continue in 2009 and some of the data will be used in another MSc thesis at the University of Montpellier.

Another interesting result concerns the effect of helpers on the juveniles they help to raise. Because helpers are expected to have a beneficial effect on reproduction we had anticipated a positive effect of helper presence on juvenile survival. However, we found exactly the opposite: helpers had a significant negative effect on juvenile survival. However, this result might be explained not by a genuinely lower survival rate of juveniles in broods with helpers, but by these juveniles having a greater propensity for dispersal, being forced to leave because of competition with the older and dominant helpers (who are usually siblings from previous broods). During 2009, we will use 'multi-state' models to analyse the dispersal behaviour of young weavers raised by pairs alone and by groups.

In addition to these ongoing studies, two other Sociable Weaver research papers were published during 2008. One paper concerns the effect of helpers on reproductive success under adverse conditions. Some studies on the effects of helpers in cooperatively breeding birds show a positive effect of helper presence on reproductive output whereas others find no effect. One possibility for this discrepancy is that helpers may have a positive effect when breeding conditions are poor but no effect under good conditions. In agreement with these predictions, we found that helpers did counteract some of the negative effects of breeding in periods of low rainfall or at large colonies, demonstrating that helpers are most beneficial under

unfavourable conditions when they can contribute to improved reproductive performance.

The other paper used Sociable Weavers as a model species to analyse the limitations of population models in predicting climate change effects. The paper developed a dynamic population model that predicts the species' response to mean annual precipitation (MAP) and tested whether the model could predict the occurrence and abundance of Sociable Weavers in their current range. The model can reproduce realistic population estimates and predicts a decreased abundance with decreasing MAP. However the model could not explain the birds' occurrence across their entire distribution nor could it simulate realistic abundances when two different sites were tested simultaneously. The results imply that the sensitive, short-term response to MAP is buffered by long-term processes such as adaptation or plasticity in life history, changing interspecific interactions or changes in habitat structure. The study also suggests that this result is common for animals in semi-arid and arid regions.

The benefits of cooperative breeding by Sociable Weavers Philetarius socius *are greatest at large colonies and during periods of low rainfall. Photo: Phil Hockey.*

Visitors

Dr Ben Hatchwell (Sheffield University, UK) visited the field station at Benfontein and the Pied Babbler Research Project in October. He conducted a short pilot project on Sociable Weavers in preparation for a grant application to NERC, the research funding agency in the UK, for a project to test alternative hypotheses for the resolution of what Ben terms a 'tragedy of the commons' (selfish individuals exploiting the cooperative behaviour of others) in the evolution of cooperation. This grant proposal was submitted late in 2008, with the Fitztitute as an affiliated research organisation.

Lectures

Seminars about various aspects of Southern Pied Babbler research were given at the Universities of Cambridge, Cape Town, Bristol, St Andrews and the Institute of Zoology, London. Talks were presented at international conferences at St Andrew's, Scotland, Cornell University, USA, and at the PAOC conference in the Western Cape. Mandy Ridley and Martha Nelson also gave talks to both the Tygerberg and Somerset West Bird Clubs.

Students:

Martha Nelson (PhD, supervisors Phil Hockey, Mandy Ridley & Colleen O'Ryan) *The causes and consequences of group and population genetic structure in the cooperatively breeding Southern Pied Babbler.*

Tom Flower (PhD, University of Cambridge, supervisor Nick Davies, advised by Mandy Ridley) *The function of vocal mimicry in the Fork-tailed Drongo.*

Krystyna Golabek (PhD, University of Bristol, supervisor Andy Radford, advised by Mandy Ridley) *Communication and social recognition in Southern Pied Babblers.*

Highlights

Several aspects of our research represent highlights for us over the past twelve months. These include:

- Extensive international media attention regarding our publications on teaching and sentinel behaviour in the Southern Pied Babbler (*Current Biology, Animal Behaviour, BBC Wildlife*).
- Extensive international media attention regarding our publication of research into inter-group interactions among Green Wood-Hoopoes (*Proceedings of the Royal Society*).
- Martha Nelson completed genotyping the entire Southern Pied Babbler population, providing invaluable insights into the breeding system and broadening the scope of future research that can be conducted on the project.
- Mandy Ridley was awarded a National Geographic Society grant to conduct detailed research on mate choice and sexual selection in the pied babbler.

Acknowledgements

We thank the Northern Cape Conservation Authority for research permits for studies of Southern Pied Babblers and Fork-tailed Drongos, and the Kuruman River Reserve Trust and private landowners in the Vanzylsrus area (Mr & Mrs H. Kotze, Mr & Mrs F. de Bruin) for land access. Thanks to De Beers Consolidated Mining, especially Mr Johan Kruger, for supporting the long-term research station at Benfontein, Kimberley. For the Karoo Scrub-Robin Research Project we thank ESKOM, particularly Mr Gert Greef and Mr Graeme Fick, for research facilitation at Koeberg Nature Reserve. Finally, we thank the International Society of Behavioural Ecology for supporting conference attendance at Cornell, USA, by Martha Nelson and Mandy Ridley.

Prof. Phil Hockey

is a member of 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 and a co-author of the best-selling Sasol Birds of Southern Africa. In the period under review, he supervised the work of two postdoctoral fellows, three PhD student and seven MSc students. He authored or co-authored four scientific papers, with a further two in press and four under review, and three semi-popular articles. He also refereed four papers for four journals.

Ecology of Migration

Programme leader
Assoc. Prof. Phil Hockey

Research team
Prof. Paulette Bloomer (University of Pretoria)
Prof. Graeme Cumming (PFIAO)
Dr Douglas Loewenthal (PFIAO Postdoctoral Fellow)
Dr Mandy Ridley (PFIAO Postdoctoral Fellow)
Dr Clelia Sirami (SANBI Postdoctoral Fellow)

Overview
We have continued to study 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 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).

Within weeks of fledging, many young African Black Oystercatchers Haematopus moquini *(right) will embark on long journeys, some travelling more than 1500 km from their birthplaces. After reaching sexual maturity, they return to their birth sites to queue for breeding opportunities. Photo: Jessie Walton.*

African Black Oystercatcher Movements
In recent years we have documented extensive movements of juvenile oystercatchers in the subregion, although these birds also exhibit strong natal philopatry especially among birds raised on offshore islands. Retrapping of metal-ringed adult birds (as well as observations of individually identifiable colour-ringed birds) indicates that although young birds may move large distances, they are close to 100% site faithful to their natal island. Sexually mature young birds may wait many years before gaining a territory on their natal island and breeding for the first time. Some of the non-breeders are at least eight years old (oystercatchers are physiologically capable of breeding at 3-4 years of age). Island populations are currently stable and have been so for *ca* 10 years. For island birds, our findings suggests that strong natal site philopatry is likely to persist into the foreseeable future because, on average, the disadvantages of waiting longer to breed (increased probability of mortality and missed breeding opportunities) are more than compensated for

by the advantages of gaining a high-quality breeding territory on a predator-free island. Ongoing colour ringing (and subsequent resighting) of oystercatcher chicks and retrapping of metal ringed adult birds in 2009 will improve our current estimates of age-specific survival and longevity (which are important in the context of the species' conservation). Ringing efforts will include Namibian Islands, primarily Possession Island, which has a large resident breeding population of oystercatchers. Although our understanding of where young oystercatchers go after fledging but before they begin breeding is now fairly good, particularly on the west coast of southern Africa, the extent to which movements are genetically as opposed to environmentally determined remains unclear. We plan to carry out observations of juvenile and non-breeding adult oystercatchers at roosts to begin to assess whether (a) there is any evidence for age-based dominance hierarchies at oystercatcher roosts, and b) the extent to which age-based dominance behaviour might explain patterns of juvenile dispersion.

Whilst movement potentially promotes gene flow, natal philopatry does not. Based on observations of juvenile birds, westward gene flow is more likely than eastern gene flow (although rates of both are expected to be slow). We have now successfully developed 14 polymorphic microsatellite loci from our blood samples with the use of the FIASCO protocol. Analysis of our genetic data (including rates of gene flow) continues to be a primary research objective of Prof Paulette Bloomer.

Anatid movements

Mduduzi Ndlovu (MSc) has been investigating movement patterns of Egyptian Geese *Alopochen aegyptiaca*. Preliminary results indicate high turnover at individual sites, supporting the hypothesis derived from ringing and other data (analysed in 2007 by Hannah Thomas) that these birds are highly mobile. Mduduzi is also monitoring seasonal changes in body condition and moulting patterns as potential indicators of why birds move when they do.

We now have 44 solar-powered satellite GPS transmitters deployed on Egyptian Geese and Red-billed Teal *Anas erythrorhyncha* from Lake Manyame (near Harare, Zimbabwe), Barberspan (North-West Province) and Strandfontein (Western Cape Province). Some of these transmitters (PTTs) have been running for over a year and we have accumulated a total of around 8000 PTT-days of data. There has been some attrition but we still have 30 PTTs transmitting on a regular or semi-regular basis. In a couple of cases there have been technology failures; some birds have died; and in other instances transmitter failure is probably a result of birds preening back feathers over the solar panels. Addition of an extra pad under the transmitters seems to have largely solved this problem for more recently tagged birds. We have recovered and redeployed three transmitters, including one from outside a jackal den at Leeuwpan (next to Barberspan), another from a bird that died from unknown causes at Lake Manyame, and one from a recaptured bird at Strandfontein.

Preliminary results show some interesting patterns. The tagged Egyptian Geese have so far proven more mobile than the Red-billed Teal, and Egyptian Geese populations in different locations have shown large differences in movement patterns. Egyptian Geese from the Cape have so far remained largely within the Cape, and birds from Lake Manyame have remained close to the Manyame catchment, with a few moving up to the Zambezi Valley. Egyptian Geese from Barberspan, however, have travelled further afield. The longest single flight to date was by a bird that went from Barberspan to Stutterheim (near East London), a distance of over 800 km, in two days. Other Barberspan Egyptian Geese have gone to Botswana, Namibia, Bloemhof Dam, and the area south of Bloemfontein. We recaptured one satellite-tagged Egyptian Goose at Strandfontein almost exactly a year after it was released there, and a relatively high proportion of colour-ringed birds from last year have returned to Strandfontein. Based on tracking and colour-ring resightings we now hypothesize that Egyptian Geese have a relatively small home range where they spend most of the year, but that many undertake a longer flight to a traditional moulting site before returning to their home range.

The tagged Red-billed Teal have been more sedentary than the Egyptian Geese, but we have nonetheless recorded a few interesting long-distance dispersal events. One bird moved from Lake Manyame north to the Kafue flats in Zambia, where it spent several weeks before returning south. Another moved from Lake Manyame west to the Makgadikgadi Pans. In general, however, teal have moved within 100-200 km of their tagging location, with a few flights of 500-600 km.

One of our satellite-tagged Egyptian Geese Alopochen aegyptiaca *made an 800 km trip from Barberspan to Stutterheim in just two days. Photo: Barrie Rose.*

Students

Mduduzi Ndlovu (MSc, supervisors Graeme Cumming & Phil Hockey) *Understanding moult, condition and the movements of Egyptian Geese in southern Africa.*

Acknowledgments

We thank South African National Parks for access to oystercatcher breeding islands, and many observers from around the subregions for their continued oystercatcher ringing and resighting efforts. For the duck research, we thank Sampie van der Merwe, Barberspan warden, for assistance with housing and access to Barberspan. For permits we thank North-West Parks Board, Cape Nature and the governments of Botswana & Mozambique. In Zimbabwe we thank Alex Caron and CIRAD as collaborators. We thank Celia Abolnik, Onderstepoort Veterinary Institute, for analysis of blood samples, and Peter Frederick (University of Florida) for advice on satellite tracking methods. We are also very grateful to the many people who have helped us in the field with counting, catching and sampling birds.

Dr Andrew McKechnie
is an Associate Professor in the Department of Zoology & Entomology at the University of Pretoria. During the review period, he supervised one MSc student. He is currently an Associate Editor for the journal Ostrich*. During the review period, research outputs from his lab included four peer-reviewed papers, one edited book, one book chapter and six semi-popular articles. The review period also saw the organisation of an international conference, the 13th International Hibernation Symposium held from 6-12 August 2008, in Swakopmund, Namibia.*

Ecological and Evolutionary Physiology

Programme leader
A/Prof. Andrew McKechnie

Research team
Prof. Mark Brigham (University of Regina, Canada)
Dr Barend Erasmus (Wits University)
Prof. Robert Freckleton (Oxford University, England)
Dr Walter Jetz (University of California, San Diego, USA)
Prof. Barry Lovegrove (University of KwaZulu-Natal)
Prof. Sue Nicolson (University of Pretoria)
Dr Craig Symes (Wits University)
James Wakelin (Ezemvelo KZN Wildlife)
Dr Craig White (University of Queensland, Australia)
Prof. Blair Wolf (University of New Mexico, USA)
Dr Stephan Woodborne (CSIR, Pretoria)

Molopo Nature Reserve is located in the Kalahari Desert biome, and was the study site for several physiological projects during 2007 and 2008. Photo: Robin Bruyns.

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
Many birds reversibly adjust their metabolic machinery over short time scales in response to changes in energy supply and/or demand. Some of the most impressive metabolic adjustments occur in long-distance migrants, but there is increasing evidence that quantitatively similar physiological changes take place in many non-migrant species. For instance, many species that are resident in temperate latitudes in the Northern Hemisphere show impressive seasonal changes in metabolic rate, with metabolism generally up-regulated in winter. In contrast, almost no information is currently available on seasonal metabolic adjustments in Southern Hemisphere species.

During 2008, Ben Smit completed his MSc fieldwork in Molopo Nature Reserve in Northwest Province. Using a portable respirometry system, Ben obtained metabolic measurements during both winter and summer for five species resident year-round in the Kalahari Desert, namely African Scops-Owl *Otus senegalensis*, Pearl-spotted Owlet *Glaucidium perlatum*, Crimson-breasted Shrike *Laniarius attrococcineus*, White-browed Sparrow-weaver *Plocepasser mahali* and Fork-tailed Drongo *Dicrurus adsimilis*. These data represent the first such measurements for wild birds in the Southern Hemisphere, and revealed an unexpected pattern. Whereas all Northern Hemisphere species investigated to date up-regulated metabolic rate in winter, the opposite was true in these five species, with winter basal metabolic rate as much as 35% lower than summer values.

African Scops-Owl Otus senegalensis *– one of the desert bird species that reduces its metabolic rate in winter. Photo: Phil Hockey.*

Torpor and hibernation in southern African birds

Many birds employ torpor, a physiological state in which body temperature is suppressed far below normal levels, to offset the energetic costs of maintaining a high, constant body temperature. The occurrence of torpor in southern African species remains a strong research focus, and in 2006 Andrew and his students documented torpor in the Freckled Nightjar *Caprimulgus tristigma*. In 2007 and 2008, the focus shifted to a group of birds that has long been somewhat puzzling in terms of torpor use – the owls. Telemetric data for free-ranging African Scops-Owls provided the first evidence for the use of shallow torpor by owls, and revealed that this species reduces body temperature by up to ~ 10°C below active levels shortly after sunrise on cold Kalahari mornings.

During 2008, Andrew McKechnie and Ben Smit investigated these responses in Acacia Pied Barbets *Tricholaema leucomelas* kept in captivity in Pretoria. The barbets showed no signs of entering torpor, but data from two wild-caught individuals in the Kalahari revealed that this species can reduce body temperature by ~ 8°C below active levels. 2009 promises to be an exciting year for this project. Ben Smit will be starting a PhD and has plans for several projects, such as manipulating food availability for wild nightjars to investigate the effects of food availability on torpor patterns.

