

# FitzPatrick Institute of African Ornithology

DST-NRF CENTRE OF EXCELLENCE

UNIVERSITY OF CAPE TOWN



ANNUAL REPORT  
2018

### **FitzPatrick Institute Advisory Board 2018**

Mark Anderson (BirdLife South Africa)  
Dr Pippin Anderson (ENGEO, UCT) – April-Dec  
Dr Graham Avery (WESSA)  
Prof. Susan Bourne (Acting Dean of Science, UCT, Chairperson)  
Michael Buckham (co-opted)  
Dean Ferreira (co-opted)  
Vernon Head (co-opted)  
Prof. Michael Meadows (ENGEO, UCT) – Jan-Mar  
A/Prof. Muthama Muasya (HoD, Biological Sciences, UCT)  
Marina Niven (FitzPatrick Memorial Trust)  
Prof. Michael Kyobe (Acting DVC Research, UCT)  
Prof. Peter Ryan (FIAO)  
Francois van der Merwe (co-opted)

### **Centre of Excellence Board 2018**

Prof. Susan Bourne (Acting Dean of Science, UCT)  
Prof. Mike Cherry (Botany & Zoology, U. Stellenbosch)  
Prof. John Donaldson (SANBI)  
Prof. Michael Kyobe (Acting DVC Research, UCT, Chairperson)  
A/Prof. Muthama Muasya (HoD, Biological Sciences, UCT)  
Prof. Peter Ryan (FIAO)  
Nathan Sassman (NRF)  
Dr Marilet Sienaert (Research Office, UCT)  
Dr Hanneline Smit-Robinson (BirdLife South Africa)

---

FRONT COVER: An Atlantic Yellow-nosed Albatross *Thalassarche chlororhynchos* leans in to investigate the camera on the Long Ridge, Inaccessible Island. Non-breeding birds gather to socialise at prominent points called 'Molly knobs' by the Tristan islanders. Surveys conducted by Peter Ryan and Ben Dilley in conjunction with Tristan's Conservation Department in November 2018 show that numbers of this Endangered species have remained stable on Inaccessible Island since 2004 (Photo: Peter Ryan).

# Contents

- 1 Director's Report
- 3 Staff, Students and Associates
- 5 Research and education highlights

## **UNDERSTANDING BIODIVERSITY: EVOLUTIONARY AND BEHAVIOURAL ECOLOGY**

- 9 Co-evolutionary arms races in brood-parasites and their hosts
- 11 Evolution, ecology and conservation of honeyguide-human mutualism
- 13 Cooperation and population dynamics in the Sociable Weaver
- 15 Pied Babblers and Fork-tailed Drongos
- 17 Sociable Weaver nests as a resource
- 19 Understanding colour polymorphism in birds
- 21 Bird pollination in the Cape Floristic Region
- 23 Intra-African bird migration
- 25 Evolution in island birds and the 'insularity' syndrome
- 27 Smart beaks: non-visual senses in birds

## **MAINTAINING BIODIVERSITY: SPECIES-LEVEL CONSERVATION**

- 29 Impacts of power infrastructure
- 31 Conserving Verreaux's Eagles
- 33 Conserving Martial Eagles
- 35 Vulture conservation
- 37 Southern Ground-Hornbill conservation
- 39 Conserving Benguela endemic seabirds
- 42 Shorebirds under threat
- 43 Conserving Southern Ocean seabirds
- 45 Conserving islands and their birds

## **MAINTAINING BIODIVERSITY: GLOBAL CHANGE**

- 47 Hot Birds – climate change and desert birds
- 51 Global change and urban birds
- 53 Understanding the ecological impacts of Pied Crows
- 55 Understanding urban raptor populations
- 57 Plastics in the environment

## **TEACHING, OUTREACH, RESEARCH SUPPORT AND RESEARCH OUTPUT**

- 59 Conservation Biology Masters Programme 2018
- 61 Niven Library
- 63 SAFRING Report
- 64 Scientific publications 2018
- 72 Popular publications 2018
- 74 Key co-sponsors

# Director's Report

It is traditional to start this report with an overview of achievements in the year under review, but this year I'll keep it short. Suffice to say, 2018 was once again a successful year for the Fitztute, and the broader Centre of Excellence (CoE). We published 152 papers in peer-reviewed journals, including many in high impact-factor journals, the highest total ever in the Fitz's history, even surpassing the heydays of the Cooperative Scientific Programmes in the late 1980s. Even more gratifying is the high quality of journals in which many of these papers appeared, with 10% of papers in journals with two-year impact factors exceeding 5. Much of this success is due to the strongly collaborative nature of research at the Fitz, and thanks in no small part to the extended network of research associates at other institutions. We are immensely grateful to all our colleagues and partners for the role they play in helping the Fitz achieve its goal of being the leading ornithological research institute in Africa.



(Photo: Ben Dilley)

Our research was made accessible to a broader audience through 58 popular articles, one book and several book chapters, as well as through a wide range of traditional and social media channels. *African Birdlife*, the BirdLife SA magazine, plays a key role in this regard, accounting for more than half of the popular articles published. All these articles are available as pdfs that can be downloaded from the Fitz website. We are very grateful to the magazine for continuing to give the Fitz a regular slot for 'News from the FitzPatrick Institute', and from 2018 the magazine also has run a page on the Southern African Bird Atlas Project (SABAP). We also enjoy considerable support from *Wild*, the magazine sent quarterly to wildcard holders, and *SANParks Times*.

After the bumper class of seven PhD students graduating in 2017, only Beckie Garbett graduated from UCT in 2018, but three other PhD students from the University of Pretoria who are linked to the Fitz CoE also graduated: Ryan O'Connor, Darren Pietersen and Michelle Thompson. Two MSc students by dissertation also graduated: Christopher Jones from UCT and Danielle van den Heever from NMU, as did 13 conservation biology students: Rio Button, Sarah Catto, Sydney Davis, Shannon Dubai, Olli Hyvärinen, Caitlin Kelly, Leungo Leepile, Colleen Lindberg, Phoebe Mottram, Oyena Masiko, Franck Mavinga, David van Beuningen and Tapiwa Zimunya. Congratulations to them all.

On the staffing front, we saw the addition of Michael Brooks and Rene Navarro to the Fitz staff complement from January 2018. With the Animal Demography Unit (ADU) unable to continue to support their salaries in 2017, the Fitz was asked to try to save their positions, and with them, the ADU's many critically important citizen science projects, including SABAP. This transition has gone remarkably smoothly, and SABAP is being run in a partnership between the Fitz, the South African National Biodiversity Institute (SANBI), BirdLife SA, BirdLasser and the Statistics in Ecology, the Environment and Conservation (SEEC) research group at UCT. The SABAP steering committee has been reinstated, and BirdLife SA's Ernst Retief has volunteered to lead the day-to-day running of the programme, assisted by Robert Thomson. Sanjo Rose, a former SAFRING intern, has been appointed as social media officer for SABAP and the other citizen science projects. The challenge for 2019 will be ensuring continued funding to cover Michael and Rene's posts beyond March 2020, when the current contract with SANBI ends.

From January 2018, the Fitz also took back the running of SAFRING, the bird ringing scheme for much of Africa. This was more a case of necessity rather than a strategic decision. I am very grateful to Robert Thomson for accepting the challenge of leading SAFRING, with assistance from the Niven Librarian and NRF-funded intern, Leigh Kelly, who was largely responsible for the day-to-day running of SAFRING from April 2018 to March 2019.

Susan Mvungi, the Niven Librarian, left the Fitz at the end of 2018 to take up a position at UCT's Graduate School of Business. I was away when she handed in her notice, but Rob Little, who was Acting Director, was able to motivate for her post to be continued, and advertised internally within UCT (the standard practice now for all support posts within the University). We were fortunate to attract a very capable, experienced candidate, and recently welcomed Janine Dunlop as the new Niven Librarian. Post-doc Dayo Osinubi is also leaving us, having been offered a position with BirdLife International based in Ghana.

On a more personal note, I was privileged to spend three months on Inaccessible Island in 2018. I have managed to return to the island every 10 years to repeat various studies that commenced during my PhD in the late 1980s. I often advise students to establish long-term studies and maintain them throughout their careers, as our ability to detect environmental change is determined by the duration of the study. Long-



term studies are particularly valuable at remote sites, which are protected from local drivers of change, because they provide insights on large-scale global change drivers. And it doesn't get much more remote than Inaccessible Island. Some of the key findings are reported in the body of this report: seabird populations are stable or increasing, but the island's large-billed finches are under threat from an introduced scale insect, and the amounts of plastic washing up on the island's shores continue to increase.

However, our ability to detect environmental change depends not only on the duration of the study, but also on the rate at which the change occurs, and currently it's happening at an ever faster rate. Unfortunately, much of the change is for the worse. A recent study suggested that even if we meet the Paris Agreement targets (which seems very unlikely) we will be committed to an ice-free Arctic by 2050, and there is compelling evidence that the West Antarctic ice-sheet breaks up when atmospheric CO<sub>2</sub> exceeds 400 ppm. We passed this milestone in 2016, yet we continue to burn fossil fuels faster than ever. There's much talk about 'future proofing' institutions in the face of the fourth industrial revolution, but how do we future proof our society in a world where 200 million people have to move because of sea level rise? Under these conditions, conservation will be the last thing on people's minds.

2019 is the 60<sup>th</sup> anniversary of the Fitztute's formation. The world has changed a lot over this period, but it will change even more over the next 30 years. Our challenge is to make that change as positive as possible. This is particularly challenging in a South Africa struggling to rebuild from the crippling impacts of widespread corruption. The national agenda is understandably focused on job creation and economic growth, but we cannot sustain either without a stable, predictable environment. It is worrying that in his State of the Nation address in February 2019, President Ramaphosa made no mention of the environment. We need to alter peoples' attitude to the environment from a nice-to-have luxury, to an essential foundation for modern society, because we cannot afford to continue on the business-as-usual trajectory. Protesting at parliament every Friday is a step in the right direction, but not if people drive there in their cars.