Climate change and birds in hot deserts

Many of the approaches that ornithologists and other biologists have used to predict the effects of climate change have been based on distribution patterns, for example the range of temperatures included within a species' current range. Ecological and evolutionary physiologists have a vital role to play in predicting climate change impacts, because much of their research focuses on the physiological processes that determine the interactions between birds and their physical environments. As an example of a more mechanistic approach, we are currently developing a model that links water requirements in desert birds to predicted increases in maximum air temperatures. Because many birds living in hot deserts require comparatively large amounts of water to avoid fatal hyperthermia on extremely hot days, increasing maximum temperatures are likely to challenge these birds with more frequent, potentially fatal bottlenecks in water balance. 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. Although there is no published evidence yet that more frequent and/or severe heat waves have adversely affected desert bird populations, large-scale mortality was recently documented in Australian bats during unusually severe heat waves.

Stable isotopes: scaling up nutrient and energy fluxes from individuals to landscapes

This project involves the use of stable isotopes (carbon, nitrogen and hydrogen) to trace and quantify fluxes of nutrients, energy and water between plants and avian consumers in North American and southern African habitats. In North America, we are investigating the role of columnar cacti such as the Saguaro *Carnegiea gigantea* as food and water resources for Sonoran Desert bird communities. In southern Africa, Craig Symes is using similar isotopic approaches to trace nutrient fluxes between flowering aloes *Aloe marlothii* and avian consumers.

The review period saw the start of a project designed to use stable isotope ratios in feathers to reconstruct migration patterns in the critically endangered Blue Swallow *Hirundo atrocaerulea*. One of the most significant obstacles to conserving this species is the lack of knowledge concerning the links between various breeding and wintering populations. During 2008, we analysed feathers from the South African and Zimbabwean swallow populations, as well as feathers from wintering swallows caught at Sango Bay, Uganda. The

feathers of the Ugandan birds matched those of the South African breeding population, strongly suggesting that birds move between these areas. During 2009, we plan to obtain feathers from the Malawian and Tanzanian swallow breeding populations to produce a complete isotopic map for this species. We may also use this technique to address similar questions in the White-winged Flufftail *Sarothrura ayresii*.

Highlights

- An invited review paper on phenotypic adjustments in metabolic rates was published in *Journal of Comparative Physiology B.*
- Andrew McKechnie co-organised the 13th International Hibernation Symposium, and co-authored an edited book containing chapters submitted by conference delegates.
- Andrew McKechnie was awarded an Exceptional Young Achiever Award by the University of Pretoria.
- MSc student Ben Smit submitted his thesis.

Conference presentations

Ben Smit and Andrew McKechnie gave a presentation at the 13th International Hibernation Symposium.

Students

Ben Smit (MSc, Wits, supervisor Andrew McKechnie) *Facultative hypothermic responses and seasonal metabolic adjustments in small owls in an arid environment*.

Craig Symes (PhD, Pretoria, supervisors Andrew McKechnie & Sue Nicolson, graduated 2008) *Avian nectarivory and pollination in* Aloe marlothii *Berger: interactions between bird communities and a winter-flowering succulent*.

Lectures, Workshops and Symposia

Andrew McKechnie presented seminars on his recent work on phenotypic plasticity at the Universities of Pretoria and KwaZulu-Natal, and was invited to give a keynote address at the 2009 meeting of the Zoological Society of Southern Africa.

White-browed Sparrow-weaver Plocepasser mahali*, one of five species for which Ben Smit obtained summer and winter metabolic rate measurements in Molopo Nature Reserve. Photo: Ben Smit.*

The Freckled Nightjar Caprimulgus tristigma *was among the first Southern Hemisphere bird species shown to enter torpor. Photo: Trevor Hardaker.*

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

Rarity and Conservation of African Birds

Programme leader:
Prof. Phil Hockey

Research team:
Prof. Paulette Bloomer (University of Pretoria)
Quentin Hagens (Research Assistant)
Dr Douglas Loewenthal (PFIAO Postdoctoral Fellow)
Dr Lizanne Roxburgh (PFIAO Postdoctoral Fellow)
Dr Rob Simmons (UCT Research Associate)

Overview

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 underlying avian rarity. In most cases, the search has been for the life-history stages at which demographic bottlenecks occur, and identifying the root causes of such bottlenecks.

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 in the tropical Indian Ocean. Our research has also contributed to a marked increase in African Black Oystercatcher numbers after we identified the key, two-week-long demographic bottleneck and promoted conservation strategies to reduce mortality rates during this period. The Institute's considerable expertise in the field of linking life-history studies with remedial action for threatened taxa has been applied in locations as disparate as sub-Antarctic and tropical Islands, grasslands, 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 several highly dispersed and/or rare taxa (e.g. Southern Ground-Hornbill *Bucorvus leadbeateri*, Blue Crane *Anthropoides paradiseus*, Cape Vulture *Gyps coprotheres*, Yellow-breasted Pipit *Anthus chloris* and Yellow-throated Apalis *Apalis flavigularis*).

The global population of African Black Oystercatchers Haematopus moquini *has increased by more than 45% in the last 30 years. Photo: Jessie Walton.*

African Black Oystercatchers

The long-term, ongoing study of the population dynamics of the African Black Oystercatcher *Haematopus moquini* by Phil Hockey and Doug Loewenthal has

involved gathering data throughout the species' breeding range and beyond at nursery areas in central Namibia where juveniles and subadults gather. During 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 has allowed us to model the effects of environmental changes, both natural and human-induced, on territorial behaviour and hence on local carrying capacity.

The African Black Oystercatcher's global population has increased by *ca* 45% over the past 25 years, from an estimated 4800 birds in the early 1980s to 6670 birds today: both the presence of the alien mussel *Mytilus galloprovincialis* and improved protection have benefited the species. Given current trends it may well be possible in the near future to downgrade the species' IUCN status from *Near-threatened* to *Least Concern*. However, despite an increase in the global population, several local populations have experienced decreases in numbers. Most of these are a result of localised emigration from areas which have experienced human-induced habitat degradation, rather than because of unsustainable reproductive rates. Nevertheless, for several unprotected local oystercatcher populations, breeding success is below the minimum required to maintain a stable population (*ca* 0.28 fledglings.pair^{-1}.year^{-1}). Our estimate of the minimum breeding success required to maintain stable numbers rests heavily on our estimates of demographic rates (e.g. post-fledging and adult survival). We now have considerably more colour ring-resighting data than was the case when survival rates were first estimated and we plan to re-evaluate and refine these estimates during the course of 2009. In unprotected areas, uncontrolled dogs killing chicks and the drowning of chicks hiding from humans and their pets appear to be the most significant ways in which human activity impacts breeding success. The species exhibits high levels of both natal philopatry and adult site fidelity, suggesting limited connectivity between sub-populations (a conclusion supported by preliminary genetic analyses). Despite the low potential for large-scale movements, long-term population viability analyses indicate a low risk of population extinction at a global or regional scale, even under unrealistically adverse conditions. Although improved reproductive success is likely to explain the global population increase, local increases in breeding numbers are largely a result of territory shrinkage in response to improved habitat quality, with a resultant influx of previously excluded, sexually mature birds. Our results show that "territory shrinkage" by territorial birds in response to improvements in habitat quality are delayed by as much as six years: this probably reflects slow behavioural adaptation of a typically 'k-selected' species to conditions of (normally) long-term stability in habitat quality. Furthermore, the long-term carrying capacity of breeding oystercatcher populations is determined almost entirely by resource availability, rather than competitor density. The overall number of birds attempting to acquire territories has little influence on territory size and therefore, under conditions where there is no change in habitat quality, potential breeders can only achieve breeder status through occupancy of vacancies that arise when territory holders die.

Based on our ongoing research, however, there is one important caveat to this seemingly 'happy' state of affairs. This stems from an analysis of breeding performance carried out by Megan Laird, Phil Hockey and Mandy Ridley. The aim of this study was to use Mixed Models to determine which factors best explained inter-annual and inter-site variability in breeding performance. The analysis was based on more than 1000 pair-years of data from around the coast spanning almost 20 years. Despite the inclusion of numerous ecological parameters in the models, the two factors identified as best explaining variation in breeding success were predation pressure and average ambient temperature during the breeding season. In the case of the latter, breeding success was inversely related to temperature, i.e. success was lowest in the hottest summers, implying that this species (which is range-restricted and a habitat specialist) may be vulnerable to the effects of climate change. In 2009, in conjunction with SANBI and Durham University, we plan to use our very large oystercatcher database to model spatial population dynamics in response to climate change. A paper outlining the requirements of such a model is currently under review with *Ecography*.

MSc student Justine Braby ringing an adult Damara Tern Sterna balaenarum *on Marmora Pan in Namibia's diamond area. Photo: Megan Murgatroyd.*

Damara Terns

The impacts of diamond mining on the *Near*-threatened Damara Terns *Sterna balaenarum* in Namibia's "forbidden area", the Sperrgebeit, are being investigated by MSc student Justine Braby. This study, co-supervised with Les Underhill of the Animal Demography Unit, was initiated at the request of the diamond mining company Namdeb. Previous research had

suggested a decrease in shorebird numbers as a consequence of diamond mining.

Initial evidence from Justine's study of breeding and foraging success of terns at different localities in the Sperrgebeit suggests that Damara Tern numbers at undisturbed colonies are equal to or larger than numbers recorded in historical surveys. However, those near the Elizabeth Bay mine may be impacted by mining activities. Breeding success in Elizabeth Bay is often lower than at a nearby un-mined 'control' site, and the number of breeding pairs is still decreasing. Justine will upgrade this study to a PhD which will include analysis of the birds' energetics, and assessing numbers and distribution of Damara Terns on their non-breeding grounds in West Africa.

Yellow-throated Apalises

The Yellow-throated Apalis is endemic to high-altitude, Afro-montane forest patches on three mountain massifs in south-eastern Malawi: it is classified by the IUCN as *Endangered*. Its population size is crudely estimated at between 2 500 and 10 000 individuals, scattered over a total range of 510 km^2, but there is much uncertainty in these estimates and the species' demographics are poorly known. In 2008, Tiwonge Mzumara, under Phil Hockey's supervision, undertook a study of habitat selection by this species and made a first empirical assessment of its population size at one of the three massifs – Mount Mulanje (a Biosphere Reserve). Although many of the pockets of Afromontane forest are small and degraded (e.g. by selective logging of endemic cedars, planting of pines and invasion by alien *Rubus* shrubs) the species' conservation seems fairly safe at present. The apalis favours forest fringes, forest patches containing cedars and disturbed/open areas within forests. It also appears highly tolerant of invasion by *Rubus*, although pine-invaded areas are avoided as are areas recently cleared of pines where there is no upper canopy. In sites where the species does occur, lowest densities are found in areas lacking both cedars and *Rubus*. Considering only Afromontane forest patches containing cedars, the population of Yellow-throated Apalises on Mount Mulanje alone is estimated at a minimum of 10 150 birds, more than the maximum global population estimated by the IUCN (in 2008). Because of the birds' tolerance of disturbed habitats and a population size greater than previously thought, our preliminary results suggest there may be a case for changing its conservation status from *Endangered* to *Vulnerable*.

Chaplin's Barbets

The main objectives of Lizanne Roxburgh's postdoctoral research are to identify the factors limiting the distribution of Chaplin's (Zambian) Barbet *Lybius chaplini*, a threatened barbet endemic to a limited range within Zambia, and to determine whether habitat transformation threatens this species. Surveys show that not only have Chaplin's Barbets disappeared from parts of their range, but (unlike Yellow-throated Apalises) their total population size has been over-estimated. Clearing of land for agriculture and urban development have reduced the extent of suitable habitat for the birds, while the removal of dead branches from Sycamore Figs *Ficus sycamorus*, which are used as nesting and roosting sites, is leading to degradation of the remaining habitat. Hunting with bird lime and catapults is also widespread, and probably contributes to population decreases in areas adjacent to villages and towns. These surveys complement Lizanne's ongoing research on the ecology and cooperative breeding of barbets in the Nkanga River Conservation Area in Choma. Based on Lizanne's findings, Chaplin's Barbet was upgraded from *Near-threatened* to *Vulnerable* in the 2008 IUCN Red List.

The Blue Crane Anthropoides paradiseus *is thriving in much of the Western Cape, although power line collisions are an issue. However the species is hanging on by a fingernail in Namibia. Photo: Peter Ryan.*

Blue Cranes

The Blue Crane is the world's most range-restricted crane. It occurs mainly in South Africa, with an isolated breeding population in Namibia's Etosha National Park and the grasslands to the north, over 1 000 km north of the most northerly South African birds. These birds pose a conservation and genetic puzzle. From a conservation point of view they are listed as *Critically Endangered* in the Namibian Red Data Book, as the population of 60-70 birds appears to be decreasing. Based on preliminary test results, they can be distinguished genetically from South African cranes. This begs the question: how can they persist in Etosha with apparently very little intermixing with South African birds? The second question is, what is special about these grasslands (where, despite the absence of natural predators, no young have ever been recorded) and how do birds survive in Etosha (which is predator-rich and where they do breed successfully)? Former MSc student Hannah Thomas found that the cranes in the grasslands to the north of Etosha flee from humans at approach distances of more than 500 m: we suspect that local herdsmen in these grasslands may be limiting the population by hunting them with rifles.

There are two additional questions that we are trying to answer: how and when do the birds move around in the landscape (especially in and out of Etosha), and are there any undiscovered populations (i.e. is the Namibian population larger than we think, which may explain its persistence)? The Namibian Crane working group that includes Rob Simmons,

Ann and Mike Scott and Chris Brown is looking to solve the mystery of the birds' movements using satellite tracking. Aerial surveys have found few birds in the northern grasslands and no sign of them elsewhere. Future surveys will continue to look for these birds in northern Ovamboland and even southern Angola.

Closer to Cape Town, CB student Jessica Shaw examined the impacts of power-line collisions on Blue Cranes and other large birds in the Overberg. Her primary goal was to ground truth a simple model developed by a Stellenbosch University student to identify high-risk areas of power line so that these could be prioritised for mitigation by Eskom. Sadly, the model failed to predict the areas where most collisions occur, but Jessica was able to confirm that Blue Cranes are highly vulnerable to power-line collisions in this region.

A Blue Crane Anthropoides paradiseus *carcass under a power line with defective markers designed to reduce bird collisions with the wires. Photo: Jessica Shaw.*

Southern Ground-Hornbills

The Institute's study of Southern Ground-Hornbill breeding biology and social behaviour started in 2001 and is based at a consortium of private game reserves totalling *ca* 180 000ha bordering the Kruger National Park. The field work is currently being undertaken by Quentin Hagens, under Phil Hockey's supervision. Within the study area there are 30 ground-hornbill groups, totalling 112 birds. The average group size (3.73 birds) is the same as elsewhere in South Africa. Group density (1 group/6 000 ha) is higher than the national average (1 group/10 000 ha), but lower than the highest density recorded in southern Africa (1 group/2 000 ha at Mana Pools, Zimbabwe). Forty-two birds (37.5%) now carry unique colour-ring combinations, allowing us to identify 14 groups with certainty. An additional three birds carry radio transmitters. Breeding performance of 23 groups has been monitored over a total of 178 group-years. Despite the fact that eight groups have produced no young since the study started, overall the 23 groups have made 53 breeding attempts and raised 36 young (a 68% success rate). This translates to an average of 1 chick/group/4.9 years. This is much higher than the 1 chick/group/9.3 years that ground-hornbills achieve in Kruger National Park. Seven groups (30.4%) have produced three or more chicks, and collectively have accounted for 69.4% of all chicks produced: one of our study groups has managed to rear five young in seven breeding seasons! Part of the reason for the high breeding success may be the deployment of substantial numbers of artificial nest logs at the study site. To date, 69% of breeding attempts have been in these artificial nests. The high breeding success is also reflected in group demographics - at least 15 groups currently include juvenile and/or sub-adult birds. The habitat at the study site, mostly dense, bushy savannah, makes it difficult to follow birds on the ground (with lions, elephants and rhinos offering additional distractions!). For this reason, in early 2009 we plan to deploy solar-powered GPS transmitters on at least five birds, belonging to groups varying in their reproductive performance, to explore daily and seasonal patterns of habitat use (which may explain the sizes of group home ranges) and roosting behaviour. This should provide important insights into why some groups reproduce so much more successfully than others. However, we shall only do so once we are confident that problems previously experienced with the harness attachment of transmitters will not recur.

Artificial nest-boxes have contributed to improved breeding success of Southern Ground-Hornbills Bucorvus leadbeateri *in our study site adjacent to Kruger National Park. Photo: Quentin Hagens.*

Multi-species studies

In addition to single-species studies of threatened taxa, we have undertaken several multi-species studies with the aim of identifying existing threat or predicting future threat. Phil Hockey and Odette Curtis developed a simple model that appears robust in predicting the threat status of vertebrates, using birds and lemurs as examples: this study was published in *Conservation Biology* in 2008. 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 than by life-history traits (this was also published in *Conservation Biology* in 2008).

Marisa Lipsey and Phil Hockey investigated whether grassland corridors in commercial forestry plantations in KwaZulu-Natal do indeed fulfil their intended conservation aims. Results clearly indicate that they do not. This study (currently under revision for *Biological Conservation*) will allow us to make recommendations as to how conservation areas should be set aside in forestry areas in order to satisfy international conservation requirements attending the export of forestry products.

Staying with the theme of grassland bird conservation, Ian Little, supervised by Phil Hockey and John Donaldson (SANBI), started a study in late 2007 of the reproductive success of ground-nesting birds in the highland grasslands of Mpumalanga. This study is comparing reproductive output across sites that vary in their management, specifically fire frequency and grazing pressure. It rests on the premise that reproductive success is a better measure of conservation status and value than is simple occurrence or density. This study has progressed well, with more than 360 breeding attempts having been monitored to date in a range of land-use types ranging from a fully protected nature reserve across the spectrum to communal grazing lands. The study also involves monthly bird-count transects and almost 100 000 invertebrate samples per season. Vegetation structure is also quantified on a monthly basis (>100 000 samples/season!). Interestingly, lowest breeding success to date has been in a nature reserve where indigenous herbivores are fenced, but at high density.

Highlights

- Securing a substantial grant from the Hans Hoheisen Charitable Trust to support satellite tracking of ground-hornbills.
- Provision of artificial nest boxes at the ground-hornbill study site has seemingly resulted in the birds achieving approximately double the reproductive success they enjoy in Kruger National Park. In the light of the species' rapidly deteriorating conservation status in South Africa, this is good news indeed.
- Publication of two papers in the leading international journal *Conservation Biology*.
- Fitztitute research identified Chaplin's Barbet as requiring upgrading to higher risk status in the IUCN Red List: this has been done. On a more positive note, it seems as though we may also be able to recommend the down-grading of the Yellow-throated Apalis.
- Justine Braby visited Nigeria in 2008 and located a colour-ringed Damara Tern that her mother had ringed in Swakopmund, Namibia. The same bird was caught again back in Swakopmund after it – and Justine – returned to Namibia!

Students

Ian Little (PhD, supervisors Phil Hockey & John Donaldson [SANBI]) *Understanding and mitigating the impacts of land-use management strategies on grassland bird communities.*

Justine Braby (MSc, supervisors Les Underhill [ADU] and Rob Simmons) *The influence of mining disturbance on the breeding productivity and population dynamics of the Damara Tern* Sterna balaenarum: *causative factors and rehabilitation measures*.

Marisa Lipsey (CB MSc, supervisor Phil Hockey; graduated June 2008) *Assessing the value of grassland networks in commercial forests for the conservation of grassland birds.*

Nicola Okes (CB MSc, supervisors Phil Hockey, David Grémillet, Lorien Pichegru; graduated June 2008) *Fish and fisheries in the southern Benguela: is a management paradigm shift needed to conserve fish-eating birds?*

Tiwonge Mzumara (CB MSc, supervisor Phil Hockey) *Status and prospects of the* Endangered *Yellow-throated Apalis at Mount Mulanje, Malawi.*

Jessica Shaw (CB MSc, supervisor Andrew Jenkins & Peter Ryan) *The end of the line for South Africa's national bird? Modelling power line collision risk for the Blue Crane.*

Lectures

Phil Hockey gave public talks to Readers of *Africa Geographic* (Johannesburg and Durban), the Stanford Bird Club and the Honorary Rangers at the West Coast National Park. He also gave invited lectures to UCT's Centre for Open Learning and to Zoology/Conservation students at Stellenbosch University, as well as interviews for Cape Talk Radio and Bush Radio. Doug Loewenthal gave talks to the Friends of the South African Museum, the Environmental Action Groups of Kommetjie and Noordhoek, the Conservancies of Blombos, Betty's Bay and Grotto Bay, Table Mountain National Park Staff, Cape Nature Conservation, The Lakes, Helderberg and Tygerberg Bird Clubs, and to children from several Cape Flats schools.

Acknowledgements

Dow Chemicals, the Association of Private Nature Reserves, the Hans Hoheisen Charitable Trust, The Polaris Foundation, Senalala Game Lodge, South African National Parks, CNRS. The Wildlife & Energy Interaction Group of the Endangered Wildlife Trust for their support of Jessica Shaw's project. For their support of Tiwonge Mzumara: the Tropical Biology Association, The Graça Machel Scholarship Fund, The Forestry Department of Mulanje Mountain Forest Reserve, the Mount Mulanje Conservation Trust and the Mountain Club of Malawi.

Assoc. Prof. Peter Ryan *is on the Editorial Board of* Bird Conservation International*, and editorial assistant for* Antarctic Science*. He 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 as well as a member of the Tristan Biodiversity Advisory Group.*

Peter is the academic co-ordinator of the Conservation Biology MSc course. He supervised four PhD and two MSc students, with two PhD and one MSc student completing their theses in the review period. Publications in 2008 include one popular book, 14 scientific papers, one book chapter and nine popular articles. He gave a keynote address at the Pan-African Ornithological Congress, was invited to give the Fourth Duerden Lecture at Rhodes University and gave several talks to bird clubs and other special interest groups. In addition to his editorial duties for Bird Conservation International*, Peter reviewed 12 manuscripts for seven 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
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, England)
Dr Geoff Hilton (Royal Society for the Protection of Birds, England)

Overview
Oceanic islands – those that have never been connected to a continental landmass – are among the most sensitive of terrestrial ecosystems. Large surrounding stretches of open sea prevent many elements typical of continental biotas from colonising these islands. The few terrestrial species that do 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 taxa. 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.

Former Fitztitute PhD student, Samantha Petersen pauses on the way up McCall Kop during the 2008 summer survey of Prince Edward Island. The expedition camp is in the background. Photo: Peter Ryan.

Impacts and eradication of House Mice
Funds were obtained from the UK Overseas Territories Environment Programme to once again have a research team on Gough Island for a full year from September 2008 to September 2009. This will greatly advance preparations towards the planned eradication attempt for House Mouse *Mus musculus* on the island. Henk Louw and Paul Visser, fresh from a year on Marion Island, were recruited to conduct the field

Procumbent Pearlwort Sagina procumbens *carpets the red scoria between* Azorella *cushions on the west coast of Prince Edward Island. This invasive plant has spread enormously since the 2001 survey. Photo: Peter Ryan.*

work. In addition to extensive bait trials (to ensure 100% uptake by mice, lethal dose levels of toxic bait, etc.), they are also continuing efforts to remove the invasive plant Procumbent Pearlwort *Sagina procumbens* from the area around the base, and are conducting routine monitoring of threatened seabird populations. Breeding success of Tristan Albatrosses *Diomedea dabbenena*, recently upgraded to *Critically Endangered*, was the lowest yet recorded. Funds have been secured to continue this fieldwork until September 2010, by which time it is hoped that a formal eradication exercise will be underway.

Monitoring and eradicating other invasive species

Attempts to eradicate the invasive *Sagina procumbens* from Gough Island stepped up a gear in 2008, with a more aggressive regime being applied in an attempt to remove remaining seed stores. This will be continued into 2009. Approval was obtained for a research programme on *Nesospiza* buntings on Inaccessible Island in the Tristan group from 2009, and this will also allow follow-up on the removal of New Zealand Flax *Phormium tenax* from the island's summit (which was not checked in 2007). Eradication effort will also continue for other localised introduced plants on the island. Following Niek Gremmen's four-month stay on Tristan during summer 2007/2008, Peter is assisting Niek with a report summarising the status of alien plants at the islands. This will be updated in 2009 when a third alien survey will take place, following those conducted in 1989 and 1999. During the summer survey of Prince Edward Island in December 2008, Peter also assisted Justine Shaw and Steven Chown from Stellenbosch University to map the spread of the three alien plants on Prince Edward Island. Not surprisingly, the most recently arrived species showed the fastest rate of spread, with *Sagina procumbens* now found virtually all round the island.

Highlights

- Ross Wanless was awarded best thesis in the Faculty of Science at UCT in 2007 and was appointed Seabird Conservation Officer for BirdLife South Africa. He was placed third in the UNEP/CMS Thesis Award for theses dealing with the conservation of migratory species.

Lectures, Workshops and Symposia

Peter Ryan included aspects arising from this programme in the fourth Duerden Lecture at Rhodes University in May and in a keynote address to the Pan-African Ornithological Congress held at Goudini in September.

Visitors

Richard Cuthbert, RSPB, visited the Fitztitute in August to join the annual relief voyage to Gough Island.

Acknowledgements

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. We are 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 the programme on* ***Island Conservation*** *and, together with* ***Prof. Tim Crowe****, leads the* ***Systematics & Biogeography Research Programme****.*

Seabird Research

Programme leader
Assoc. Prof. Peter Ryan

Research team
Dr Christophe Barbraud (CNRS, Chize, France)
Dr Francesco Bonadonna (CNRS, Strasbourg, France)
Dr Yves Cherel (CNRS, Chize, France)
Dr Sarah Converse (USGS Patuxent Wildlife Research Center, USA)
John Cooper (Animal Demography Unit, UCT)
Dr Rob Crawford (Marine and Coastal Management)
Dr Richard Cuthbert (Royal Society for the Protection of Birds, England)
Dr Marienne de Villiers (Animal Demography Unit, UCT)
Dr David Grémillet (CNRS, Montpellier, France)
Dr Geoff Hilton (Royal Society for the Protection of Birds, England)
Dr Akiko Kato (National Institute of Polar Research, Japan)
Dr Samantha Petersen (WWF-SA Responsible Fisheries Programme)
Dr Richard Phillips (British Antarctic Survey, Cambridge, England)
Dr Lorien Pichegru (PFIAO Postdoctoral Fellow)
Dr Yan Ropert-Coudert (CNRS, Strasbourg, France)
Dr Mareile Techow (PFIAO Postdoctoral Fellow)
Dr David Thompson (NIWA, Wellington, New Zealand)
Prof. Les Underhill (Animal Demography Unit, UCT)
Dr Ross Wanless (BirdLife South Africa)
Barry Watkins (BirdLife South Africa)
Prof. Rory Wilson (University of Swansea, Wales)

Overview
As a group, seabirds are among the most threatened birds in the world, with almost one 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.

Albatross demography and individual variation in reproductive success
Annual monitoring of selected surface-nesting seabirds continued at Marion and Gough Islands, and was boosted by a summer survey of breeding populations at Prince Edward Island in December 2008. This was the second summer survey of Prince Edward, following an initial visit in December 2001. Overall, there were no major changes in seabird populations, but better coverage resulted in larger population estimates for some species, notably Sooty Albatross *Phoebetria fusca*.

Zach Vincent completed his MSc on the demography of Wandering Albatrosses *Diomedea exulans* at Marion Island. His use of the latest multi-state maximum likelihood models to estimate demographic parameters, under the patient tutelage of Hal Caswell and Christine Hunter at Woods Hole Oceanographic Institute, garnered positive responses from his examiners, but a problem with one parameter needs to be resolved before the work can be published. Sarah Converse (USGS Patuxent) continues to analyse the demography of Atlantic Yellow-nosed Albatrosses *Thalassarche chlororhynchos* breeding at Gough Island, and Christophe Barbraud (CNRS, France) has offered to assess the role of climate change and fisheries on the

demography of Wandering Albatrosses at Marion island in a joint analysis with the French data set from the Crozet Islands.

A study of individual variation in reproductive success among albatrosses commenced in 2006, taking advantage of the colonies of marked birds set up by John Cooper in the 1980s. 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 lifetime reproductive success. One more year of fieldwork is planned at Marion Island, including both correlative and experimental approaches to tease apart the factors responsible for why some birds/pairs are consistently better at raising chicks than are others. Genevieve Jones, the PhD student heading up the project, returned to Marion Island for her third year on the island in April 2008. As a key part of this project, post-doc Mareile Techow has been using genetic 'finger-printing' to assess the level of extra-pair paternity among Wandering and Grey-headed Albatrosses *Thalassarche chrysostoma*. She is also determining the sex of chicks so that we can tell whether this influences parental investment. Ongoing genetic analysis will determine the feasibility of using MHC markers to study diversity and mate choice in Wandering Albatrosses.

A Grey-headed Albatross Thalassarche chrysostoma *fledgling on Marion Island. Photo: Viviane Barquete.*

Foraging ecology of Cape Gannets, African Penguins and Cape Cormorants

This year was the seventh consecutive year of monitoring the at-sea behaviour of Cape Gannets *Morus capensis* from the Malgas Island colony. This long-term data set helps us to understand the response of these birds to shifts in the distribution and abundance of their prey - sardines and anchovies. During this period, prey abundance off the west coast has fallen dramatically, linked to an eastward shift of pelagic fish onto the Agulhas Bank. With most of their traditional prey beyond their foraging range, the Malgas gannets have switched to feed almost exclusively on discards from the hake trawl fishery. Gannet chicks grow more slowly and have reduced survival on this poor-quality diet, and the colony continues to decrease in size. By comparison, the colony on Bird Island, Algoa Bay, is increasing in size, apparently benefiting from the south-eastward shift in the distribution of sardines. The foraging behaviour of gannets breeding at this site will be monitored in early 2009, following up field work conducted in 2005-06.