**Peter Ryan, March 2019**



Greta Thunberg, the Swedish teen activist who started the Friday protest against climate change. Outraged youths whose futures are being stolen are giving more prominence to the debate on climate change, but we need much more radical action, akin to the wholesale restructuring of economies during the Second World War, if we are to move away from the business-as-usual trajectory that is condemning us to catastrophic climate change in the next few decades. (Photo taken from the Internet).

# Staff, Students and Associates

## UCT GRADUATES

### PhD

Rebecca Garbett

### MSc

Chris Jones

### Conservation Biology MSc

Rio Button, Sarah Catto, Sydney Davis,  
Shannon Dubay, Olli Hyvärinen, Caitlin Kelly,  
Leungo Leepile, Colleen Linder, Oyena Masiko,  
Franck Mavinga, Phoebe Mottram,  
David van Beuningen, Tapiwa Zimunya

## NEW UCT STUDENTS

### PhD

Emmanuel Adekola (Peter Ryan); Benjamin  
Murphy (Susan Cunningham); Nick Pattinson  
(Susan Cunningham)

### MSc

Abigail Ramudzuli (Peter Ryan); Miqayla Stofberg  
(Arjun Amar and Susan Cunningham), Eleanor  
Weideman (Peter Ryan)

**Upgrade from MSc to PhD:** Carla du Toit  
(Susan Cunningham); Luke McClean (Claire  
Spottiswoode)

### Conservation Biology MSc

Eleven students began the CB MSc in January 2018.

### BSc Hons

Billi Krochuk (Robert Thomson); Samantha Kirves  
(Arjun Amar); Jess Lund (Robert Thomson)

## Academic Staff

### Director:

Prof. Peter Ryan, PhD (Cape Town)

### Academic and Research Staff:

Dr Arjun Amar, PhD (Aberdeen)  
Dr Susan Cunningham, PhD (Massey)  
Prof. Claire Spottiswoode, PhD (Cambridge)  
Dr Robert Thomson, PhD (Oulu)

### Honorary Professor:

Prof. David Cumming, PhD (Rhodes)

### External CoE Team Members

Asst Prof. Rauri Bowie, PhD (Cape Town) – UC, Berkeley  
Prof. Derek Engelbrecht, PhD (Limpopo) – U. Limpopo  
Prof. Andrew McKechnie, PhD (Natal) – U. Pretoria  
Dr Pierre Pistorius, PhD (Pretoria) – NMU  
Dr Chevonne Reynolds, PhD (Cape Town) – Wits

### Honorary Research Associates

Dr Phoebe Barnard, PhD (Uppsala)  
Dr Rita Covas, PhD (Cape Town)  
Prof. Graeme Cumming, PhD (Oxford)  
Dr Tom Flower, PhD (Cambridge)  
Dr David Grémillet, PhD (Kiel)  
Prof. Steven Redpath (PhD, Leeds)  
Assoc. Prof. Mandy Ridley, PhD (Cambridge)  
Dr Rob Simmons, PhD (Wits)  
Dr Ross Wanless, PhD (Cape Town)

### Honorary Research Affiliate

Dr Azwianewi Makhado, PhD (Cape Town)

### Research Associates

Dr Steve Boyes, PhD (KwaZulu-Natal)  
Dr Callan Cohen, (PhD, Cape Town)  
Dr Timothée Cook, PhD (La Rochelle)  
Dr Richard Dean, PhD (Cape Town)  
Dr Claire Doutrelant, PhD (Paris)  
Dr Robert Flood (PhD, City University, London)  
Dr Gabriel Jamie, PhD (Cambridge)  
Dr Andrew Jenkins, PhD (Cape Town)  
Dr Genevieve Jones, PhD (Cape Town)  
Dr Grant Joseph, PhD (Cape Town)  
Dr Alan Lee, PhD (Manchester Metropolitan)  
Dr Ian Little, PhD (Cape Town)  
David Lloyd-Jones, BSc Hons (Canterbury)  
Dr Kristi Maciejewski, PhD (NMU)  
Dr Rowan Martin, PhD (Sheffield)  
Dr Martim Melo, PhD (Edinburgh)  
Dr Antoni Milewski, PhD (Murdoch)  
Michael Mills, MSc (Cape Town)  
Prof. Sue Milton, PhD (Cape Town)  
Dr Lorien Pichegru, PhD (Strasbourg)  
Dr Sebataolo Rahlao, PhD (Cape Town)  
Dr Yan Ropert-Coudert (PhD, NIPR, Tokyo, Japan)  
Dr Colleen Seymour, PhD (Cape Town)  
Dr Jessica Shaw, PhD (Cape Town)  
Dr Richard Sherley, PhD (Cape Town)  
Dr Antje Steinfurth, PhD (Kiel)  
Dr Gareth Tate, PhD (Cape Town)  
Dr Jane Turpie, PhD (Cape Town)  
Jessie Walton

## Support Staff

### Manager, DST-NRF CoE:

Dr Rob Little, PhD (Cape Town)

### Principal Technical Officer:

Gonzalo Aguilar

### Administrative Assistant:

Hilary Buchanan BA, HDipLib (Cape Town)

### Senior Secretary, DST-NRF CoE:

Carmen Smith

### Departmental/Accounts Assistant:

Anthea Links

### Niven Librarian:

Susan Mvungi MSc (Cape Town)

### Niven Library Assistant:

Phelisa Hans

### Ad Hoc Research Assistants:

Amy Bruce, Elsa Bussiere, Christie Craig, Ben Dilley, Thobile Dlamini, Campbell Fleming, Carrie Hickman, Sally Hofmeyr, Samantha Kirves, Alan Lee, Anthony Lowney, Shane McPherson, Lesedi Moagi, Christie Munro, Kirsten Packer, Nola Parsons, Vonica Perold, Natasha Pindral, Jennica Poongavanan, Sanjo Rose, Vhuawelo Simba, Jessleena Suri, Terriann Thavar, Zingfa Wala, Kyle Walker

## Students

### Post-doctoral fellows

Dr Diana Bolopo, PhD (Valladolid)  
Dr Anina Coetzee, PhD (Stellenbosch)  
Dr Susan Miller, PhD (TUT)  
Dr Megan Murgatroyd, PhD (Cape Town)  
Dr Dayo Osinubi, PhD (Christchurch)  
Dr Margaux Rat, PhD (Cape Town) Jan-Mar  
Dr Petra Sumasgutner, PhD (Vienna)

### Doctoral

Emmanuel Adekola, MSc (Jos)  
Amanda Bourne, MSc (Cape Town)  
Christiaan Brink, MSc (Cape Town)  
Daniël Cloete, MSc (Cape Town)  
Ben Dilley, BSc (Hons) (Cape Town)  
Carla du Toit, BSc (Hons) (Cape Town)  
Selena Flores, BSc (San Diego)  
Rebecca Garbett, BSc (Hons) (Kent)  
Anthony Lowney, MSc (Manchester)  
Luke McClean, BSc (Queens)  
Carina Nebel, MSc (Vienna)  
Stefan Schoombie, MSc (Cape Town)  
Kim Stevens, BSc (Hons) (Cape Town)

### MSc by dissertation

Campbell Fleming, BSc (Hons) (Cape Town)  
Laurie Johnson, BSc (Hons) (Cape Town)  
Chris Jones, BSc (Hons) (KwaZulu-Natal)  
Kyle-Mark Middleton, BSc (Hons) (Pretoria)  
Ditiro Moloto, BSc (Hons) (Limpopo)  
Alexis Osborne, BSc (Hons) (Cape Town)  
Abigail Ramudzuli, BSc (Hons) (Limpopo)  
Miqayla Stofberg, BSc (Hons) (Cape Town)  
Rona van der Merwe, BSc (Hons) (Stellenbosch)  
Eleanor Weideman, BSc (Hons) (Cape Town)

## Masters in Conservation Biology 2018/19

Kerry-Ann Grey, BSc (Stellenbosch)  
Amy Hoffenberg, BSc (Hons) (Cape Town)  
Sandra Hörbst, BSc (Leopold-Franzens)  
Xolani Mabaso, BSc (Hons) (UKZN)  
Rebecca Muller, BSc (Hons) (Cape Town)  
Thinabakho Ncube, BSc (Hons) (Wits)  
Michelle Schroeder, BSc (Humbolt State)  
Clara Steyn, BSc (Hons) (Cape Town)  
Daryl van der Merwe, BSc (Hons) (Pretoria)  
Olivia Venter, BSc Chem Eng (Cape Town)  
Joshua Weiss, BSc Hons (Wits)

## Masters in Conservation Biology 2017/8

Rio Button, BSc (Hons) (Cape Town)  
Sarah Catto, BSc (Hons) (Cape Town)  
Sydney Davis, BSc (San Diego)  
Shannon Dubay, BSc (James Madison)  
Olli Hyvärinen, BSc (Hons) (Leiden)  
Caitlin Kelly, BA (Virginia)  
Leungo Leepile, BSc (Botswana)  
Colleen Lindberg, BSc (Nebraska)  
Oyena Masiko, BSc (Hons) (UNISA)  
Franck Mavinga, BSc Eng (Brazzaville)  
Phoebe Mottram, BSc (Hons) (St Andrews)  
David van Beuningen, BSc (Hons) (Cape Town)  
Tapiwa Zimunya, BSc (Hons) (Chinhoyi)

### BSc Honours

Billi Krochuk, Samantha Kirves, Jess Lund

## Externally registered students

### Postdoctoral fellow:

NMU - Dr Alistair McInnes, PhD (Cape Town)  
Cambridge - Dr Gabriel Jamie

### Doctoral

Cambridge - Tanmay Dixit  
Montpellier - André Ferreira, Aloïs Robert  
NMU - Tegan Carpenter-Kling, Katharina Reusch,  
Gwendoline Traisnel  
Oulu - Jere Tolvanen  
Porto - Rita Fortuna, Sandra Reis  
Pretoria - Celiwe Ngcamphalala, Matthew Noakes, Ryan  
O'Connor; Darren Pieterse, Michelle Thompson  
Rhodes - Krista Oswald  
UCT - Edmund Rodseth (MCB)  
Western Australia - Camilla Soravia

### MSc by dissertation

CIBIO, Porto - Inês Duarte, Sandra Esteves, Barbara  
Freitas, António Viera  
Lund - Johan Jensen  
Montpellier - Louis Bliard  
NMU - Ilana Engelbrecht, Tayla Ginsberg, Lilli Ruiters,  
Makabongwe Sigqala, Danielle van den Heever  
Oulu - Mira Sassi  
Pretoria - Shannon Conradie, Ryno Kemp,  
MphoMalemata, Barry van Jaarsveld

### BSc Honours

NMU - Oliver Hartley, Natasha Shilubane  
Pretoria - Emma Jepson, Monique van Dyk

# Research and education highlights

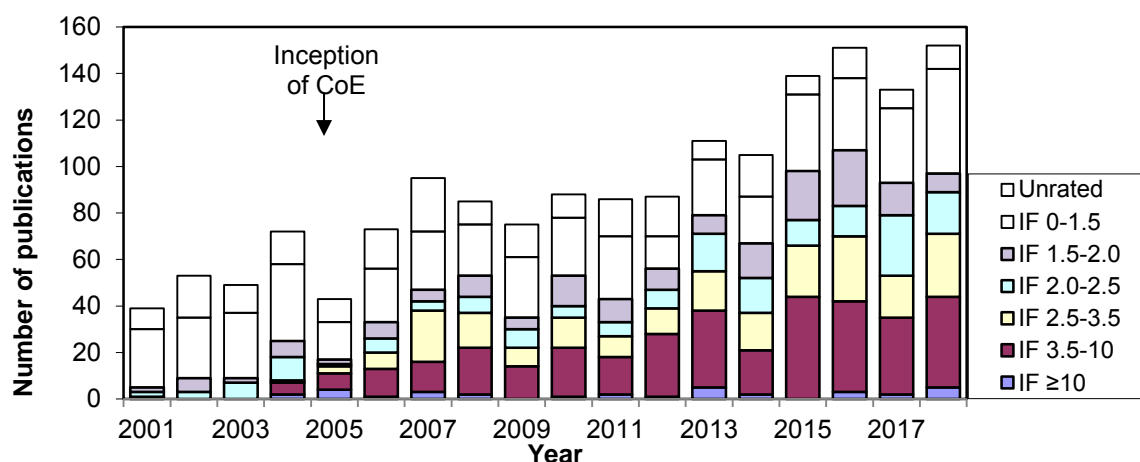
- The FIAO conducted 32 research projects during 2018 with a new project on micro-plastics pollution.
- The FIAO CoE supported 22 PhDs, 39 MScs and 8 Post-doctoral Fellows.
- Post-doc Petra Sumasgutner received a L'Oréal UNESCO Women in Science award.
- Prof. Peter Ryan gave an invited plenary talk on 'Seabird Conservation – a Southern Hemisphere Perspective' at the 27<sup>th</sup> International Ornithological Congress (IOC) held in Vancouver, Canada, during August 2018
- Five conference presentation awards were received by Fitz students.
- 152 papers in peer-reviewed journals, including 44 papers in journals with ISI science impact factor ratings of  $\geq 3.5$  were published.
- 57 popular articles, 1 book and 4 book chapters in were published.
- CoE members served on the editorial boards of 30 scientific journals and reviewed 122 papers for 67 peer-reviewed journals.

## Research activities:

The FIAO conducted 32 research projects during 2018. A new project on micro-plastics pollution was started by Prof. Peter Ryan which entailed bulk sampling surface ocean water and highlighted the widespread occurrence of microfibrils (presumably mainly from washing machine effluent) throughout the oceans. MSc student Eleanor Weideman also sampled several major rivers in South Africa to assess the importance of the region as a source for marine

microplastics and began analyses of spatial and temporal patterns in microplastics around the South African coast over the last two decades.

The Fitz continued to exceed its publication target with 152 papers published in peer-reviewed journals in 2018, including 44 papers in journals with ISI science impact factor ratings of  $\geq 3.5$  (see below). One book, four chapters in semi-technical books and 57 popular articles were also published.



Trends in the number and quality of Fitz CoE publications (measured by journal 'Impact Factors' IF) before and after the establishment of the Centre of Excellence.





Southern Ground-Hornbills *Burcorvus leadbeateri* have experienced a two-thirds reduction in their South African range in the past 100 years (Photo: Kate Carstens).

#### **Education and training:**

During 2018, the Fitz CoE supported 22 PhD, 39 MSc and two BSc Honours students, of whom 15 (24%) were black and 35 (56%) were women. Eight Postdoctoral Fellows were registered. The centre graduated 21 students during 2018 (4 PhD, 2 MSc by dissertation, 13 MSc Conservation Biology and 2 BSc Honours). Post-doc Petra Sumasgutner received a L'Oréal UNESCO Women in Science award in October 2018.

Recent Fitz PhD graduate Chevonne Reynolds was appointed to a lectureship position at the University of the Witwatersrand in January 2018 and a new research collaborative partnership has been established with her as a Research Associate of the Fitz.

#### **Collaboration and service rendering:**

FIAO CoE members served on the editorial boards of 30 scientific journals and as members of 76 relevant membership and advisory fora. They also served the broader scientific community by participating on scientific steering committees and working groups and by reviewing project proposals for science funding agencies and reviewed 122 papers for 67 peer-

reviewed international and local journals during 2018.

The Fitz conducted a broad range of close collaborative working relationships with at least 100 scientific peers and a variety of conservation NGOs and governmental organisations both nationally and internationally. The Fitz continues to build much-needed African capacity in the broad arena of biodiversity conservation. Seven prominent research and conservation partners visited the Fitz and presented seminars during 2018.

The transfer of the Animal Demography Unit (ADU) databases to the Fitz in January 2018 has significantly increased the information brokerage capacity of the institute making the diverse range of web-based databases freely available to users across the world.

CoE Manager Dr Rob Little and MSc student Kyle-Mark Middleton participated in developing a Biodiversity Management Plan (BMP) for the Southern Ground-Hornbill with the Department of Environmental Affairs (DEA), relevant provincial conservation agencies and other stakeholders during May 2018 which will be

implemented in collaboration with the DEA and SANBI.

#### **Information brokerage:**

Fitz staff and students presented research findings at 16 international and nine local conferences during 2018, receiving five presentation awards. They also presented more than 50 seminars and illustrated talks at numerous universities, bird clubs, and membership-based societies, and maintained a broad range of collaborative working relationships with scientific peers and a variety of conservation NGOs and governmental organisations, both nationally and internationally.

Six staff, 10 students and Post-docs presented their research outputs at the 27<sup>th</sup> International Ornithological Congress (IOC) held in Vancouver, Canada during August 2018, which attracted 1700 delegates from around the world. Prof. Peter Ryan gave an invited plenary talk on 'Seabird Conservation – a Southern Hemisphere Perspective'. A/Prof. Arjun Amar and Post-doc Petra Sumasgutner presented in their symposium on 'Human-raptor Interactions: from Conservation Priorities to Conflict Mitigation'; Dr Susie Cunningham contributed to one titled 'Towards a Mechanistic

Understanding of Avian Responses to Climate Change'; Dr Robert Thomson highlighted how birds can share nests in a session on 'The Form and Function of Birds' Nests'; Post-doc Megan Murgatroyd talked about senescence in raptors in the symposium 'Population and Individual Ecology: Population Dynamics'; and CoE core team member Prof. Andrew McKechnie highlighted the challenges of keeping cool in a symposium on 'Avian Energetics in a Changing World' and served as a member of the IOC Scientific Programme Committee. Several students gave speed talks to accompany their poster presentations.

The Fitz and BirdLife South Africa co-hosted the fourth biennial conference *Learn About Birds (LAB)* at Club Mykonos, Langebaan during March 2018. The conference was attended by over 300 delegates and was regarded as a great success, particularly for young scientists. Six CoE staff members and 18 CoE students attended the conference.

Prof. Peter Ryan was invited by the Royal Society of South Africa and the Academy of Science of South Africa to give a public lecture titled 'Seabirds: their biology and conservation' at the South African Astronomical Observatory (SAAO) Auditorium in June 2018.

Prof. Claire Spottiswoode gave the Stamford



Delegates at the 2018 Learn About Birds (LAB) conference at Club Mykonos, Langebaan (Photo: Albert Froneman).





Lappet-faced Vultures *Torgos tracheliotos* are among the six raptor species showing the greatest declines in northern Botswana (Photo: Maans Booysen).

Raffles Lecture at the Zoological Society of London in June 2018 as well as seminars at the University of Lausanne, Switzerland (April); EO Wilson Laboratory of Biodiversity, Gorongosa National Park, Mozambique (October); and at the University of Roehampton, London (November).

#### **Select research highlights:**

In April 2018, the Editor of *Ibis* (Vol. 160 Issue 2) selected the Jess Shaw et al. paper titled “High power line collision mortality of threatened bustards at a regional scale in the Karoo, South Africa” as the top paper highlighting avian science.