An African Penguin Spheniscus demersus *with a GPS and dive logger attends its chick on Bird Island. Photo: Lorien Pichegru.*

Breeding populations of African Penguins *Spheniscus demersus* off South Africa also have fallen sharply since 2004. Rob Crawford (MCM) has spearheaded the closure to purse-seine fishing of an area within 20 km around Dassen and St Croix Islands. Lorien Pichegru was appointed as a post-doctoral fellow in April to assess the effects of this intervention on penguin foraging and breeding performance in Algoa Bay. She is comparing birds at St Croix with those at nearby Bird Island. Data on at-sea behaviour, diet, chick growth and breeding success are being collected on both islands, both before and after closure of the fishery. Deployment of GPS loggers on breeding penguins from St Croix showed the largest foraging range for African Penguins, with most of the birds foraging more than 40 km from the island. It will be fascinating to see if this changes once a 20 km no-fishing area is established around St Croix.

The Cape Cormorant *Phalacrocorax capensis* is the third major seabird predator of pelagic fish in the Benguela Upwelling Region, but to date little attention has been paid to direct measurement of its foraging behaviour. MSc CB student Maike Hamann, in collaboration with David Grémillet, Francesco Bonadonna and Lorien Pichegru, deployed GPS loggers and Time-Depth Recorders on birds from three colonies at Malgas, Dassen and Dyer Islands. Most birds remained within 20 km of their colonies, although some birds from Malgas Island travelled more than 60 km while provisioning small chicks.

Foraging ranges of albatrosses

Frances Taylor has been recruited to work on this project. This is excellent news, given her close association with BirdLife International's Seabird Tracking Programme for the last five years. She will work on existing data on the post-breeding dispersal of Wandering Albatrosses from Marion Island, as well as with new data gathered in the last two years from birds with

known breeding histories. She will also visit Rory Wilson's lab in Swansea to learn how to work with the extremely detailed data collected by his 'daily diary' loggers. She will also visit Marion Island in April-May 2009 to deploy GPS loggers in conjunction with daily-diary loggers to ground truth the dead-reckoning tracking measured by the daily diaries. Ultimately, it is planned that Frances will work with Henri Weimerskirch (CNRS, Chize) to analyse the spatial habitat use of Wandering Albatrosses from the adjacent populations on the Prince Edward and Crozet Islands, which together support more than half the world's population of this species. Richard Phillips (BAS, Cambridge) is currently writing up the comparison of post-breeding dispersal in Grey-headed Albatrosses, which show intriguing differences between birds from South Georgia and Marion Island.

Fitztitute researchers Lisa Nupen and Dr Lorien Pichegru hydrate an oiled Cape Gannet Morus capensis *on Bird Island, Algoa Bay. Photo: Lloyd Edwards.*

Incidental mortality of seabirds

Samantha Petersen completed her PhD on the impacts of a suite of long-line fisheries on seabirds, turtles and sharks, and was awarded first prize in the UNEP/CMS Thesis Award for Conserving Migratory Species at a ceremony in Rome in December. Barry Watkins left BirdLife International's 'Albatross Task Force' team in October, but was replaced at BirdLife by recent Fitz PhD graduate Ross Wanless. This programme continues to monitor bycatch of seabirds killed in both long-line and trawl fisheries, and is working closely with the fisheries to ensure effective implementation of mitigation measures. The cap placed on individual vessels in the pelagic long-line fishery from January 2008 proved highly effective in reducing the numbers of albatrosses and petrels killed. Unfortunately, this measure was dropped from permit regulations again in 2009, despite vocal opposition from conservation NGOs; it remains to be seen whether mortality increases again. In the trawl fishery, honours student Alwyn Lubbe showed that macerating discards, coupled with mandatory use of bird-scaring lines, reduces the numbers of birds dragged under by warps. Fishery observers and compliance officials continue to be trained.

Other studies

PhD student Marta de Ponte is completing her study on the impacts of Great White Pelicans *Pelecanus onocrotalus* on breeding seabirds. Shannon Hampton was awarded an MSc for her study of the impacts of flipper bands on African Penguins. She continues to monitor the differential survival of banded and unbanded birds at Robben Island, and has recently secured funds from BirdLife to upgrade the automated recording station on the island. Greg Cunningham published his paper suggesting that African Penguins use the scent of dimethyl sulphide, a pungent compound released by phytoplankton, to help locate their prey in the *Journal of Experimental Biology*.

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. In 2008, he published a paper in *Marine Pollution Bulletin* on long-term changes in the composition of ingested plastic in seabirds and wrote a review paper on monitoring plastics in the environment (including the use of birds as monitors of plastics at sea) for a special issue on plastics in the environment for the *Transactions of the Royal Society, London.* He was invited to attend a workshop on marine debris in Tacoma, Washington, USA in September, but this clashed with the Pan-African Ornithological Congress.

Highlights

- During 2008, two PhD (Samantha Petersen and Lorien Pichegru) and two MSc students (Shannon Hampton and Zach Vincent) graduated from this programme.
- Ross Wanless was awarded best thesis in the Faculty of Science at UCT in 2007 and was appointed Seabird Conservation Officer for BirdLife South Africa.
- Samantha Petersen won the UNEP/CMS Thesis Award for the best thesis dealing with the conservation of migratory species; Ross Wanless was placed third.
- A paper describing seabird mortality in the deep-water hake trawl fishery was selected as the feature paper in the August 2008 edition of *Animal Conservation*.
- Nine papers were published as well as one book chapter, four semi-popular articles and a poster on seabird conservation that was circulated with *Africa: Birds & Birding*.
- The imposition of a cap on individual vessel catches of seabirds greatly reduced the numbers of seabirds killed by the pelagic long-line fishery off South Africa.
- Trials with macerating discards proved effective in reducing warp strikes in the South African deep water hake fishery.
- The foraging range of breeding Cape Cormorants was recorded for the first time, with data gathered from three colonies.
- Funding was obtained from BirdLife International for tracking Indian Yellow-nosed, Sooty and Light-mantled Albatrosses as well as three petrel species.

Students

Viviane Barquete (PhD, supervisor Peter Ryan) *Using stable*

isotopes as a tool to understand the trophic relationships of seabirds off southern Africa.

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

Genevieve Jones (PhD, supervisor Peter Ryan) *Individual variation in albatross reproductive success: Wandering and Grey-headed Albatrosses at Marion Island.*

Shannon Hampton (MSc, supervisors Peter Ryan and Les Underhill, graduated 2008) *The impacts of flipper bands on African Penguins.*

Zach Vincent (MSc, supervisor Peter Ryan, graduated 2008) *Demography and individual variation in reproductive performance of Wandering Albatrosses at Marion Island.*

Maike Hamann (CB MSc, supervisors David Grémillet, Lorien Pichegru & Peter Ryan) *Foraging ecology of breeding Cape Cormorants.*

Alwyn Lubbe (BSc Hons, supervisor Peter Ryan, graduated 2008) *Mincing fish waste as a strategy to reduce seabird mortality in the South African deep-water hake fishery.*

Lectures, Workshops and Symposia

Peter Ryan was invited to give the fourth Duerden Lecture at Rhodes University in May. Mareile Techow presented two posters at the International Congress of Genetics in Berlin in July. Peter Ryan, Samantha Petersen, Ross Wanless and Barry Watkins presented papers at the Fourth International Albatross and Petrel Conference held in Cape Town in August. Viviane Barquete, Genevieve Jones, Mareile Techow (2), Zach Vincent and Ross Wanless presented posters at the same meeting. Peter Ryan was the sole South African keynote speaker at the Pan-African Ornithological Congress held at Goudini in September, talking about seabird conservation. Lorien Pichegru also gave a talk at the same meeting, as well as seminars at the CNRS in Montpellier and the Zoology Department, UCT. Marta de Ponte presented a poster at the Pan-African Ornithological Congress. Both the BirdLife Seabird team and WWF's Responsible Fisheries Programme give regular lectures on seabird conservation to the public, and run training courses for skippers of fishing vessels, fishery observers and enforcement officials.

Visits and visitors

Cape Town was the host city for the Fourth International Albatross and Petrel Conference in August, with the Meeting of Parties of the Agreement for the Conservation of Albatrosses and Petrels (ACAP) following immediately thereafter in Hermanus and Somerset West. This brought a large number of the world's top seabird biologists to the Cape, and was an excellent opportunity to network. Peter Ryan attended a workshop hosted by WWF-SA in early August to promote closer collaboration between South African and French workers at the adjacent sub-Antarctic island groups of the Prince Edwards (SA) and Crozets (France). Richard Cuthbert (RSPB, UK) once again visited in Aug-Oct to accompany the seabird monitoring team to Gough Island. David Grémillet (CNRS, France) visited Cape Town again in Oct-Nov to initiate a programme tracking the foraging range of breeding Cape Cormorants, and was followed by a visit from Francesco Bonadonna (CNRS, France) who continued working on this project with Lorien Pichegru and Maike Hamann.

CB Msc student Maike Hamann checking seabird colony attendance on Malgas Island. Photo: Peter Ryan.

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, assisted in part through grants from the UK Overseas Territory Environment Programme. 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. 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. Colleagues both at UCT and in the field are thanked for their assistance. SANParks and Cape Nature Conservation kindly granted permits to work on guano islands off South Africa, and often assisted with transport, accommodation and occasional assistance in the field. Raggycharters Whale Watching also offered free transport onto the islands in Nelson Mandela Bay. This programme is a truly a collaborative effort.

Dr Andrew Jenkins
is a Research Associate of UCT and heads the Raptor Research Programme with long-term studies of Peregrine Falcons and Black Harriers. He has co-supervised several students and invests much time in interpreting research results for the lay public. Recently he has assessed bird-power line interactions as a research co-ordinator with the Wildlife & Energy Interaction Group of the Endangered Wildlife Trust.

Dr Rob Simmons
is a Research Associate of UCT, co-founder of the Fitztitute's Climate Change Programme and co-leader of its 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 reviews manuscripts for many journals, was NRF rated in 2006 and funded in 2007. During the review period, Rob supervised a CB MSc student, co-supervised a masters-by-dissertation student, continued a BIOTA transect study of climate change in Namibia, and added to the 9-year Black Harrier data set. He co-authored two papers, contributed six semi-popular articles and still hopes the Namibian Red Data book, of which he is senior author, will be published in 2009.

Raptor Research

Program leaders
Dr Andrew Jenkins
Dr Rob Simmons

Research team
David Allan (Durban Museum)
Mark Anderson (Executive Director, Birdlife South Africa)
Dr Pat Benson (Wits University)
Andre Botha, Adri Barkhuysen (Birds of Prey Working Group, EWT)
Odette Curtis (Overberg Conservancy Programme)
Ann Koeslag (resident Tokai, seconded to the research team)
Leo Legra (MSc student, University of Papua New Guinea)
Zanne Macdonald, Lucia Rodrigues and Colleen Rust (amateur naturalists, seconded to the research team)
Anthony van Zyl (PFIAO affiliate)
Anne Williams (naturalist E Cape, seconded to the research team)
Adam Welz (MSc student, Botany Dept, UCT)

One of the 'red buzzards' Buteo *sp. breeding near Elgin: the identity of these birds remains a mystery. Photo: Jessie Walton.*

Overview
There are two core foci within the Raptors Research Programme. The first is the monitoring of populations of rare species (e.g. Taita Falcon *Falco fasciinucha*) or those of conservation concern (e.g. Black Harrier *Circus maurus* and Cape Vulture *Gyps coprotheres*) to provide up-to-date information for effective management decisions. In these cases we liaise closely with regional and national conservation organizations to facilitate the transfer of results. The second aim is to provide research results for species or populations that provide long-term data on population ecology and dynamics (Peregrine Falcon *Falco peregrinus* and Black Sparrowhawk *Accipiter melanoleucus*), the effects of pesticides (e.g. African Fish-Eagle *Haliaeetus vocifer*), responses to climate and other systemic environmental changes (peregrines, sparrowhawks and vultures) or migratory species whose world populations visit the subregion (kestrels). A recent new direction has been to consider the effects of climate change on some of these species, particularly because raptors are good indicators of biodiversity, and are sensitive to changing food levels in the environment and to changing weather patterns. So for example, why peregrines are getting smaller, why migratory kestrels are arriving later in southern Africa, and how Papuan Harriers *Circus spilothorax* can avoid annual grass fires have become key questions. The arrival of new breeding species in South Africa is a rare occurrence, so the appearance of mystery "Red Buzzards" breeding in the Western Cape has caused

quite a stir, not least because their identity remains unresolved! A new programme focussed on these birds in 2008 and will continue into 2009.

Small hands are needed for those delicate knots: Black Harriers Circus maurus *are among the first raptor species to be satellite tagged in Africa. Photo: Cat Simmons.*

Black Harrier conservation

The Black Harrier is among southern Africa's rarest endemic species, with the global population numbering less than 2000 birds. Found in arid grasslands and fynbos, this species is globally *Vulnerable*. The present study, in its ninth year, investigates the breeding ecology and resources required by Black Harriers, with a view to improving management strategies to meet their conservation needs. 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 147 nests sites and over 300 nesting attempts indicate that in the Northern and Western Cape Provinces (i) clutches are smaller and fledging success lower in inland sites (mountains and Overberg habitats) relative to coastal areas where prey (mice) are more numerous; (ii) breeding in the Northern and Eastern Cape Provinces is sporadic, occurring in approximately two out of every three years; (iii) polygyny occurs at a low level only in the mountains; and (iv) Reversed Size Dimorphism (females larger than males) levels are high, as predicted.

(2) An investigation of the use of remnant patches of the Cape Floral Kingdom's most threatened habitat, renosterveld. Following on from Odette Curtis's MSc finding that Black Harriers only breed in renosterveld patches larger than 100 ha and that radio-tracked males foraged exclusively within natural habitat, we asked – are Black Harriers indicators of greater biodiversity value in the patches in which they breed? Julia Jenkins' CB MSc found some support for this and a paper on the topic is in review.

(3) A new and exciting development is the addition of satellite-tagging technology to follow birds through a breeding season and then determine where they spend the winter (predicted to be in Namibia or Botswana). We hope to examine possible links between this migratory behaviour and the low population size of this species. Tagging began in 2008 with two birds carrying tiny solar-powered satellite transmitters weighing a mere 9.5 g each. Funds and collaboration were forged with Hawk Mountain (USA), and Natural Research (UK).

Cape Vulture conservation in South Africa and Namibia

Following a CB MSc project by Pippa Schultz, which combined satellite-tracking technology and experimentation to determine if foraging by Cape Vultures are negatively affected by bush encroachment in Namibia (probably yes), a second CB MSc project was initiated to assess how climate change is influencing birds. Jamshed Chaudhry assessed behavioural changes in relation to solar radiation in different colonies and this work is reported on under Climate Change.

Mystery "Red" buzzards breeding in the Western Cape

Over the past few years there have been reports of buzzards breeding in the Western Cape that do not conform to the standard Forest Buzzard *Buteo trizonatus* phenotype which breeds in our forests. These buzzards are either red or very dark brown in appearance and reports from Elgin suggest that they are replacing the typical Forest Buzzards in some areas. This raises the question of whether these new Red buzzards are driving the Forest Buzzards out, or hybridizing with them. More intriguing was the discovery by Andrew Jenkins of dark buzzards breeding successfully on rocky cliffs on Table Mountain, behaviour unheard of in Forest Buzzards. To determine why, Ann Koeslag and others sampled blood from chicks from active nests in 2007 and tissue from two others was collected for DNA analysis. Adult birds are particularly difficult to trap and Ann has been working on various ways of doing so to gain further DNA samples. She was able to confirm however, a typical Forest Buzzard male paired with a deep red buzzard in 2008. This project will undertake genetic analysis of the blood samples and an MSc/PhD student will be assigned to find and capture as many "Red" and Forest Buzzards as possible. Behaviour, morphology and DNA will be compared between these "Red Buzzards" and all other buzzards in southern Africa to determine their identity, phylogeny and geographic origin.