A paper on the origins of the Inaccessible Island Rail with Prof. Peter Ryan and Dr Martin Melo as authors published in the journal *Molecular Phylogenetics and Evolution* attained the highest ever Altmetric score for that journal and received substantial exposure in over 100

media outlets and in 19 languages around the world.

A research paper by A/Prof. Arjun Amar and PhD student Rebecca Garbett on birds of prey fast disappearing from one of Africa's last great wilderness areas in Botswana was featured as a Global Source of Science News EurekAlert! titled ‘Scientists stunned by decline of birds during epic Southern African road trip’ in June 2018.

#### **Looking ahead:**

As one of the original six CoEs whose third 5-year cycle of DST-NRF support comes to an end in 2019, the Fitz submitted a sustainability framework document to the DST in November 2018 which includes a sustainability plan and a vision and alignment document to motivate for continued funding beyond 2019. The DST has committed to table an umbrella sustainability framework outlining the future of the six CoEs in May 2019.

# Coevolutionary arms races in brood parasites and their hosts

Coevolution is the process by which two or more species reciprocally influence one another's evolution, and can escalate to produce beautifully refined adaptations. Brood-parasitic birds, the cheats of the bird world, give us an ideal opportunity to study coevolution in the wild. Coevolutionary "arms races" can arise as hosts evolve defences such as rejecting parasitic eggs, which imposes natural selection for parasitic counter-adaptations such as mimicry of host eggs, and in turn for ever more sophisticated defences from hosts. At the FitzPatrick Institute, three long-term projects address different aspects of this fascinating model system for coevolution.

Robert Thomson's team work in Finland focusing on how host pairs of Common Redstarts *Phoenicurus phoenicurus* can decrease the chance of a Common Cuckoo *Cuculus canorus* laying an egg in their nest. Hosts that are able to avoid parasites would decrease the fitness costs of parasitism; the earlier that avoidance occurs during the breeding cycle would further minimize these costs. Therefore, adaptations occurring prior to egg laying would be especially beneficial for hosts. The Finnish project investigates frontline defences used by hosts and counter-adaptations by parasites, especially during nest site and territory location decisions which have received almost no attention to date. Redstarts are the only regular cuckoo hosts that breed in cavities; this aspect challenges adult cuckoos during egg laying and also challenges cuckoo chicks during the phase of evicting host eggs/chicks.

Claire Spottiswoode's team works in Zambia on three general questions. First, how do interactions between species generate diversity among individuals? Specifically, how do biological arms races between hosts and parasites shape phenotypic diversity in both parties? For example, parasites diversify to mimic multiple hosts, and in response hosts sometimes diversify with defensive adaptations to foil mimicry, such as visual 'signatures' of identity. Second, how is specialisation to different coevolutionary partners genetically maintained? The genetic basis of signature-forgery arms races played out by brood parasitic birds is currently almost entirely unknown. In collaboration with Prof. Michael Sorenson and his lab at Boston University, we are using



Tanmay Dixit collecting data during an egg rejection experiment (Photo: Claire Spottiswoode).

genomic approaches to ask how specialised adaptations to different host species (mimicry of host eggs) are maintained within a single parasitic species (Cuckoo Finches *Anomalospiza imberbis* and Greater Honeyguides *Indicator indicator*) in the absence of parasite speciation. Reciprocally, we are also interested in the genetic basis of host defences, and whether convergent genetic mechanisms have evolved in their corresponding parasitic mimics. Third, what is the role of phenotypic plasticity (such as developmental differences and learning) in coevolution? We are interested in how such plasticity might facilitate parasitic exploitation of new host species in the initial absence of appropriate genetic adaptations, and addressing this both within and between species of parasitic finches and honeyguides.



Fitz Research Associate Jessie Walton has been studying a population of Brown-backed Honeybirds *Prodotiscus regulus* which parasitise Karoo Prinias *Prinia maculosa* at a high rate in the Bot River area of the Western Cape. Among the Brown-backed Honeybirds' remarkable adaptations that we are investigating are their blue eggs, highly unusual in piciform birds, that broadly mimic those of their hosts. Moreover, up to three honeybird chicks are raised in the same host nest, despite killing host young with their bill hooks. How honeybirds escape being killed by their nestmates remains an intriguing mystery.

### Activities in 2018

- The field season in Finland continued with a smaller than usual field team which focused on continuing the long-term data on redstart nest location decisions and their parasitism rates.
- In the rainy season in Zambia, Dr Gabriel Jamie completed sampling for his research on the genetic basis of egg signatures in Tawny-flanked Prinias; sequencing is now underway. Interns Tanmay Dixit and Jana Riederer successfully carried out projects on Cuckoo Finch-host interactions, and Tanmay began his PhD on this topic at the University of Cambridge later in 2018.
- In the dry season in Zambia, Luke McClean completed his final season of field experiments on honeyguide-host interactions before writing up his PhD, and hosted a visiting PhD student from Royal Holloway University of London.
- In the Cape spring, Jessie Walton carried out a successful field season on Brown-backed Honeybirds.

### Highlights:

- Jere Tolvanen defended and received his PhD entitled 'Informed habitat choice in the heterogeneous world: ecological implications and evolutionary potential'.
- Amongst other outreach activities in Zambia, Gabriel Jamie and the field team hosted the Livingstone Museum's newly-appointed ornithologist, Maggie Mwale, at our field site for a week and assisted with capacity building.
- Gabriel Jamie was a selected speaker at the Joint Congress on Evolutionary Biology, Montpellier, France, giving a talk on

indigobird and whydah speciation.

- Claire Spottiswoode co-edited a special issue of *Philosophical Transactions of the Royal Society of London B*, entitled "The co-evolutionary biology of brood parasitism: from mechanism to pattern" (published Feb 2019).



A Cuckoo Finch chick begging in a Zitting *Cisticola juncidis* nest in the 2018 rainy season (Photo: Claire Spottiswoode).

### Key supporters

DST-NRF CoE grant; Academy of Finland; Finnish Cultural Foundation, University of Oulu graduate School; Biotechnology and Biological Sciences Research Council (BBSRC); The Leverhulme Trust.

### Research team

Prof. Claire Spottiswoode (FIAO, UCT and U. Cambridge)

Dr Robert Thomson (FIAO, UCT)

Dr Nicholas Horrocks (U. Cambridge)

Dr Gabriel Jamie (U. Cambridge)

Dr Jukka Forsman (U. Oulu, Finland)

Prof. Michael Sorenson (U. Boston)

Dr Rose Thorogood (U. Helsinki, Finland)

Jessie Walton (FIAO, UCT)

**Students:** Jere Tolvanen (PhD, Oulu); Tanmay Dixit (PhD, Cambridge); Luke McClean (MSc, UCT); Mira Sassi (MSc, Oulu).

### Research assistants:

Finland: Carles Dura, Verity Bridger, Vicky Pritchard.

Zambia: Silky Hamama, Lazaro Hamusikili, Oliver Kashembe, Kiverness Moono, Collins Moya, Gift Muchimba, Sylvester Munkonka, Sanigo Mwanza, Calisto Shankwasiya and many others.

# Evolution, ecology and conservation of honeyguide-human mutualism

This project focusses on a unique mutualism: the foraging partnership between the Greater Honeyguide *Indicator indicator* and human honey-hunters whom it guides to bees' nests. Honeyguides know where bees' nests are located and like to eat beeswax; humans know how to subdue the bees using fire, and open nests using axes. By working together, the two species can overcome the bees' defences, with benefits to both. Remarkably, this relationship has evolved through natural selection, rather than through training or domestication which underpins cooperation by other human foraging partners such as dogs or falcons. The honeyguide-human system provides a wonderful opportunity to study the ecology and evolution of mutualisms in nature, because local human and honeyguide populations vary strikingly in whether and how they interact, and because we can readily manipulate these interactions experimentally.

Claire Spottiswoode and her team have been studying human-honeyguide interactions since 2013 in the Niassa National Reserve of northern Mozambique, collaborating with the honey-hunting community of Mbamba village, and receiving crucial support from the Mariri Environmental Centre led by Dr Colleen Begg and Keith Begg of the Niassa Carnivore Project. A key focus so far has been investigating reciprocal communication between the two parties: not only do honeyguide signal to humans, but in many different cultures humans signal back to honeyguides, giving special calls to attract honeyguides and maintain their attention while following them. Among the Yao honey-hunters of northern Mozambique, this call is a loud trill followed by a grunt: "brrrr-hm!". In 2016, using a field experiment, we showed that honeyguides were twice as likely to initiate a cooperative interaction with humans who made this sound compared to humans giving control human and animal sounds, and three times as likely to successfully lead such humans to honey. So honeyguides use these specialised signals to choose partners who are likely to be good collaborators, in a two-way conversation between our own species and a wild animal, from which both partners benefit.

Supported by a Consolidator Grant from the European Research Council, we are now asking whether learning is involved in maintaining a geographical mosaic of honeyguide adaptation to local human cultures; how such reciprocal communication between humans and honey-

guides mediates their interactions; what the effects of cultural co-extinctions may be on each partner and their ecosystems; and ultimately, we hope, how quickly such cultures can be re-ignited following their loss. In so doing we hope to test for the first time the hypothesis that reciprocal learning can give rise to matching cultural traits between interacting species. Understanding the role of such phenotypic plasticity is crucial to explain how and why the outcome of species interactions varies in space and time, and to predict how they will respond to a rapidly changing world.

Our research is conducted primarily in the Niassa National Reserve in Mozambique, with the support and cooperation of the Mariri Environmental Centre, and the community and traditional chiefs of Mbamba and Nkuti Villages. Here our research project is known as 'Projecto Sego' (sego is greater honeyguide in the Yao language), and heavily involves the local community in independent data collection as well as assistance with our field sampling and experiments.

## Activities in 2018

- From May to October, David Lloyd-Jones and local data manager Orlando Ncuola managed and provided ongoing training and support to 20 honey-hunters collecting data on their own activities. This has been enabled by a custom app we developed together with the company HabitatInfo.
- From May to June, David Lloyd-Jones and

Claire Spottiswoode carried out behavioural experiments designed to test whether young honeyguides refine their guiding behaviour through learning.

- During October, Dominic Cram, Jessica van der Wal, David Lloyd-Jones and Claire Spottiswoode captured and colour-marked honeyguides in our study area, to establish a marked population for future experimental work, and trialled methods for experiments that which will continue on a larger scale in 2020.
- UCT collaborator Prof. Timm Hoffman joined us in the field to advise on methods for the vegetation and landscape ecological components of the project.

### Highlights:

- Twenty honey-hunters have already collected high-quality data on hundreds of honey-hunting trips, involving thousands of interactions with honeyguides. This directly involves Niassa's community in our data collection, providing them with additional sources of income and allowing us to cooperate in scientific research.
- We celebrated our first year of honey-hunter data-collection with a 'Festa' at Mariri Environmental Centre in May 2018, honouring the teamwork and attention to detail of the honey-hunter team, and awarding prizes for data and photo quality and care of equipment.
- We have established a colour-ringed population of over 100 greater honeyguides, plus smaller numbers of lesser and scaly-throated honeyguides (which eat wax but do not guide humans) in our study area.
- The research team continue to carry out regular outreach activities in Mozambique, giving presentations to groups of school learners, visiting the Mariri Environmental Centre from various towns and villages in Niassa Province. Claire also contributed a week-long module on research design and scientific writing to the Masters course at the Edward O. Wilson Biodiversity Laboratory, Gorongosa National Park which trains young conservation biologists from all over Mozambique (a joint initiative between Lúrio University, Zambeze University, and Manica Higher Polytechnic Institute).
- Claire presented findings from the project in research talks in Mozambique, the USA, UK,

and Switzerland, including the 2018 Stamford Raffles Lecture of the Zoological Society of London.

### Impact of the project

This project is allowing us to involve rural communities in understanding a unique human-animal relationship. We hope this study will further our understanding of how mutualisms evolve, and specifically how learnt traits mediating mutualisms may coevolve with one another. Understanding mutualisms is broadly relevant because they help to shed light on the evolution of mutualisms is important because it sheds light on the mechanisms that can maintain cooperation among unrelated individuals. It is also important for effective conservation, because mutualisms can have a wide reach in ecological communities. The honeyguide-human mutualism has already died out from large parts of Africa, as the continent develops. It would be a tragedy if it vanished altogether before we fully understood this part of our own evolutionary history.



Research assistants Orlando Iassine and Musaji Muemede with a male greater honeyguide we have just caught in a snap-trap baited with wax (Photo: Claire Spottiswoode).

### Key supporters

European Research Council; National Geographic Society; Max Planck Institute for Evolutionary Anthropology; DST-NRF CoE grant.

### Research team

Prof. Claire Spottiswoode (FIAO, UCT and, U. Cambridge)  
 David Lloyd-Jones (FIAO-UCT)  
 Dr Jessica van der Wal (FIAO, UCT)  
 Orlando Ncuella (Niassa Carnivore Project)  
 Dr Dominic Cram (U. Cambridge)  
 Dr Brian Wood (U. California Los Angeles)  
 Prof. Timm Hoffman (Biological Sciences, UCT)  
 Dr Colleen Begg (Niassa Carnivore Project)  
 Keith Begg (Niassa Carnivore Project)



# Cooperation and population dynamics in the Sociable Weaver

The aptly named Sociable Weaver *Philetairus socius* is a highly social species that is endemic to the Kalahari region of southern African. As the common name suggests, these weavers work together to accomplish diverse tasks, from building their highly distinctive thatched nests to help raising the chicks and defending the nest and colony mates from predators. Their fascinating social structure and different types of cooperative behaviours make them an ideal study model to investigate the benefits and costs of sociality and the evolutionary mechanisms that allow cooperation to evolve and be maintained.

Cooperation among family members is relatively easy to explain, since close kin share a large proportion of genes, and hence by helping close relatives achieving higher survival or reproductive output, the cooperative individual is contributing to spread its own genes in the population. In Sociable Weavers, many cooperative interactions take place among family members. For example, older offspring help the parents feed their siblings, clean the nest and contribute to maintain the family's nest chamber. However, some cooperative behaviours such as the communal nest building that allows the colony structure to be maintained is conducted by related and unrelated individuals, and nest defence against predators may also involve relatives and non-relatives of the nests under attack.

Currently, one of the main focuses of the Sociable Weaver Project, led by Rita Covas in

collaboration with Claire Doutrelant, is to investigate whether there are benefits of cooperating that go beyond kin selection. In particular, we are interested in finding out whether more cooperative individuals are preferentially chosen as mates or as social partners. This could lead to higher reproductive success or higher survival and provide an additional mechanism favouring investment in cooperative tasks as opposed to cheating. Research being undertaken at our study site in Benfontein, near Kimberley is collecting data on cooperative investment, patterns of social association and mating patterns to investigate these hypotheses.

Another of our main research interests is the interaction between sociality and environmental conditions. Do social factors influence individual life-history strategies and population trends? We have been investigating the role of maternal investment in relation to social and climatic factors and how these influence individual fitness. In addition, we use the project's long-term demographic data to investigate questions related to how environmental change affects crucial population parameters and how this interacts with social factors to determine population outcomes. Under the current climate change scenario, the frequency and intensity of extreme weather events such as droughts and heat waves is predicted to increase, and cooperative species may be better equipped to cope with these extreme adverse conditions than non-cooperative species.



MSc student Louis Bliard shakes the frost off the mist-nets during an unusually cold and wet morning at the beginning of September 2018. The study colonies are captured every year. (Photo: Claire Doutrelant).

## Activities in 2018

- The 2017-2018 breeding season lasted eight months. The Sociable Weavers at the 14 study colonies produced 1 166 eggs. But as a result



of predation and other losses, only 352 chicks fledged.

- Post-doc Nora Carlson conducted an experiment to investigate whether male helpers are more cooperative in the presence of females by simulating the presence of different audiences using playbacks.
- During the annual captures in Aug-Sept we captured all the colonies known in our study area (a total of 28 colonies and 1 147 birds). This will allow us to study the movement between these colonies and the factors influencing dispersal and colony size trends.
- We started to collect social network data in an automatic way using a system based on PIT-tags and RFID readers developed by PhD student André Ferreira in collaboration with Damien Farine (Max Planck Institute). This system is now operating at five colonies and a paper on social networks was submitted for publication.
- Two MSc students joined the project to study the effects of cooperation and breeding group size on the survival of helpers (Louis Bliard, U. Montpellier) and on the interactive effects of climate and social factors on reproductive output (António Vieira, CIBIO, U. Porto).
- A strong drought, probably in combination with unusually high temperatures, prevented the normal breeding activity that should have started in September 2018, and therefore seriously affected our research effort, which is largely based around reproduction.

### Highlights

- A paper published by Rita Covas and Claire Doutrelant in *Trends in Ecology and Evolution* appeared online in December 2018.
- A paper by former MSc student Liliana Silva showing a cost of dominance for Sociable Weaver females was published in *Animal Behaviour*.
- Rita Covas gave a talk at the Oppenheimer De Beers Group Research Conference in Johannesburg.
- PhD student Rita Fortuna presented her work at both the European Conference on Behavioural Biology in Liverpool, UK and at the Oppenheimer De Beers Group Research Conference in Johannesburg.
- Post-doc Pietro D'Amelio joined the project in Sept on a contract from U. Paris-Sud. Pietro has been awarded a Claude Leon fellowship



Feeding stations equipped with RFID antennas are now operating at five colonies to automatically collect data on associations between individuals (Photo Cécile Vansteenbergh).

through UCT from April 2019.

- MSc students Sandra Esteves and Inês Duarte graduated from CIBIO, U. Porto. Their projects focused on personality syndromes and the link between cooperation and dominance, respectively.
- Two new MSc students António Vieira (CIBIO, U. Porto) and Louis Bliard, (U. Montpellier) joined the project.

### Impact of the project

The long-term nature of this project allows unique insights to understand the evolution of cooperation and the mechanisms that allow it to persist. The demographic data allow for examination of the factors affecting population dynamics in relation to environmental change.

### Key supporters

The Foundation for Science and Technology (FCT), Portugal; French Research Agency; ANR, France; DST-NRF CoE grant; LIA Biodiversity.

### Research team

Dr Rita Covas (FIAO, UCT and CIBIO, U. Porto)  
 Dr Claire Doutrelant (FIAO, UCT and CNRS, France)  
 Dr Fanny Rybak (U. Paris-Sud, France)  
 Dr Nora Carlson (CIBIO, U. Porto)  
 Dr Pietro D'Amelio (U. Paris-Sud, France)  
 Dr Damien Farine (Max Planck Institute, Germany)

**Students:** André Ferreira (PhD, U. Montpellier); Rita Fortuna (PhD, U. Porto), Inês Duarte (MSc, CIBIO), Sandra Esteves (MSc, CIBIO), António Vieira (MSc, CIBIO), Louis Bliard (MSc, U. Montpellier)

**Research Assistants:** Franck Théron, Liliana Silva, Rita Leal, Ryan Olinger, Barbara Alonso, Corey Jeal, Cécile Vansteenbergh, Annick Lucas, Samuel Perret.