Papuan Harriers – the world's most elusive raptor?

To complete the phylogenetic tree of the genus *Circus* (the harriers), samples from two of the world's 16 species were still required. Unable to secure either museum specimens or recent tissue from researchers or museums in their countries of origin, Rob visited the tropical island of Papua New Guinea in 2007 to hunt down the world's most elusive harrier. In that 3-week trip funded by Natural Research, Hawk Mountain and University of Heidelberg, two of the first nests ever found were located and photographed. A paper giving the first estimate of the small population size of this island endemic was accepted and co-authored with local ornithologist Leo Legra. One of the main findings was the high frequency of fire in the island which is

both a blessing and curse to for these uncommon harriers – on the one hand it opens up forest to provide suitable grassland for nesting and foraging, but on the other the timing of fires (most occur as the dry season begins) destroys nests with eggs and chicks. Both nests we discovered were destroyed in this manner. DNA samples unfortunately still languish in Goroka as export permits still have not been issued 18 months after specimens were collected. When these are analysed we will learn where this large harrier fits into the harrier phylogeny. Once DNA recently secured from the Pied Harrier *Circus melanoleucos* of Mongolia is sampled, the entire *Circus* family tree will be complete.

Breede River Fish-Eagle Project – looking for chemical connections

Research on the value of African Fish-Eagles as indicators of chemical pollution of freshwater systems continued this year, under the auspices of the Birds of Prey Working Group, Endangered Wildlife Trust, the practical management of Adam Welz, and with significant input from Bill Bowerman of Clemson University, Michigan, USA and his colleagues in US Fish & Wildlife. The eagles on the Breede experienced a relatively poor breeding season, with heavy spring rain resulting in extensive flooding along the length of the catchment. Conditions also prevented sampling at several nests which were rendered inaccessible by the floodwaters. However, blood samples were obtained from nestlings at a reasonable number of sites on the river, and more broadly across the Western Cape Province. These have been added to the growing body of material from this study. A sister study of fish-eagles breeding along the Vaal River has been conducted by Mark Anderson (N. Cape Nature Conservation, now BirdLife SA), and these samples are awaiting analysis in the USA.

A colour-ringed female Peregrine Falcon Falco peregrinus *and her clutch of four eggs in a nest box on a building in urban Cape Town. Photo: Andrew Jenkins.*

In for the long haul – monitoring and marking raptors on the Cape Peninsula

Long-term banding studies of Peregrine Falcons, Rock Kestrels *Falco rupicolus* and Black Sparrowhawks on the Cape Peninsula were extended into 2008, with the peregrine work reaching two decades of continuous population monitoring and over 10 years of colour ringing. Black Sparrowhawk breeding continues to be monitored by Ann Koeslag and the number of colour-marked pairs has been increased because suitable habitat for these birds is being rapidly diminished by alien tree clearing. Among the main findings from the peregrine study are a) that birds are getting smaller, and b) that they increase productivity with warm, fine spring weather. For the sparrowhawks, we demonstrated clearly that Egyptian Geese *Alopochen aegyptiaca* are the key negative influence on breeding success, aggressively usurping occupied nests and causing the hawks to desert.

Taita Falcon surveys

Among the rarest and most elusive of falcons – the diminutive Taita Falcon was the subject of a second survey in October 2008, following on the original surveys of the massive Drakensberg escarpment of north-eastern South Africa in 2006. A team led by Andrew Jenkins searched about 80 km of high cliff-line looking for this spectacular little bird. Three new nest sites were found, to add to the two sites found in 2006 and the two original sites known since the 1990s. The South African total now stands at seven known pairs (of which six were actively breeding in 2008), establishing the area as a global hot-spot for this hyper-rare species.

Highlights

- Three new Taita Falcon nesting sites discovered in South Africa, bringing the known national population to seven breeding pairs.
- First satellite tags on raptors in southern Africa placed on male and female Black Harriers.

Students

Jamshed Chaudhry (CB MSc, supervisors Rob Simmons & Pat Benson, graduated June 2008) *The impact of climate change on Cape vulture* (Gyps coprotheres) *breeding at north vs. south facing cliffs of Manutsa, Kransberg and Potberg in South Africa.*

Acknowledgements

The Black Harrier study is partially supported by the NRF. Jamshed's study received support from Pat Benson and Kevin Shaw who freely shared their data and knowledge of Cape vulture colonies. Previous work on Namibia's Cape Vultures was facilitated and supported by Maria Diekmann and John Mendelsohn. Thanks to Anthony van Zyl (head: Migrating Kestrel Project, Birds of Prey Working Group, EWT) for access to data and global interpretation of the results. The Papua New Guinea odyssey would not have happened without financial support from Natural Research (UK), Hawk Mountain (USA), and University of Heidelberg (Germany) and field support from Don Scott, John and Michael Simmons, and particularly Leo Legra. The Breede River Fish-Eagle Project is funded by Distell and Flight of the Fish Eagle Brandy and is now managed by the Birds of Prey Working Group, EWT, while the long-term study of peregrines on the Cape Peninsula is supported by Steve Phelps and Peregrine Properties. The Taita Falcon survey was funded by The Peregrine Fund, BirdLife SA, and Pick 'n Pay. Several raptor projects have been supported by many committed volunteers, notably Lucia Rodrigues, Zanne Macdonald, Colleen Rust and Ann Koeslag.

Spatial Parasitology and Epidemiology

Programme Leader:
Prof. Graeme Cumming

Research Team:
Dr Celia Abolnik (Onderstepoort Veterinary Institute)
Dr Leo Bruinzeel (PFIAO Postdoctoral Fellow)
Dr Alex Caron (CIRAD, France)
Mr. Ngoni Chiweshe (CIRAD, France
Prof. Phil Hockey (PFIAO)
Dr. Michael Kock (WCS)
Mr. Innocent Magunje (BirdLife Zimbabwe)
Mr. David Nkosi (Field Assistant)

Overview

Pathogens have a high relevance for conservation, particularly in small protected areas, within small or endangered populations, or at localities in which anthropogenic influences are high. 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, tsetse flies and mosquitoes).

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, etc.) affect ectoparasite numbers or the prevalence of pathogens in avian populations? Do more diverse host communities harbour more diverse pathogen communities, and what would be the implications of this for the management of disease in wild populations? Are there thresholds in ectoparasite or pathogen abundance that dictate the likelihood of disease outbreaks occurring? Are there thresholds in host numbers 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?

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 from a food web and community ecology perspective (but with links to other agendas and approaches) to understand the relationships between landscape heterogeneity, wetland dynamics, the movements of water birds, and avian influenza and malaria.

Water bird movements and avian influenza

The Institute, in partnership with the Onderstepoort Veterinary Institute and the Wildlife Conservation Society, 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 seven sites spread across South Africa (Strandfontein in the Western Cape and Barberspan in the North-West Province), Botswana (Makgadikgadi Pans and Lake Ngami), Mozambique (Lake Chuali) and Zimbabwe (Lakes Chivero and Manyame, near Harare). The primary aims of the project are twofold: first, to document the prevalence of influenza viruses (including but not restricted to H5 strains) and malaria parasites 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 and malaria

Prof. Graeme Cumming *holds the Pola Pasvolsky Chair in Conservation Biology. Graeme currently leads two programmes, 'Spatial Parasitology and Epidemiology' and 'Pattern-process Linkages in Landscape Ecology'. During 2008, Graeme supervised eight students at UCT (two dissertation MSc students, five CB MSc students, one PhD student) and a postdoc. Graeme published six peer-reviewed papers in international journals in 2007. He has another ten papers currently under review and three in press for 2009. He co-edited a book ('Complexity theory for a sustainable future', Columbia Press) that was published in mid-2008. He taught the 4-week landscape ecology module and a week-long module on complexity theory on the CB MSc course. In 2008 he also served as external examiner for Walter Sisulu University; as an associate editor for two journals,* Diversity and Distributions *and the* South African Journal of Wildlife Research*; as a special feature editor for* Ecology and Society*; and as a member of the local organising committee for the next international DIVERSITAS meeting (Cape Town, 2009). He reviewed 7 papers for different international journals, as well as one proposal for the NRF and two book proposals for publishers. Graeme gave oral presentations at the Ecological Society of America's annual meeting in Milwaukee and at "Resilience 2008" in Stockholm; participated as an invited speaker in a panel discussion at Resilience 2008 in Stockholm. He also gave an invited address at a NERC/DFID workshop in Somerset West.*

testing are being collected from ducks and waders at each site. These data are supplemented by standardized duck counts, measures of water quality and quantity, and a range of satellite image-derived measures of habitat type and quality. Twenty-two individuals of each of two species, Red-billed Teal *Anas erythrorhyncha* and Egyptian Geese *Alopochen aegyptiaca*, are being tracked in three focal locations using GPS satellite telemetry; we are also undertaking a colour-ringing study on Egyptian Geese (see below) as part of Mduduzi Ndlovu's MSc research. 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.

David Nkosi, Ngoni Chiweshe and Mduduzi Ndlovu setting up a mist net at Lake Chuali, Mozambique. Photo: Mike Kock.

Movement ecology of Egyptian Geese

Although there is an extensive literature about the biology of many Anatidae, little is known about the body condition dynamics, dispersal distances, movement patterns and moult biology of the Egyptian Goose. The Egyptian Goose is one of the most abundant and widespread ducks in southern Africa, has a wide habitat tolerance, and is increasing in numbers. However, studies focusing on its ecology are limited. The movements of wild ducks in South Africa are not well understood and ornithological programmes like SAFRING are currently unable to cast much light on the movement patterns of nomadic duck species. SAFRING data show that the dispersal distances travelled by Egyptian Goose range from just a few kilometres to over 1000 km in less than a year, but little is known about the proportion of the population that undertakes short- and long-distance dispersal and whether (and how) this phenomenon relates to physical environmental variation.

The lack of synchrony in life-history stages among Egyptian Geese across the region makes it difficult to understand the survival strategies of the species in response to environmental variation. Or is the lack of synchrony a survival strategy in itself? The objectives of this study, undertaken by MSc student Mduduzi Ndlovu are (1) to investigate how body condition, moult and abundance of Egyptian Geese relate to annual environmental variations in photoperiod, rainfall and temperature; and (2), using satellite telemetry and colour rings, to determine the movement patterns and dispersal distances of Egyptian Geese banded at the study sites.

This research will attempt to unite behaviour, ecology, moult biology and movement into a broad overview of the responses of Egyptian Geese to environmental variation. In addition to its scientific interest, this information will also be essential for the development of epidemiological models of avian influenza transmission dynamics.

Highlights

- Graeme is currently coordinating a special feature on 'Risk mapping for avian influenza' for the peer-reviewed journal *Ecology & Society*. The Fitztitute contribution to the special feature is already in print:
- We have so far obtained samples for influenza and malaria testing from over 4 000 birds at seven different locations in four countries. Roughly 40 birds have so far tested positive for low-pathogenicity avian influenza.
- Over 45 different people have assisted in the field and been trained in ringing and sampling techniques.

Students

Mduduzi Ndlovu (MSc, supervisors Graeme Cumming and Phil Hockey) *Understanding moult, condition and the movements of Egyptian Geese in southern Africa.*

Gregory Mutumi (MSc, supervisor Graeme Cumming) *Stable isotope analysis as a tool for understanding movements of nomadic ducks.*

Acknowledgements

This programme is currently funded by USAID through the Wildlife Conservation Society's GAINS program. We are also grateful to our collaborators in each country and to the many volunteers who have helped out in the field.

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:
Prof. David Cumming (PFIAO and Tropical Resource Ecology Programme, Zimbabwe)
Assoc. Prof. Grenville Barnes (University of Florida, USA)
Assoc. Prof. Stephen Perz (University of Florida, USA)
Dr Xanic Rondon (PFIAO Postdoctoral Fellow)
Assoc. Prof. Jane Southworth (University of Florida, USA)

African Elephants Loxodonta africana *have a major impact on the occurrence of tall trees in Miombo woodlands. Grant Joseph's CB MSc study showed that in Chizarira National Park, loss of tall trees has knock-on effects on the occurrence of deadwood and ultimately on densities of cavity-nesting birds. Photo: Graeme Cumming.*

Overview

The earth is currently entering an age that has been termed the Anthropocene, 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 changes. Humans and other organisms respond to landscape change across a range of scales. The central theme of this research programme 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 events 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 individual 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. 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

Over the last year, progress on this project has been hindered by the political problems in Zimbabwe. Nonetheless, both Glynis Humphreys and Grant Joseph completed their CB MSc projects and we were able to support a thesis by TREP student Milton Makumbe contrasting vegetation patterns on termitaria in areas with different large herbivore communities (indigenous, domestic, and absent) at Lake Chivero. Grant and Glynis's projects indicated that large termitaria provide important refugia for large trees; and that these in turn provide the deadwood needed by cavity-nesting birds. Numbers of cavity nesters were lower in areas with lower densities of termite mounds. At the time of writing, Grant Joseph is planning a return to Chizarira over December and January to increase his sample size and produce a more solid publication.

Data on wetlands and their ecological influence on duck communities (currently being collected through the water bird project described under the Spatial Parasitology and Epidemiology Programme) will also contribute to this project theme.

Spatial relationships between functional and taxonomic diversity

Matthew Child completed an honours project in 2006 that compared spatial patterns of functional and taxonomic diversity. The results, which are based on the Roberts' database and additional beak morphological measurements, indicated that taxonomic richness is not always a good surrogate for functional richness in South African bird communities. Graeme added an *a priori* functional classification to Matt's analysis to provide a second, complementary perspective. This research has been accepted for publication as part of a special feature in the high-impact journal *Philosophical Transactions of the Royal Society.* Matt followed up on his honours project with an excellent CB MSc dissertation looking at functional changes in South African bird communities inside and outside protected areas. His results indicate that South African protected areas are key reservoirs for populations of raptors and scavengers. This research has been submitted to *Diversity and Distributions* and is currently under review.

Simon Dures is currently completing a CB MSc project on avian communities in protected areas in lowland fynbos in and around Cape Town, to test how landscape connectivity and patch characteristics influence both the taxonomic and functional composition of avian communities in a largely urban matrix.

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 Madre de Dios, Accre, and Pando area of the Amazon basin, where Bolivia, Brazil and Peru meet. This is an intriguing case study because it includes three areas with similar biophysical templates but vastly different institutions and political systems. We predict that resilience of Amazonian social-ecological systems will be greatest 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. Much of the remotely sensed data for the project has now been processed, and Graeme has recently taken on a new postdoc, Xanic Rondon, to help with work on the modelling component.

Highlights

- Seven peer-reviewed papers were published or accepted for publication as part of this programme in 2008:
- An edited volume titled '*Complexity theory for a sustainable future*' (Norberg & Cumming, Columbia Press) was published.

Students

Michael Mills (PhD, supervisor Graeme Cumming & David Cumming) *The influence of termitaria on biodiversity and ecosystem function: consequences for bird communities*.

Matt Child (CB MSc, supervisor Graeme Cumming, graduated 2008) *Assessing the impact of agricultural transformation on avian taxonomic and functional richness.*

Grant Joseph (CB MSc, supervisors Graeme Cumming & David Cumming, graduated 2008) *Large termitaria provide refugia for cavity-using birds in a modified miombo woodland system.*

Glynis Humphrey (CB MSc, supervisor Graeme Cumming, David Cumming & Lindsay Gillson, graduated 2008) *Large termitaria as indicators of species diversity and tree height structure in a modified* Brachystegia/Julbernadia *miombo woodland in Chizarira National Park, Zimbabwe.*

Simon Dures (CB MSc, supervisor Graeme Cumming) *Assessing the impact of management practices on avian taxonomic and functional richness across Cape Town's biodiversity network.*

Tsholofelo Dithlobolo (CB MSc, supervisors Sue Milton & Graeme Cumming) *Does protection from grazing alter species composition and improve grazing value of the semi-arid Karoo rangeland.*

Acknowledgements

We are grateful to Zimbabwe's Wildlife Management Authority for allowing us to work in Chizarira National Park; to the NRF for funding research on termitaria through a SARC grant to Graeme and David Cumming; and to the NSF (USA) for supporting the MAP program.

Dr Jane Turpie

is a part-time academic staff member responsible for teaching the Resource Economics module of the Conservation Biology MSc programme. Jane's research and consulting interests incorporate resource economics, conservation planning and estuarine ecology. Jane is on the editorial board of the African Journal of Marine Science*. She sits on the steering committees of Water Research Commission projects concerning estuarine ecology, management and economic evaluation. During the review period Jane supervised one PhD in environmental economics, one MSc by dissertation in environmental economics and one MSc by dissertation in estuarine ornithology.*

Jane attended the SANBI Biodiversity Forum in March where she gave an oral presentation, and she was author or co-author of four oral presentations at the South African Marine Science Symposium in June.

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

Project leader
Dr Jane Turpie

Overview
This programme is multidisciplinary, integrating ecological, social and economic research 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 ecological model of the East Kleinemonde for use in water allocation and management decision making; the development of a tool for assessing the socio-economic importance of wetlands; an assessment of the tradeoffs involved in water allocation in Tanzania under different policies and climatic conditions; the development of a protocol for the economic valuation of wetlands; and a national ecosystem services valuation and mapping study.

The nature, distribution and value of ecosystem services in South Africa
The valuation of ecosystem services is essential to find an optimal balance between conservation and development. With ecosystem valuation studies having proliferated over the last decades, the emphasis is increasingly on understanding the spatial distribution of value to inform broad-scale planning. Mapping ecosystem service values depends on a proper appreciation of the definition of the nature of ecosystem services in biophysical terms as well as understanding the demand for these services. This study was carried out as the project for the Resource Economics module of the CB course. The aim of the study was to use existing information to map the supply of ecosystem services based on spatial data on ecosystem characteristics and contextual parameters, and to provide a rough estimate of the total value of ecosystem services provided by terrestrial, freshwater and estuarine ecosystems in South Africa, taking spatial variation in factors influencing demand into account. The study included estimates of provisioning value (grazing, natural resource harvesting and bio-prospecting), regulating services (carbon sequestration, pollination, erosion control, flow regulation and water quality treatment) and cultural services (recreation and tourism, scientific value and cultural/spiritual value), although cultural/spiritual value was not estimated in monetary terms. Values were significantly influenced by land use/management. There was a fair degree of complementarity between values, but overall value was highest in the eastern parts of the country. Although the broad-scale nature of the study meant that spatial resolution was relatively low, the approach could be repeated to reveal values at a finer scale. The study highlighted areas where further ecological and economic research is needed, as well as the urgency of developing high-resolution spatial datasets that will be required for detailed mapping of ecosystem services.

Estimating the social and economic trade-offs in allocating environmental flows for the Pangani River Basin, Tanzania
Allocation of flows to the environment requires consideration of the social and economic costs and benefits as well as impacts on aquatic ecosystem health, to balance biodiversity conservation with social and economic goals. There is a demand for simple tools that can be easily used by river basin managers to assist in decision making regarding environmental flows. A socio-economic assessment tool was developed for the Pangani River Basin, in which predictions about environmental changes under different flow scenarios were used to estimate changes in the wellbeing of rural people living in the vicinity of the river system, as well as the value of the ecosystem services generated by this system. Changes in societal wellbeing

take into account the contribution of aquatic resources to household livelihoods as well as the intangible benefits obtained from aquatic ecosystems. Changes in economic value considered include agricultural production, natural resource production, hydropower and water purification and nursery services provided by the wetlands and estuary. Baseline values were estimated from information collected from the basin, including a household survey. These values were altered under different flow scenarios by means of a series of estimated response curves to generate changes in social wellbeing and economic values relative to the present. Flow scenarios analysed showed that there is generally a trade-off between ecosystem integrity and societal wellbeing, because of the high dependence on water for agriculture, and that economic value is maximised under scenarios that maximise hydropower output. Overall net benefits can be increased through water demand and supply management.

An inhabitant of the Pangani Basin explaining aspects of her livelihood to an enumerator during the research phase of the study. Photo: IUCN.

Variation in the use of intermittently open estuaries by birds: a study of four estuaries in the Eastern Cape, South Africa

The main objective of this study was to describe the use of intermittently open estuaries (IOEs) by waterbirds, and the factors that influence avifaunal community composition in space and time. The study area consisted of four IOEs of varying sizes within a 40 km stretch of coastline in the warm temperate coastal biogeographical region of South Africa. Community composition differed significantly between estuaries. Habitat availability, in particular the area of floodplain and vegetated channel, was a major factor in determining avifaunal species composition and abundance. Overall, bird numbers were low, but bird abundance did change immediately after breaching at all estuaries. Open- and closed-mouth conditions also significantly influenced bird community structure by influencing the proportional representation of different feeding guilds, especially piscivores. The findings of this study have implications for the controlled management of the mouth dynamics of these estuaries.

Quantification of the flow regulation services provided by Nylsvlei wetland, South Africa, using hydrological and hydraulic modelling

Quantification of the services that wetlands provide is becoming increasingly important to justify their water and land requirements. However, one of the most important stumbling blocks is finding sufficient biophysical information upon which to base valuation. This study was conducted as a case study to investigate the flow regulation value of a wetland, using simple and standard hydrological techniques together with unsteady hydraulic modelling of the Nylsvlei wetland, a relatively large and ecologically important floodplain wetland in South Africa's Limpopo Province, and subsequent mapping of inundation areas for the Mogalakwena River into which the wetland drains. Two wetland development scenarios were compared: one with the wetland in its current state and one with the wetland drained and replaced by a trapezoidal grassed canal. A quaternary catchment scale was chosen for the hydrology to enable use of readily available quaternary catchment information. The services provided through the attenuation of incoming floods were estimated using floods determined using the Unitgraph Method. The services provided through long-term maintenance of low flows were estimated using 23-year daily inflow time-series that were derived for each quaternary catchment, scaled from a patched observed daily flow time-series within the catchment. Losses to evapotranspiration were also estimated and included for the long-term maintenance of low-flows modelling. Significant attenuation of floods flowing through the wetland was indicated, as might be expected for a large floodplain wetland. However, the simulations indicated that the flood peaks generated by the quaternary catchments located downstream of the wetland, some of which had relatively large tributaries, may have a significant influence on flood peaks, levels and inundation areas in the river reach downstream of the wetland for both development scenarios. This was due to the time-lagging of floods passing through Nyslvlei from upstream. The simulations therefore indicate that the position of a wetland within the drainage landscape determines the flood attenuation services it provides and that the attenuation capacity is not the only important factor determining the degree to which downstream areas benefit. Large evapotranspiration losses for the wetland development scenario were simulated in the long-term simulations, which indicated a negative effect on low flows at the wetland outflow point compared to the canal development scenario.

Students

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

Katy Lannas (MSc, supervisor Jane Turpie, graduated 2008) *Determining the socio-economic value of wetlands and devising an evaluation metric for South Africa.*

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

Climate Change Research Programme

Programme leaders
Dr Rob Simmons (PFIAO)
Dr Phoebe Barnard (Birds & Environmental Change Partnership, SANBI)

Research team:
Dr Res Altwegg (SANBI)
Mark Anderson (Executive Director: Birdlife South Africa)
Dr Pat Benson (University of the Witwatersrand)
Dr Niels Blaum (BIOTA, University Potsdam, Germany)
Dr Lynda Chambers (Bureau of Meteorology, Australia)
Bernard Coetzee (Stellenbosch University)
Dr Richard Dean (Research Associate)
Dr Barend Erasmus (University of the Witwatersrand)
Dr Lesley Gibson (Department of Environment & Conservation, Western Australia)
Prof. Phil Hockey (PFIAO)
Dr Brian Hole (Conservation International and Durham University, England)
Prof. Brian Huntley (Durham University, England)
Dr Guy Midgley (SANBI)
Thabiso Mokotjomela (PhD Student, Stellenbosch University; SANBI)
Dr Colleen Seymour (SANBI)
Dr Clélia Sirami (SANBI Postdoctoral Fellow)
Dr Wilfried Thuiller (Université Joseph Fourier, Grenoble, France)
Prof. Les Underhill (Animal Demography Unit, UCT)
Dr Steve Willis (Durham University, England)

Overview

There are few greater challenges facing biodiversity today than that posed by anthropogenic climate change. Africa is widely accepted to be the continent most vulnerable to climate change and the least equipped to adapt to it. Climate change impacts on southern African biodiversity are expected to be significant, given our high levels of endemism. Climatic impacts are increasingly understood to be exacerbated by other global change drivers, such as land-use change, biotic invasion and desertification. The magnitude and pace of these problems demands a concerted research response, coupled to the development of tools for conservation planners, policy makers and habitat managers.

In 2005-06, together with SANBI's Birds and Environmental Change Partnership, the Fitztitute established this programme to focus attention on the vulnerability of bird species to climate change and other drivers of environmental change. Research work is done collaboratively by the Institute, the Animal Demography Unit at UCT, and SANBI, with international partners. The policy and planning translation is undertaken mainly by SANBI with partners' inputs. Key modelling approaches are now being developed in a productive new collaboration with Durham University and Australian scientists focused on climate change and animal vulnerability.

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 species predicted an average 40% range loss, but only one of these species, Blue Swallow *Hirundo atrocaerulea*, is currently on South Africa's Red List. Res Altwegg, Phoebe Barnard and Wilfried Thuiller, in collaboration with Durham University researchers, are developing advanced bioclimatic envelope and demographic modelling techniques, which we will combine in

Dr Phoebe Barnard
is an Honorary Research Associate of the PFIAO. She founded and runs the national Birds and Environmental Change Partnership at the South African National Biodiversity Institute (SANBI), set up to focus bird research, monitoring and conservation activities on pressing issues of global change. She was a global board member of the Millennium Ecosystem Assessment, and is a member of the editorial boards of Biology Letters*,* Animal Conservation *and* African Journal of Ecology*, in 2008 co-editing a special feature in* Biology Letters *on global change biology. Phoebe is active in the Africa Section of the Society for Conservation Biology, and mentors young scientists nationally and across Africa, also supervising three PhD students and a postdoctoral fellow. She runs the Climate Change module of the Conservation Biology MSc course, and during the review period published two scientific papers, a synthesis booklet and six popular articles, as well as having two further papers in press. Her main professional interest is applying insights from behavioural, population and evolutionary ecology to understand how species cope with global change in real-world, fragmented landscapes. Phoebe also writes and speaks widely on global change and society's transformation to sustainability.*

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

more sensitive analyses.

Using a comparison of present and past distribution patterns, Phil Hockey, Mandy Ridley, Clélia Sirami and CB MSc student Hassan Babiker have analysed which ecological traits predispose southern African birds to respond rapidly to climatic change. Such analyses are hampered by the poor quality of historical range data, but preliminary results indicate that the most responsive species are mobile (migratory or nomadic) habitat generalists – many such species have undergone range changes (mostly expansions) in the past 50 years. At the other extreme, sedentary habitat specialists have been the least responsive. Among such species, range shifts may only occur when the habitat itself changes - either in its intrinsic properties or in its spatial distribution.

In recent years, and driven by the urgency of the situation, climate and habitat modelling have been favoured tools in predicting how species' ranges and populations will respond to global change. A limitation of this approach is that it lacks a strong empirical basis and is forced to make fundamental, often untested assumptions about the links between range occupancy and climate envelopes. Broken down to its most simple elements, climate is, in effect, a sequence of weather events: climate change thus represents a rearrangement of these weather sequences which may, for example, be manifested in an increasing frequency and duration of 'hot weather' events. This is certainly the pattern predicted for some of the hot, dry regions of southern Africa. In 2008, Phil Hockey, Guy Midgley (SANBI) and Justine Cordingley (CB student) launched a pilot project to assess the behavioural stress responses of desert birds to high ambient temperatures. We are hoping, funding permitting, to expand this in 2009 to link behavioural responses to their physiological implications. Justine spent much of November and December sweltering in the Kgalagadi Transfrontier Park gathering primary data. Contrary to physiological predictions, it seems that large birds may suffer more at high ambient temperatures than do small birds, but feedback on the full analysis will have to wait until next yea

Given the overwhelming evidence of widespread range changes resulting from climate change, there is an equally overwhelming tendency to attribute all range changes to this cause. Phil Hockey and Guy Midgley completed a study in 2008 (in press) which analysed colonization events by indigenous bird species on the Cape Peninsula over the last 50-60 years. Interestingly, none of the species predicted to have colonised the Peninsula based on climate/habitat models did in fact do so. Rather, the suite of colonisers was dominated by forest and wetland species which would have been able to use plantations, gardens and man-made wetlands as stepping stones on their way west. Range changes as a result of the use or avoidance of man-made habitats were also explored in a paper published by Nicola Okes, Phil Hockey and Graeme Cumming in *Conservation Biology* in 2008. The study analysed historical range changes of wetland birds and showed that many of those that used man-made wetlands had expanded their ranges westwards whereas many of those avoiding such habitats and favouring natural, vegetated wetlands had contracted their ranges eastwards, in concert with the greatest degradation of such wetlands having occurred in the east.

Basic data on the demography, phenology and morphometrics of fynbos endemics such as Orange-breasted Sunbird Anthobaphes violacea *are being analysed in a long-term population and community study by Phoebe Barnard and colleagues. Photo: Rob Simmons.*

How do differences in vulnerability affect populations?

Large-scale range shifts on their own are an incomplete way of understanding the impacts of climate change because, for example, significant population-scale impacts may already be underway by the time ranges shift. We need to establish how populations are affected in detail – which individuals or age classes suffer most and why; how breeding, migration and feeding are affected; and whether normal activities carry increased costs (e.g. energy/water balance) and risks (e.g. predation) for individuals as the climate changes. This work is constrained by the availability of long-term data, but Phoebe Barnard and Wilfried Thuiller, in their special feature in *Biology Letters*, identified the development of these more robust and defensible models as a priority for global change biology. Following an expert workshop at SANBI in September 2008, Brian Huntley, Phoebe Barnard, Res Altwegg and others are submitting a paper in Jan 2009 which outlines the components of integrated spatial and demographic models which more accurately predict vulnerability to climate change.

In 2008 Rob Simmons presented some of the first data on climatic effects on wetland bird demography. Wetland species' population dynamics are difficult to model due to the large natural variation in rainfall, relative to variation in temperature. Using a 50-year dataset on flamingos, collated with Wilferd Versfeld of Etosha National Park, Namibia, Rob showed that breeding is triggered by threshold rainfall events, that long-term rainfall has decreased by 11% over 50 years (leading to reduced recent breeding productivity), and that under expected scenarios of decreased rainfall and increased evaporation, breeding events are likely to be increasingly rare in the future. Construction of man-made breeding islands, such as that at Kamfers Dam, Kimberley, are one way of buffering flamingos from population declines.