# Pied Babblers and Fork-tailed Drongos

Since 2003, Amanda Ridley's Pied Babbler Research Project has explored the causes and consequences of cooperative breeding behaviour in Southern Pied Babblers *Turdoides bicolor*. Amanda maintains an exceptional study population of habituated, free-living babbler groups on the Kuruman River Reserve in the southern Kalahari Desert. Her research has provided fascinating insights into the evolution of cooperative societies. Additionally, she has supported research on her study population contributing to our understanding of animal communication and cognition. In 2006, Amanda expanded her study to include the local Fork-tailed Drongo *Dicrurus adsimilis* population, investigating interactions between drongos, babblers and other species. Tom Flower also began to conduct research on the drongos, and in 2008 greatly expanded the population, establishing the Drongo Project to enable detailed research on species interactions, with a focus on the drongos' use of false alarm calls to steal food from other animals. Recently, both Amanda and Tom have collaborated with Dr Susie Cunningham to explore how increasing temperatures resulting from climate change will affect the reproduction and survival of babblers and drongos in marginal semi-arid savanna environments.

## *The causes of conflict and cooperation in group-living societies*

The Pied Babbler Research Project investigates the benefits of cooperation and the causes of conflict in this highly cooperative, group-living species. The study population of 12-19 habituated, colour-ringed groups has been monitored continuously for 16 years. Both group size and number varies considerably according to weather conditions in the Kalahari, with the population suffering a considerable decline following breeding seasons with poor rainfall and high temperatures. The population also declines during very cold winters, when juveniles experience high mortality. Long-term life history data, along with short-term observations and experiments, have helped the team understand the causes and consequences of cooperative breeding behaviour. These findings help to reveal the benefits of cooperation and the causes of conflict not just in babblers, but from a broader evolutionary perspective.

## *How interactions between species shape animal behaviour*

The Fork-tailed Drongo project focuses on a population of over 40 pairs of habituated and colour-banded drongos that are individually

recognisable. This study population provides a unique opportunity to explore how climate change will affect birds, and biodiversity more generally. Tom Flower and Susie Cunningham have previously demonstrated how increasing temperatures place thermoregulatory constraints on drongo foraging and offspring provisioning, thereby reducing chick fitness. Presently they are co-supervising PhD student, Ben Murphy, whose research is focusing on how drongos adjust their behaviour to reduce the impact of high temperatures on reproductive success, including through offspring shading, foraging tactics and even shifting to crepuscular or nocturnal activity.

## *Activities in 2018*

- PhD student Amanda Bourne successfully completed her second field season on Southern Pied Babbler behaviour and physiology and had her first paper accepted for publication in *Functional Ecology*. This paper looked at the efficacy of determining metabolic rates using non-invasive techniques. She is busy collating her data from her final season and preparing further manuscripts for submission in 2019.
- Elizabeth Wiley and Amanda Ridley's research on the benefits of pair bond tenure in Pied

Babblers was published in the journal *Ecology & Evolution*.

- Martha Nelson-Flower published a paper in *Journal of Animal Ecology* that used the long-term Pied Babbler database coupled with a genetic pedigree to illustrate when and why Pied Babblers disperse from their cooperative groups.
- Martha Nelson-Flower published a paper in *Molecular Ecology* which used the genetic and long-term Pied Babbler databases to illustrate the causes of sex differences in male and female reproductive skew.
- A new PhD student, Camilla Soravia, started her research project on the relationship between heat stress, cognition and sociality, supervised by Amanda Ridley. Her work will build on the ground-breaking research on the relationship between sociality and cognition recently uncovered by Amanda and her colleagues in cooperative magpies (Ashton et al, *Nature* 2018).

#### Highlights:

- Papers from the Pied Babbler Research Project were published in *Journal of Animal Ecology*, *Molecular Ecology*, *Ecology and Evolution* and *Behavioral Ecology*.
- Pied babbler research published in 2018 received considerable international attention: it was featured on the front cover of *Ecology and Evolution* (Wiley & Ridley 2018), as the Editor's Choice article for *Behavioral Ecology* (Engesser et al. 2018), and as the *InFocus* article for *Journal of Animal Ecology* (Nelson-Flower et al. 2018).
- Pied Babbler and Fork-tailed Drongo research was presented at several national and international conferences including the International Ornithological Congress in Vancouver in August 2018.
- A fully funded PhD scholarship was awarded to Camilla Soravia to allow her to begin her research on pied babblers.
- PhD student Ben Murphy joined the Fork-tailed Drongo Project and began field research in September 2018 to explore how drongos adjust their behaviour to reduce fitness costs associated with foraging and breeding at high temperatures. His work will help us predict the impact of climate change on biodiversity.



Pied Babbler research featured on the front cover of *Ecology and Evolution* 8(14) thanks to an article by Elizabeth Wiley and Amanda Ridley on the benefits of long-term pair bonds.

For more details on the collaborative work between the Pied Babbler and Fork-tailed Drongo Projects and the Hot Birds Project, see the Hot Birds Project section of this report (p.47).

#### Key supporters

DST-NRF CoE grant; Australian Research Council.

#### Research team

Assoc. Prof. Amanda Ridley (FIAO, UCT and UWA)  
 Dr Thomas Flower (FIAO, UCT and Capilano University)  
 Dr Susie Cunningham (FIAO, UCT)  
 Dr Ben Ashton (UWA)  
 Prof. Andrew McKechnie (U. Pretoria)  
 Dr Sabrina Essenger (U. Zurich)  
 Dr Martha Nelson-Flower (U. British Colombia)  
 Dr Ben Smit (Rhodes University)  
 Prof. Claire Spottiswoode (FIAO, UCT and U. Cambridge)  
 Dr Simon Townsend (U. Zurich)

**Students:** Amanda Bourne (PhD, UCT); Benjamin Murphy (PhD, UCT); Camilla Soravia (PhD, UWA).

**Research assistant:** Lesedi Moagi.



# Sociable Weaver nests as a resource

This project examines the importance of Sociable Weaver *Philetarius socius* nests to Kalahari animal and plant communities. The objectives are to investigate the diversity of animals associated with the nests, the interactions between these species, and to gain insights into the life histories of associated species. We also aim to understand how the ‘ecological engineer’ potential of these nests may have community-wide impacts on structure and function, and how this impact may change across environmental gradients.

Evidence of the importance of facilitation in communities has accumulated, which challenges the traditional emphasis of negative interactions in ecology. In particular, facilitative interactions are predicted to increase in importance in stressful environments and may become a crucial component of the adaptive responses of communities under stress. Ecological engineers are species that modify habitats and ameliorate abiotic stress that benefits other species and are a key research focus. Identifying and understanding the impact of ecological engineers is vital, especially in arid environments that are expected to become harsher with global climate change.

Pygmy Falcons *Polihierax semitorquatus* are the most controversial user of the weaver colonies. They never construct their own nests, depending entirely on weaver colonies, which is a unique obligate nesting association. Pygmy Falcons also, albeit rarely, prey on weaver nestlings and even adults, suggesting a semi-parasitic relationship between the species. We aim to describe the natural history and ecology of Pygmy Falcons, and to characterise their interactions with Sociable Weavers; do falcons provide benefits to weavers or are they vertebrate parasites?

## Activities in 2018

- PhD student Anthony Lowney investigated the importance of Sociable Weaver colonies to the local animal community over a temporal stress gradient. Across the weaver’s range in South Africa and Namibia, he conducted field studies to determine weaver colony importance to the animal community as environment harshness changes.
- BSc Hons student Jess Lund investigated whether Pygmy Falcons lower their body temperature at night to save energy during cold and food stressed winters.
- The Pygmy Falcon population in the study area was monitored for the eighth season. Postdoc



A Pygmy Falcon provisioning a skink at a Sociable Weaver colony (Photo: Anthony Lowney).

Diana Bolopo was investigating how the presence of Pygmy Falcons in a colony is costly for the weavers in terms of behavioural changes, most notably their sleeping hours.

- Our team presented the results of our studies at three international and two national conferences.

## Highlights:

- A paper was published on the fledgling body condition of bigger broods of cooperatively breeding Pygmy Falcons in *Behavioral Ecology and Sociobiology*.
- A paper from Billi Krochuk’s BSc Hons thesis exploring the strange Pygmy Falcon behaviour of lining their nest chambers with faeces was published in *Ostrich*.
- A BBC documentary ‘Animals Behaving Badly’ filmed at our field site featuring falcon and





A Sociable Weaver poking its head out of the huge nesting mass (Photo: Anthony Lowney).

weaver interactions was first aired in May 2018. A German production team, Text und Bild, also filmed the system this year. Our team members acted as scientific advisers for both crews.

- Diana Bolopo presented at the International Society for Behavioural Ecology conference in Minnesota in August. Anthony Lowney, Billi Krochuk and Robert Thomson presented at the 27<sup>th</sup> International Ornithological Congress held in Vancouver in August 2018. Robert's talk was featured by the Cornell Lab of Ornithology as one of the congress highlights.
- Anthony Lowney and Robert Thomson presented at the Annual Meeting of the Raptor Research Foundation in Kruger National Park in December 2018 and they both also attended the 9<sup>th</sup> Annual Oppenheimer-De Beers Group Research conference in Johannesburg in October 2018.
- Anthony Lowney was awarded the prize for best presentation at the 2018 UCT Department of Biological Science postgraduate research day.
- Our project joined forces with top researchers from WITS, UP, UNISA and UWC to form KEEP (Kalahari Endangered Ecosystem Project) at the Tswalu Kalahari Reserve. This program will incorporate research from a range of taxa to investigate the ecosystem consequences of climate change in the Kalahari. The project, led

by Prof Andrea Fuller, has already received sponsorship of two Suzuki field vehicles.

### *Impact of the project*

This project will provide unique insights into the community ecology and between-species interactions in the Kalahari. It will quantify the ecological engineering role of the Sociable Weaver and potentially determine the role of Sociable Weaver nests in a warming and increasingly arid Kalahari. The outputs of this project will also contribute to available eco-tourism information that enhances the experience of visitors to landscapes within the distribution of the Sociable Weaver.