Phoebe Barnard adjusting mistnets as part of the longterm population study of climate and land use impacts on fynbos endemics in the Cape Peninsula mountains. Photo: Rob Simmons.

Using current climates to predict future changes to species assemblages

In 2007 a new initiative began in collaboration with the German-funded BIOTA Programme to assess bird species richness across one of the steepest rainfall gradients in Africa. Five study sites from east (415 mm) to west (115 mm) in central Namibia were surveyed for birds in three habitat types – open grassland, bush thicket and riverine woodland. Preliminary findings suggest that bird species richness and diversity in two of the habitats (open and bush thicket) decreased as expected with decreasing rainfall. Under a drier climate in Namibia within these habitats we might therefore expect a decrease in avian diversity. However, the importance of rivers (or attributes of them) was apparent in the data for riverine birds across the same gradient – both species richness and diversity increased as the surrounding environment became drier. The implications of this were explored in 2008. It appears that very recent rainfall is more closely related to species diversity than the previous year's rainfall, or the long-term mean annual rainfall. Final field data for this project will be collected in 2009.

Vultures and climate change – a case study

The plight of Africa's vultures continues to be a litany of bad news: more birds poisoned, populations decreasing, and species retracting their ranges, despite innovative re-introduction and education programmes. The traditional focus on poisons, reduced food resources and persecution as agents driving population decreases may have clouded our perceptions of a larger "elephant in the room". Following a provocative paper by Rob Simmons and Andrew Jenkins suggesting that the trends that we see for decreasing Cape *Gyps coprotheres* and Bearded Vultures *Gypaetus barbatus* are consistent with factors linked to climate warming, CB student Jamshed Chaudhry compared behavioural responses of Cape Vultures to full sun at two active colonies in northern South Africa, one south-facing (Kransberg), and one north-facing (Manutsa), and compared behaviours of chicks and parents there with the most southerly colony at Potberg. With long-term breeding success data provided by Dr Pat Benson (Wits University) from the northern colonies and Kevin Shaw (Cape Nature) from Potberg, Jamshed found, as predicted, that birds in the north-facing colony showed more signs of heat stress. They spent more time head-drooping and chick-shading than did vultures in the same region at the south-facing colony. He found no such stress behaviour at the temperate Potberg colony, which is also the only colony of this species at which numbers are increasing.

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, for example, uptake of data in State of the Environment (SoE) reports. 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. Given the difficulties and uncertainties that have arisen in analyses based on poor-quality historical data (see above), such work is urgently needed to shape and strengthen appropriate conservation strategies for the future.

Highlights

- Four scientific articles, nine semi-popular articles and one semi-popular booklet were published.
- Phoebe Barnard, Rob Simmons and Phil Hockey cemented collaborative links with the Durham University climate-change group and climate scientists in Australia. Phil assisted the Durham group with a funding proposal for the British National Environmental Research Council, and Phoebe co-led a successful grant application with Durham University to the Royal Society.
- An international symposium and round table were held at the Pan-African Ornithological Congress on climate change and birds, and an expert workshop on this was held at SANBI.

Students

Jamshed Chaudhry (CB student, supervisors Rob Simmons, Pat Benson & Peter Ryan, graduated June 2008) *Are Cape Vultures* (Gyps coprotheres) *feeling the heat? Behavioural differences at north- and south-facing colonies in South Africa*.

Justine Cordingley (CB student, supervisors Phil Hockey and Guy Midgley) *Hot, hotter, gone? Predicting climate-induced species losses from hot African ecosystems.*

External/Contractual lecturers

A/Prof. Colin Attwood
(Zoology Department, UCT)

Dr Phoebe Barnard
(SANBI)

Dr Jacqui Bishop
(Zoology Department, UCT)

Prof. David Cumming
(TREP)

A/Prof. John Hoffmann
(Zoology Department, UCT)

Prof. Astrid Jarre
(Zoology Department, UCT)

Dr Jackie King
(Zoology Department, UCT)

Dr Guy Midgley
(SANBI)

Prof. Sue Milton
(PFIAO and University of Stellenbosch)

Prof. Norman Myers
(Oxford University)

Prof. Astrid Jarre
(Zoology Department, UCT)

Prof. Dave Richardson
(University of Stellenbosch)

Dr Sheona Shackleton
(Rhodes University)

Michael Schoon
(Arizona State University)

Conservation Biology Masters Programme

Course co-ordinators
Prof. Graeme Cumming
Assoc. Prof. Peter Ryan

Justine Cordingley and Jessica Shaw explore the wonders of the Fynbos ecosystem on a hike up to Elephant's Eye cave, Silvermine Nature Reserve. Photo: Clifton Meek.

The 16th cohort of Conservation Biology students completed their projects early in 2008, with all 12 of the students graduating in June 2008. Three students obtained their degrees with distinction: Matthew Child, Tessa Hempson and Marisa Lipsey. The 17th cohort started in January 2008, comprising 11 students from nine countries: Botswana, Germany, Kenya, Malawi, South Africa, the United Kingdom, the United States of America and Zimbabwe. All 11 survived the coursework component of the programme and are currently completing their individual research projects.

This year saw the first run of the newly restructured CB course. A number of changes have been made to the previous curriculum. The course has been divided more rigidly into two halves, a biological core and an interdisciplinary core, with the goal of ensuring that subjects are presented in a logical order while still allowing for some flexibility in the exact timing of each module so that the needs of our guest lecturers can be accommodated. In the first half of the course, we took the difficult decision to reduce the formal modelling component of the course and increase the aquatic component in its place, with the addition of modules on marine and freshwater systems by Colin Attwood and Jackie King respectively. New additions to the second half of the course include a week on complex systems theory, which frames the key interdisciplinary questions and problems for conservation; a week on climate change and conservation, taught by Phoebe Barnard and Guy Midgley; and a four-week social sciences module, taught in 2008 by Sheona Shackleton and Michael Schoon.

Feedback on the revised curriculum has generally been positive, with many students appreciating the new aquatic modules and finding the new concluding sections (on linking people and nature) eye-opening and exciting. In the words of one student: “I thought this was going to be fluffy and pointless. It wasn't… I learnt a huge amount in these few weeks that normally I don't think I would ever encounter”. We

plan to continue with the new curriculum for the next couple of years, with some minor tinkering based on the availability of lecturers and feedback from students, until it becomes the old curriculum and is once more in need of a larger revision.

Another important milestone for the CB course has been a full update and revision of the course handbook, which was last revised in 1996. The glossy new version can be downloaded in pdf format through the Fitztitute's web site at http://www.fitzpatrick.uct.ac.za/docs/conshand.html

The course continues to be wonderfully supported by a wide variety of people both inside and outside UCT. We owe particular thanks to module leaders from outside the Fitztitute – listed on page 45 – for their willingness to teach on the course and the consistently high academic standards that they have maintained. Many other people have contributed through guest lectures, field trips, or practical sessions. The programme is also strengthened by the support and dedication of the Fitz and Zoology staff, especially Meg Ledeboer who handles a plethora of queries from potential students, and Hilary Buchanan who administers the project examination process and handles administrative and domestic arrangements for the newly arrived foreign students.

A fortuitous lightning strike ensured that CB student Justine Cordingley did not get lost en route to her Kalahari study site! Photo: Phil Hockey.

Conservation Biology projects: 2008/9

Bewana, Aphiwe: *A re-assessment of the state of Marine Protected Areas management in South Africa: 2008.* Supervisor: Colin Attwood.

Justine Cordingley: *Hot, hotter, gone? Predicting climate-induced species losses from hot African ecosystems.* Supervisors: Phil Hockey, Guy Midgley.

Tsholofelo Ditlhobolo: *Does protection from grazing alter species composition and improve grazing value of the semi-arid Karoo rangeland?* Supervisors: Sue Milton, Graeme Cumming.

Simon Dures: *Assessing the impact of management practices on avian taxonomic and functional richness across Cape Town's biodiversity network.* Supervisor: Graeme Cumming.

Maike Hamman: *Conservation implications of the foraging behaviour of breeding Cape Cormorants* Phalacrocorax capensis. Supervisors: Peter Ryan, Lorien Pichegru, David Grémillet.

Clifton Meek records data on the composition of invasive alien plants along the lower reaches of the Eerste River, Stellenbosch. Photo: Donald Miponga.

Clifton Meek: *Effects of land use on alien plant composition along a riparian corridor in the Cape Floristic Region, South Africa.* Supervisors: Dave Richardson, John Hoffman.

Alexander Menayas: *Do Requiem and Hammerhead sharks off the coast of South Africa exhibit multiple paternity? A study using cross-species microsatellites.* Supervisor: Jacqui Bishop.

Tendai Musvuugwa: *A geographical analysis of the breeding effort and success of ground-nesting gamebirds and wildfowl.* Supervisor: Phil Hockey.

Tiwonge Mzumara: *Status and prospects of Malawi's Yellow-throated Apalis* Apalis flavigularis. Supervisor: Phil Hockey.

Tarryn Quayle: *The effects of monitors on the diet, activity budget and movement patterns of a troop of Chacma baboons* (Papio h. urnsinus) *on the Cape Peninsula, South Africa.* Supervisor: Justin O'Riain.

Jessica Shaw: *The end of the line for South Africa's national bird? Modelling power line collision risk for the Blue Crane.* Supervisors: Andrew Jenkins, Peter Ryan.

Some of the 2008 class celebrating after a hard day of field work in the Succulent Karoo, Prince Albert. Photo: Maike Hamann.

Librarian
Margaret Sandwith Koopman

Interns
Nomonde Sotashe
Neziswa Nqayi

Contract Staff
Phelisa Hans

Volunteers
Sally Dalgliesh


Nomonde Sotashe


Neziswa Nqayi


Phelisa Hans


Sally Dalgliesh

Niven Library

Overview

2008 was a busy year for the Niven Library. Additional storeroom space was allocated enabling the Librarian and assistants to reallocate space in the 2nd floor library store and in the library. The long overdue repairs to the library were completed and the leaking wall was sealed.

A new intern was employed until the end of October 2008 when the second phase of the SKEP database project was completed.

The Niven Librarian attended four workshops/conferences during the year as well as attending a lecture held by the LIASA Cape Town group.

Staff and staff development

Margaret Sandwith Koopman: Margaret co-authored a paper in *Innovation* and edited the same edition entitled *Open Source in Libraries*. She continued as joint Book Review Editor for *Ostrich: Journal of African Ornithology* a task first undertaken in 2004 at the invitation of Richard Dean, then Scientific Editor.

Margaret continues to act as the Zoology Department co-ordinator of the UCT Annual Report and the annual publication count, a responsibility first undertaken in 2003. She attended the 10th Annual Library Symposium at Stellenbosch University, entitled *Shall the twain ever meet? Supplying the demand in an academic library and information service environment*. It is pleasing to report that although the Niven Library operates in comparative isolation, the service offered is on par with that reported by other librarians at the symposium. Some new ideas were generated by the symposium which could improve the Niven Library's visibility nationally and internationally.

Margaret attended a presentation on the NRF evaluation and rating system and as a response to this developed an information page on the publication process for the Fitztitute website. On the basis of the internship projects supervised in the Niven Library, she was invited to participate in the task team of the C.A.P.E. Learning Network.

Margaret has also been researching the history of the Niven Library over the past two years in preparation for the 50th anniversary of the Fitztitute in 2010. This task was all but completed by the end of 2008.

Nomonde Sotashe's internship project, the development of a SKEP database, funded by the Critical Ecosystem Partnership Fund through the Botanical Society of South Africa, continued into 2008. Nomonde was subsequently offered a permanent post by the South African National Biodiversity Institute in the Harry Molteno Library and started work there on 1 February 2008.

Neziswa Nqayi was appointed in the internship position to complete the SKEP database project on 1 March 2008. Neziswa and the Niven Librarian attended a workshop and a conference during 2008 in connection with the project. The workshop was held by the Critical Ecosystem Partnership Fund (CEPF), funders of the SKEP database project. Neziswa was introduced to the range of projects being undertaken in the Succulent Karoo to better enable her to develop the database.

The second was the Interfaces 2008 conference which highlighted the progress made on the Fynbos Ecosystem and the Succulent Karoo Ecosystem projects. A poster highlighting the work on the SKEP database was presented at the conference and a survey was conducted during the conference. The survey was designed to advertise the database, to find out about the needs of researchers, and to find out their opinion on combining the SKEP and Fynbos databases. The findings were reported to SANBI who indicated that they would like to extend the database project biome-wide in 2009.

Neziswa completed her internship at the end of October 2008 with the completion of the SKEP database. She was offered a post at the Graduate School of Business Library and took up this position on 1 December 2008.

Phelisa Hans continued to be employed part-time by the Fitztitute during 2008 on a renewable contract basis to assist with routine tasks in the Niven Library. Phelisa's nine hours per week enabled the Niven Librarian to continue with the research and write-up of the history of the Niven Library. She was principally involved in the various moves of the collection, firstly to enable the repairs to be made to the library and subsequently with packing up and labelling journals to move between storerooms and from the library to the storerooms on the 2nd and 3rd floors. Phelisa took maternity leave from October to December 2008.

Sally Dalgleish has continued to work in her own time on the reprint collection, both the paper and electronic copies, providing a valuable service to the Niven Library. During the research on the Niven Library history it emerged that Sally has been working in the Niven Library on and off since 1981.

Library development

Space management:

The allocation of an additional storeroom on the 3rd floor of the south wing of the John Day Building, during July 2008 enabled the Librarian to reallocate duplicate journals and least-used journal holdings to this storeroom. This created shelf space in the 2nd floor storeroom for closed holdings of low-use journals into an alphabetical sequence in the space available. One hundred and seven titles were moved to the 2nd floor storeroom and each catalogue entry was edited on the Niven Library database to indicate where the title could now be found should a user wish to consult this material. This created 22 empty shelves into which the remaining journal and book collection in the library could be redistributed. This remains a short-term solution which will have to be addressed either through drastic weeding of the book collection or the allocation of additional space, preferably from the underutilised animal rooms on the same level as the library. Compact storage for the journal collection, for which the Librarian requested quotes in 2006, remains a medium-term option.

Library maintenance:

During August 2008 the UCT maintenance team embarked on the job of repairing the water damage resulting from a leak in the Niven Library south wall. Although previous external work on emptying and re-sealing planters on the outside of the building had been completed earlier in the year, this had not stopped the leak in the Library. The problem was eventually tracked down to a structural problem on the roof of the building which was feeding water directly down the wall and into the Niven Library. Once this had been repaired the wall had to dry out before the scraping and painting could commence.

Preparing for the repairs meant moving the entire thesis collection and all the journals on the shelves on the south wall. The library reading room was closed for meetings and seminars for two weeks, but on the whole the disruption was kept to a minimum.

Unfortunately 2008 was an extremely wet year and it was not possible to allow the walls to dry out completely, this has resulted in residual bubbling of the new paint work. The maintenance team have also not yet re-hung the fire hydrants and nor have they secured the newly routed power cable. Other than these small details the library looks respectable once again.