### **Key supporters**

DST-NRF CoE grant; Tswalu Foundation; Academy of Finland; Claude Leon Foundation; University of Cape Town launching grant.

### **Research team**

Dr Robert Thomson (FIAO, UCT)  
 Dr Diana Bolopo (FIAO, UCT)  
 Prof. Michael Cramer (UCT)  
 Prof. Andrew McKechnie (UP)  
 Dr Luke Arnot (UP)  
 Dr Dorianne Elliott (UP)

**Students:** Anthony Lowney (PhD, UCT); Billi Krochuk (BSc Hons, UCT); Jess Lund (BSc Hons, UCT); Ryno Kemp (PhD, UP).

**Research Assistants:** Melissa Goepfert, Nosipho Mali.

# Understanding colour polymorphism in birds

Many species show a variety of different phenotypes. How this diversity is maintained is one of the main questions in evolutionary biology. Colour polymorphism represents an ideal system to explore these issues because the different phenotypes represent their genotypes. Researchers have long been fascinated by colour polymorphism because the occurrence of two or more phenotypes in the same population runs counter to the notion that selective pressure should favour the optimal form for an environment, and any lesser quality individuals should be eliminated through natural selection. Colour polymorphism occurs in around 3.5% of bird species, but is more common in raptors and particularly within *Accipiter* hawks where about 25% of species are polymorphic.

Colour morphs are known to influence the performance and fitness of individuals through both direct effects of pigment production (e.g. camouflage or thermoregulation) and indirect effects (e.g. correlated physiological and behavioural traits). Hence, it is unlikely that different morphs are distributed randomly in the environment. Our focus species is the Black Sparrowhawk *Accipiter melanoleucus* which occurs as either a dark or a light morph. The morph distribution of this species across South Africa follows a cline which is associated with winter rainfall patterns and the intensity of solar radiation. Thus, within the Western Cape we have a far higher proportion of dark morphs than the rest of the country. Our research has shown that the foraging success of the two morphs differs depending on ambient light levels, with dark morphs foraging more successfully in duller light conditions than the light morph, possibly due to improved background crypsis. Thus, in theory the two morphs when breeding together in a 'mixed' pair might be able to complement each other by expanding the conditions (daylight hour, prey or habitat types) in which parents can successfully forage and provision their offspring. Indeed, pairs consisting of mixed-morph parents produce more offspring than parents consisting of the same morphs, and their offspring show higher survival rates. The idea that pairs consisting of the two different morphs may complement each other has been termed the complementarity hypothesis. However, this fails to explain the predominance of dark morphs, because the light morph gene is dominant.

We have extended the research project from correlative studies to conducting field experiments and behavioural tests under laboratory conditions to understand the mechanisms behind the observed fitness advantages for breeding with a partner of the opposite morph.

## Activities in 2018

- In 2018, we performed an immune challenge on 40 Black Sparrowhawk chicks from 21 nests to understand the strength of the innate immune function in relation to different colour morphs of the parents.
- PhD student Carina Nebel conducted a behavioural experiment at the field station in Bainskloof, where she tested the reaction time of pigeons towards an approaching hawk of different plumage morphs.
- Adrien Pajot from Bordeaux Sciences Agro, France, worked in the research group during three months and analysed video footage and screened blood slides for avian malaria infection rates.
- Samantha Kirves completed her BSc Hons project investigating the impact of blood-parasite infection on fitness parameters in the polymorphic Black Sparrowhawk.
- Arjun Amar collaborated with Dr Chevonne Reynolds (Wits) and Dr Chris Briggs (USA) on a project to explore whether the morphs of Swainson's Hawks vary clinally across their North America breeding range. The paper was accepted for publication in the *Biological Journal of the Linnean Society*.





Black Sparrowhawks in the City of Cape Town raising three chicks in the Constantia Greenbelt in view of many residents (Nest camera footage).

### Highlights:

- Arjun Amar presented research on the use of MORPHIC to explore patterns of polymorphism at the British Ornithological Union's conference in Nottingham, UK, the 4<sup>th</sup> Learn About Birds (LAB) conference in Langebaan, Western Cape, and at the Annual Meeting of the Raptor Research Foundation (RRF) in Skukuza, RSA.
- Carina Nebel presented research from her experiments at the Annual Meeting of the Raptor Research Foundation (RRF) in Skukuza, RSA, where she was awarded the William C. Andersen Memorial Award of the Raptor Research Foundation for the best student presentation.

### Impact of the project

This project will add to our understanding and theory about the maintenance of genetic diversity in populations. It provided the first

empirical evidence for the light level hypothesis for the maintenance of colour polymorphism in birds that is now experimentally tested.

### Key supporters

DST-NRF CoE grant; Claude Leon Foundation.

### Research team

Dr Arjun Amar (FIAO, UCT)  
 Dr Petra Sumasgutner (FIAO, UCT)  
 Dr Gareth Tate (EWT)  
 Dr Jacqui Bishop (Biological Sciences, UCT)  
 Dr Rob Ingle (MCB, UCT)

**Volunteers:** Margaret MacIver, Antje and Bernard Madden.

**Students:** Carina Nebel (PhD, UCT); Edmund Rodseth (MSc, MCB, UCT); Samantha Kirves (BSc Hons, UCT).

**Research Assistants:** Dr Shane McPherson, Kyle Walker.



# Bird pollination in the Cape Floristic Region

Why do flowers come in so many different colours, both within and between species? This deceptively simple question is still surprisingly difficult to answer. The Cape Floristic Region's bird pollination systems provide an ideal opportunity to address it in the context of natural communities of co-flowering species. Claude Leon Post-doc Anina Coetzee is tackling this question in collaboration with Claire Spottiswoode and Colleen Seymour. Specifically, she is testing the hypothesis that flower colour variation within species arises from selection for convergence in flower colour with other species in the local community, to benefit from shared signalling to pollinators. Such ecological processes may now be threatened by habitat fragmentation in many parts of the Cape Floristic Region, and understanding these effects is the goal of PhD student Daniël Cloete's research.

The genus *Erica* is one of the most diverse in the fynbos biome, and its many bird-pollinated species are striking for the high levels of colour polymorphism in their flowers. Some *Erica* species have up to five different colour morphs both within and between species. These species are pollinated predominantly by just one bird species, the Orange-breasted Sunbird *Anthobaphes violacea*, so the prevalence of these polymorphisms is a mystery. This project is investigating the origin and maintenance of these flower colour polymorphisms: what role does plant community context and sunbird foraging behaviour play in generating the intra-specific colour diversity of this group of plants, and how might habitat transformation influence these ecological and evolutionary processes?

Flower colour polymorphisms may evolve for two opposing reasons. Firstly, if co-existing species experience competition for the attention of pollinators, then colour divergence may promote assortative foraging by pollinators. Secondly, when a plant species receives low pollinator visitation rates, it may benefit from mimicking the signals of co-existing species in order to attract more pollinators. Evidence of such honest signal mimicry, as opposed to deceptive mimicry, is very rare in nature. A cause for concern is that habitat fragmentation may change sunbird behaviour in such a way that the evolutionary process maintaining this diversity in ericas is changed completely

PhD student Daniël Cloete is working in and around the Tsitsikamma section of the Garden Route National Park to directly address the effect of habitat fragmentation on the fitness of bird-

pollinated plants. Daniël's research aims to investigate how bird pollination relationships are affected by habitat fragmentation, and to test whether certain thresholds of patch size and isolation exist where pollination services by birds start to break down. To do so, he is measuring pollination by sunbirds and sugarbirds of *Protea* and *Erica* species across 17 fynbos patches, natural and fragmented, in areas located in the vicinity of Nature's Valley. This is a good area to address this question because it naturally comprises of a matrix of forest, fynbos and coastal thicket, now further fragmented by agriculture, plantations, alien infestations, farmland and urban areas. Insights from Daniël's research will hopefully shed light on how threats, including land-use change, alien invasive vegetation and climate change are affecting, and will further affect, ecosystem function and services in the Cape Floristic Region.

## Activities in 2018

- Anina Coetzee completed the data collection for hybrid pollination experiments on three *Erica* species. This showed that bird-pollinated *Erica* species are dependent on sunbirds for seed production and that hybridisation between species is limited by post-pollination mechanisms.
- The patterns found in this study so far suggest that *Erica* species have possibly evolved different flower morphologies and similar flower colours to facilitate their coexistence and their sharing of sunbird pollinators. In order to test these mechanisms, behavioural experiments have been planned and



Orange-breasted Sunbirds are the main pollinator of bird-pollinated ericas (Photo: Oliver Plokhooy).

preliminary tests conducted.

- Anina's research was communicated to the public through an article in *African Birdlife* and presentations at bird clubs.
- Daniël completed his data processing and analysis following a year of fieldwork in the Nature's Valley area, where he seasonally collected data on bird species presence and relative abundance, *Protea* flowering phenology, and bird-pollinated *Protea* and *Erica* nectar traits and seed set, for each of 17 study patches.
- Daniël extracted data from his high-resolution aerial photos captured by drone to determine the distribution and density of bird-pollinated *Protea* species in each of the study patches.
- Daniël's preliminary analyses suggest that the fynbos-specialist endemics, Cape Sugarbird *Promerops cafer* and Orange-breasted Sunbird, are both negatively affected by fragmentation. By contrast, more generalist species such as the Southern *Cinnyris chalybeus* and Greater Double-collared Sunbirds *Cinnyris afer* and Amethyst Sunbirds *Chalcomitra amethystina* are more accepting of fragmentation, and may in fact benefit because of their flexibility to use resources from the surrounding non-fynbos matrix.