Collection management

Journals:

A further drive to re-establish exchanges for ornithological titles was made in July 2008 including a copy of the latest edition of *Africa Birds & Birding*. The final count of exchange agreements by the end of 2008 was 20 exchanges for *Africa Birds & Birding* and one exchange for *Ostrich* which is funded by the Fitztitute. The exchange agreements are worth R14 855.00 at the October 2008 exchange rate. We are extremely grateful to Black Eagle Publishing for their generosity.

During 2008 the Niven Library received 15 journals on the basis of subscriptions and a further 13 titles through UCT Library electronic access which had previously been subscribed to in hard copy by the Fitztitute. Various journals are posted to the Niven Library through gratis subscriptions, such as *Systematic Biology* and *Antarctic Science*.

A very small number of institutions are still sending journals and/or newsletters to BirdLife South Africa for receipt to the BLSA collection in the Fitztitute although all exchange agreements with BirdLife South Africa ceased in 2003.

Reprints:

The Librarian continued to add to the reprint collection either as hard copies or electronic copies gleaned through regular browsing through the current journal alerts which are distributed to interested academics and students.

Books:

The Fitztitute acquired 113 new titles during 2008. Of these 14 were purchased by the Fitztitute and the balance were donations or review titles. The Science and Engineering Library also purchased a number of books of relevance to Zoology and Fitztitute staff and students which are available for loan from UCT Library. These titles are advertised to staff and students when they are received by UCT Library. Some significant titles acquired during this period are:

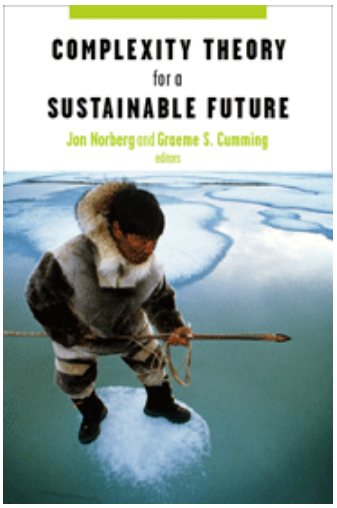
- The vegetation of South Africa
- Bird sounds of Madagascar
- The birds of Zambia
- Handbook of the birds of the world Volume 12
- Lost land of the Dodo
- Behavioral ecology of tropical birds
- Ducks, Geese and Swans, Vols 1&2
- Atlas des oiseaux nicheurs de la Grande Comore
- Charles Darwin on the Origin of Species
- Handbook of bird biology
- Neuroscience of birdsong

The Librarian is in the process of assessing the value of the collection, last estimated in 1996. This is in order to provide a more accurate idea of the insurance value of the Niven Library.

Staff Books published during 2008

Norberg, J. and Cumming, G.S. (eds) Complexity theory for a sustainable future. New York, Columbia University Press, 2008.

Ryan, P. Kirstenbosch birds & other wildlife. Cape Town, Struik, 2008.



Complexity Theory for a Sustainable Future lays out a conceptual basis for the future interdisciplinary development of conservation in social-ecological systems.

Databases:

NISC staff continued to capture references for the *Afrotropical Bird Database* (ATBD). During October 2008 NISC USA was acquired by EBSCO who are now the new owners of the Wildlife World Wide Database of which the ATBD is a component. The May 2002 agreement between NISC-SA and the Fitztitute for the acquisition of the Fitztitute Bird Database gave the Fitztitute access in perpetuity to the AfroTropical Bird Database. Correspondence between NISC-SA and the Niven Librarian confirms that free access will continue through the new owners of the database.

Niven Library Database

The Niven Library database remains stable and, at the end of 2008, the database contains 48 967 records. These include books, journals, audiovisual and electronic media, newsletters and, by far the largest component of the collection, reprints. The Niven Library continues to use its own server to host the database.

Use of the Library

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

	2008	2007	2006	2004/5	2003/4
Monographs	300	376	410	438	519
Reprints	27	88	60	82	83
Theses	24	45	24	42	-
Journals	141	265	298	345	27
Audio Visual	5	5	15	9	7
Total	497	779	807	916	887

Document Delivery

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

	2008	2007	2006	2004/05	2003/04
Items requested (by staff/students)	96	90	95	166	95
Items supplied	189	151	160	485	403
Requests not satisfied	15	8	9	35	24

Reprint requests

During 2008 there were 243 requests for reprints of Fitztitute staff and student publications. The majority of these were e-mail requests and pdfs were supplied where possible. Requests are mostly for publications in South African or African journals such as *African Journal of Marine Science*, *Annals of the Transvaal Museum*, *Ostrich*, *Malimbus* or for older publications which are not available electronically. Where requests are made through the Librarian for older papers a pdf is made and archived for future requests. 774 staff pdfs are now on file electronically.

Table 3. Requests for PFIAO Reprints

Reporting Period	2008	2007	2006	2004/05	2003/04
Number of reprint requests	243	258	165	211	275
Number of countries	35	36	29	21	37

The breakdown of reprint requests by country is: Argentina 10, Australia 11, Belgium 2, Botswana 1, Brazil 8, Canada 4, Chile 1, Cuba 1, Czech Republic 1, Falkland Islands 1, France 4, Germany 34, Guam 2, Hawaii 1, Hungary 1, India 4, Iran 1, Italy 2, Malaysia 1, Mexico 3, New Caledonia 8, New Zealand 4, Pakistan 1, Peru 4, Poland 21, Portugal 5, Slovakia 1, South Africa 58, Spain 1, Sweden 1, Switzerland 1, United Kingdom 9, United States of America 33, Venezuela 1.

Cash photocopying

1716 cash copies amounting to R686.40 were made on the photocopier in the library during 2008. The charge for photocopying remained at 40c per page for 2008. As in previous years the availability of electronic journals has enabled the printing of articles, which is a more cost effective way of reproducing material.

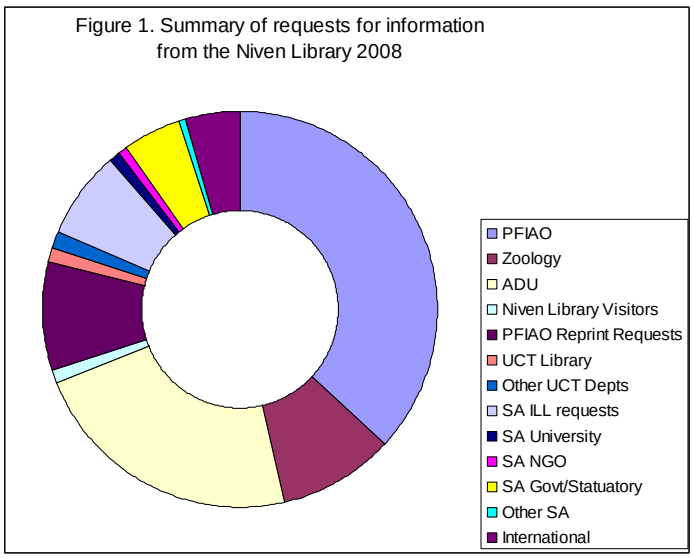
A further R1194.70 was received for the supply of material requested from the Niven Library from users within South Africa and internationally.

Research requests

A total of 2717 requests for information were received during the period under review, with approximately 37% of these requests generated by staff and students of the Fitztitute. 1022 pdf or jpg files were supplied by e-mail to users locally,

nationally and internationally. The number of hard copy articles supplied (298 in 2008; 287 in 2007) remains constant and is probably explained by requests for articles predating electronic journals. In addition 31 literature searches were compiled and e-mailed to users. Other usage of the library was for verification of information, impact factors of journals, the supply of URL's and e-mail addresses and numerous other general queries. The Library received 995 research requests from the staff and students of the PFIAO, 257 from Zoology staff and students, and 605 from ADU staff and students. 617 requests for information were also received from elsewhere on the UCT campus, and both nationally and internationally (see figure 1), excluding the supply of Fitztitute reprints.

Figure 1. Summary of requests for information from the Niven Library 2008



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:
Elizabeth Horne, Ajubatus Marine Rescue and Rehabilitation, Cape St Francis; Penguin Task Force, Sea Research Foundation in Mystic, CT, United States; David Johnson, Global Owl Project, Virginia, USA.

Conservation NGOs:
Ruth-Mary Fisher, Table Mountain National Park; Wellington Zoo Trust, New Zealand; Helen de Klerk, Cape Nature; EcoShelter, U.K.; Roger Uys, KZN Wildlife.

Government affiliations:
Centre for Australian Weather & Climate Research - Bureau of Meteorology, Melbourne, Australia.

Publishers:
The Upper Room Magazine, Methodist Church, USA; The Titanium Room for Shambala Game Reserve, South Africa; Landbouweekblad, South Africa; Vanessa Stephen, Earth-Touch, South Africa

Private Companies:
Chris Roche, Wilderness Safaris, South Africa; Andrew Cook, freelance writer for National Geographic Kids, used the Niven Library for research on parrots; Full Circle Consulting, Knysna, South Africa; van Rensburg Pathology, Bloemfontein, South Africa

South African Universities
Assoc Prof Rodney Edgecombe, English Language & Literature, UCT; Dr. Tiawanna Taylor, Dept. Zoology, UKZN; Maureen Coetzee, University of the Witwatersrand

Acquisitions and collection building

At the end of December 2008 the bibliographic records on the OPAC system totalled 48 967. The numbers of individual items received in the Niven Library are shown below:

Table 4. Niven Library acquisitions over the last five years

	2008	2007	2006	2004/5	2003/4
Monographs	113	102	206	194	108
Journals	351	530	597	819	520
Newsletters	296	272	294	474	304
Reprints	121	93	63	2182	1078
PDFs	1300	1357	1482	2351	
AudioVisual	12	8	5	8	

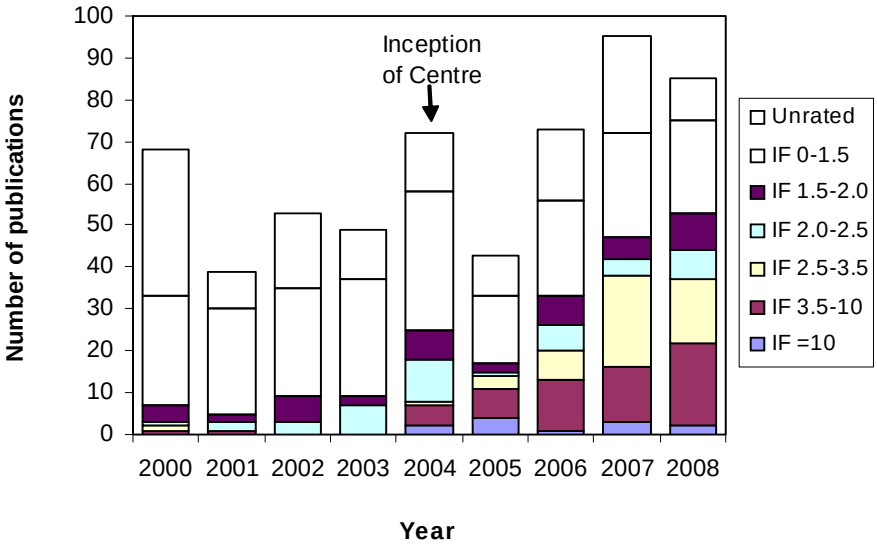
Books added to the collection were ordered by members of the Percy FitzPatrick Institute, or were donated books and review books for *Ostrich*. The Zoology Department, SAFRING, Animal (formerly Avian) Demography Unit and the African Seabird Group continued to donate their exchange journals.

Donations

We acknowledge with thanks donations from the following: African Wader Studies Group; Rob Anderson; Animal Demography Unit; Alex Antrobus; E.J.M. Baumbach; BirdLife Zimbabwe; Black Eagle Publishing; Andre Boschoff; Christy Bragg; BBC Radio; Callan Cohen; John Cooper; Timothy Crowe; Graeme Cumming; Jeremy David; Jenny Day; Charlotte Deerenberg; Eric Dinerstein; Morné du Plessis; Simon Dures; Endangered Wildlife Trust; Charles Griffiths; Phil Hockey; Jackie King; K. Ludynia; Lynx Edicions; Coleen Moloney; Patrick Morant; Musée Royal de l'Afrique Centrale ; Museu Nacional Rio de Janeiro; Norman Myers; Natural History Museum, LA County, USA; NISC; Darcy Ogada; Dieter Oschadleus; Samantha Petersen; Lorien Pichegru; T & AD Poyser; Peter Ryan; Lisa Shorey; Alan Sieradzki, Global Owl Project; SANBI; Peter Steyn; Les Underhill; Ross Wanless; J.K. Winstanley; Tristram Wyatt.

Scientific Publications

FitzPatrick Institute publications in SCI-rated journals, 2000-2008



Graph showing how the quality of Fitz publications (as measured by journal 'Impact Factors' has improved since the establishment of the Centre of Excellence. IF = Impact Factor. To place the figure in perspective, only five life sciences journals (including Science *and* Nature*) have impact factors >10.*

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Great White Pelicans Pelecanus onocrotalus *are causing significant mortalities among breeding seabirds on west coast islands. The impacts of this predation are being studied by PhD student Marta de Ponte. Photo: Albert Froneman.*

Fitz News articles published in
Africa Birds & Birding in 2008


news from the PERCY FITZPATRICK INSTITUTE

Bye, baby bunting


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Vultures feel the heat


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Geese – in or out of the ballpark?


news from the PERCY FITZPATRICK INSTITUTE

New director appointed


news from the PERCY FITZPATRICK INSTITUTE

A stab in the dark

Semi-popular Publications

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Semi-popular Publications

PFIAO 2008. New director appointed. *Africa Birds & Birding* 13(4):33.

PFIAO 2008. When the cat's away. *Africa Birds & Birding* 13(5):23.

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CB teaching before …

… and now.

The end of 2008 saw a major upgrade to our Conservation Biology teaching facility, with the new facility (right) awaiting the 2009 student cohort. Photos: Chris Tobler.

Seminars

April 29: Dr Ricardo Lopes, CIBIO, Research Center in Biodiversity and Genetic Resources, Portugal

Migratory connectivity of Dunlin populations using the East Atlantic flyway & genetic diversity of Mediterranean populations of African Purple Swamphen after recent human-mediated expansions.

May 9: Dr Robert Costanza, Gund Institute for Ecological Economics, University of Vermont, USA

Sustainability of collapse: what can we learn from integrating the history of humans and the rest of nature?

May 23:

Prof. Gary Voelcker, University of Memphis, USA

My research interests and vision for the Percy FitzPatrick Institute of African Ornithology as a National Research Foundation Centre of Excellence.

Prof. Phil Hockey, University of Cape Town

My research interests and vision for the Percy FitzPatrick Institute of African Ornithology as a National Research Foundation Centre of Excellence.

July 1: Prof. Robert Holt, University of Florida, USA

Applied metacommunity ecology: landscape-scale experiments.

August 26: Dr Doug Loewenthal, PFIAO, University of Cape Town

The African Black Oystercatcher: a model Southern Hemisphere species for studying the population and dispersal biology of a shorebird in the face of climate change.

September 25: Pholoshi Maake, MSc student, Rhodes University

Genetic diversity and population structure in the southern African fish species Glossogobius callidus*, as inferred from mtDNA Cytochrome b.*

September 30: Dr Marco Girardello, University of Newcastle, England

Tree-based modelling methods: a useful addition to the ornithologist's toolbox.

Penn Lloyd explains some of the finer points of ornithology to undergraduate students at the de Hoop Academy – a project run jointly between the Fitztitute and the Centre for Invasion Biology at Stellenbosch University. Photo: Phil Hockey.

Financial Report

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