#### Highlights:

- Anina's paper on urban nectarivorous birds was published in *Journal of Avian Biology*.
- Anina presented the results of the study at the International Association of Vegetation Science Symposium in Montana, United States, where she received second place for the Best

Young Scientist Oral Presentation. She also presented this project at the conference of the South African Association of Botanists in Pretoria.

- Anina recruited two Masters Students to work on projects involving the ecology and conservation of sunbirds in 2019. She also trained a prospective postgraduate student from rural Limpopo as part of her fieldwork.

#### Impact of the project:

The unique sunbird-*Erica* mutualism will allow us to gain key insights into the mechanisms by which individual bird behaviour affects community ecology. It provides an opportunity to address knowledge gaps, particularly because human disturbance may directly interact with evolutionary processes in this system. Insights into the effects of habitat transformation on pollination systems such as this will inform the development of guidelines for maintaining biodiversity and ecosystem functioning.

#### Key supporters

DST-NRF CoE grant; The Botanical Education Trust; Biotechnology and Biological Sciences Research Council; South African National Botanical Institute; Harry Crossley Green Matter Scholarship.

#### Research team

Dr Anina Coetzee (FIAO, UCT)  
 Prof. Claire Spottiswoode (FIAO, UCT and U. Cambridge)  
 Dr Phoebe Barnard (FIAO, UCT and SANBI)  
 Dr Mark Brown (Nature's Valley Trust)  
 Prof. Peter Ryan (FIAO, UCT)  
 Dr Colleen Seymour (SANBI)

**Student:** Daniël Cloete (PhD, UCT).

# Intra-African bird migration

Migrant birds are at greater risk of extinction globally than are resident species. To date, the emphasis has been on long-distance, inter-continental migrants. We are employing a broad-scale spatial approach to addressing questions of phylogeography, movement ecology, phenotypic variation and potential speciation in focal intra-African migrant birds that have seasonal breeding ranges across western, eastern and southern Africa. Since mid-2015, we have sampled migrants at study sites in western, eastern and southern Africa, and tracked Woodland Kingfishers from South Africa.

Little is known about the migratory routes, timing, drivers, connectivity and environmental prescriptions of intra-continental migrant birds in Africa compared to inter-continental migrants. This project investigates migratory patterns of focal intra-African migrant birds, including Woodland Kingfisher *Halcyon senegalensis*, African Pygmy Kingfisher *Ispidina picta*, Diederik Cuckoo *Chrysococcyx caprius* and Klaas's Cuckoo *C. klaas*.

## Activities in 2018

- The third southern African field season was completed from November to December 2017. The same three study areas from the 2016 season were visited in Limpopo Province, and samples collected from 12



MSc student Abigail Ramudzuli examining a kingfisher nestbox (Photo: Dayo Osinubi).

Woodland Kingfishers, two African Pygmy Kingfishers, 15 Diederik Cuckoos and one Klaas's Cuckoo. Of the eight multi-sensor geolocators donated by Vogelwarte (Swiss Ornithological Institute) deployed on breeding Woodland Kingfishers in the previous season, two were retrieved and two were confirmed as lost, and an additional 11 geolocators were deployed.

- The third western African field season was completed from June to July 2018. Fieldwork was again conducted at several sites around Accra and Damongo in Ghana, as well as a first field visit to Cape Coast where we made our first western African breeding record for the Woodland Kingfisher, but only seven Woodland Kingfisher and one Diederik Cuckoo was sampled. We also recorded a solitary Woodland Kingfisher in the Damongo area in northern Ghana, which is supposed to be within the breeding area of the migratory *Halcyon senegalensis*. However, the behaviour of this individual strongly suggested that breeding was not taking place at that time.
- The third eastern African field season was completed from July to August 2018, with a focus on sites around Entebbe, Uganda. Samples were collected from six Woodland Kingfishers, one African Pygmy Kingfisher and one Red-chested Cuckoo *Cuculus solitarius*. A second reconnaissance visit was made to northern Uganda to explore possible areas of overlap between *Halcyon s. senegalensis* and *H. s. cyanoleuca*. This year's survey was more extensive than the one in 2017, and ranged from Gulu to Atiak. We recorded a solitary Woodland Kingfisher near the Unyama River, but similar to the lone individual encountered in northern Ghana, its behaviour strongly suggested that breeding



was not taking place. Some of the locals around the Achewa River said they had seen the Woodland Kingfisher or 'Labane' as it is locally called. A local name does suggest an historic presence of the bird and human interaction with the species in the area. However, there were conflicting reports of the time of the year when the Woodland Kingfisher is present.

- The fourth southern African field season was completed from November 2018 to January 2019. Two of the three regular study sites were visited, collecting samples from 13 Woodland Kingfishers, three African Pygmy Kingfisher, four Diederik Cuckoos and two Red-chested Cuckoos. Two more geolocators were recovered from Woodland Kingfishers and another 11 were deployed.

### Highlights:

- Postdoctoral fellow Dayo Osinubi presented a poster at the 27<sup>th</sup> International Ornithological Congress (IOC) in Vancouver, Canada (August 2018), which outlined the objectives and achievements of the intra-African bird migration project to date.
- Abigail Ramudzuli joined the project as an MSc student in 2018. She is exploring moult patterns and stable isotope variations in the flight feathers of the Woodland Kingfisher, with a view to checking whether stable isotopes can indicate where migratory birds spend the non-breeding season. For the laboratory analysis of the carbon, nitrogen and hydrogen elements in these feathers, Abigail worked with the iThemba LABS in Johannesburg.
- Abigail presented a talk at the 9<sup>th</sup> Annual Research Symposium of the National Zoological Gardens in Pretoria, South Africa (November 2018), during which she discussed her preliminary results and received valuable feedback.
- Under the Schifferli Scholarship, Dayo visited Vogelwarte in Semach, Switzerland in September 2018. Data were successfully downloaded from the two geolocators retrieved from Woodland Kingfishers during the third southern African field season. The analysis of the data indicates the migratory route and stop-over sites, and the process for publishing this information is underway.
- Vogelwarte further supported the project with a third donation of multi-sensor



Dayo Osinubi removing an African Pygmy Kingfisher from the mist net (Photo: Claudio De Nini).

geolocators (15 new geolocators) for use on Woodland Kingfishers breeding in southern Africa. During the fourth southern African field season, another two geolocators were retrieved, bringing to total number of retrieved geolocators to four. The total number of geolocators confirmed as lost is three. Eleven of the new 15 geolocators were successfully deployed.

### Impact of the project

This project addresses some of the research, conservation and policy gaps concerning intra-African migrant birds. It also facilitates a research network that links research institutions across Africa, providing a near-regional operating base for other students and researchers to utilise in answering diverse questions about intra-African migrant birds. This network serves to support the objectives of the UNEP/CMS African-Eurasian Migratory Landbirds Action Plan (AEMLAP) and the Migrant Landbird Study Group (MLSG).

### Key supporters

DST-NRF CoE grant; National Zoological Gardens of South Africa (NZG); International Foundation for Science; BirdLife West Africa Sub-Regional office; A.P. Leventis Ornithological Research Institute; Swiss Ornithological Institute (Vogelwarte), African Bird Club, British Ecological Society; iThemba LABS.

### Research team

Dr Samuel Temidayo Osinubi (FIAO, UCT)  
Prof. Desire Dalton (NZG)  
Dr Phoebe Barnard (FIAO, UCT)  
Prof. Peter Ryan (FIAO, UCT)

**Student:** Abigail Ramudzuli (MSc, UCT).

# Evolution in island birds and the ‘insularity’ syndrome

In spite of the importance of islands as centres of endemism and important ‘laboratories’ for the study of ecology and evolution, some aspects of island ecology and evolution remain poorly understood. This programme studies patterns of adaptation on islands worldwide as well as conducting detailed studies using Tristan da Cunha and the Gulf of Guinea islands as study systems. Previous research has explored global patterns in life-history and behaviour of island species and, over the last year, we have shown how the low diversity of island communities influences the evolution of bird song.

Although the level of endemism on islands is generally high, individual island communities hold fewer species than their mainland counterparts. This has many ecological, behavioural and evolutionary consequences. PhD student Alois Robert (U. Montpellier, France) has been investigating how these processes affect communication, focusing on acoustic traits. The lower species diversity on islands also extends to parasites. Previous work conducted by our group revealed decreased diversity and prevalence of Haemosporidia parasites in the Gulf of Guinea islands. This decrease in parasite pressure may favour the evolution of a weaker immune systems, a contention that is currently debated. A new collaboration has now enabled us to test this hypothesis.

## Activities in 2018

- PhD student Alois Robert, working with Claire Doutrelant, Martim Melo and Thierry Lengagne (CNRS, France) revealed new patterns of acoustic communication in island bird communities. Comparing the soundscapes on islands in the Gulf of Guinea and Madeira with adjacent mainland communities (Cameroon and southern France, respectively), he found that mainland communities were louder and occupied a larger frequency range, especially in Cameroon, revealing a decreased availability of acoustic space for tropical mainland birds. In diverse communities, singing species exhibit a higher acoustic turnover and overlap less in time and frequency with each other than in more depauperate communities. This leads to greater acoustic niche partitioning on mainlands than islands,

which suggests that competition for acoustic space plays a role in song evolution. This conclusion is further supported by the broader frequency bandwidths of island species compared to their mainland counterparts.

- We established a collaboration with Benoit Nabholz (U. Montpellier, France) and Claire Loiseau (CIBIO) to obtain funding to investigate the effects of insularity on the immune system using toll-like receptors. Lab work has started on samples collected in previous years.
- After considerable effort, Martim Melo and his team finally caught an individual of the recently discovered scops owl on Príncipe Island by recording its call and using play-



The scops owl recently discovered on Príncipe Island (Photo: Martim Melo).



back to attract this elusive species. Genetic analyses confirmed it is a new species, distinct from the São Tomé Scops Owl *Otus hartlaubi*. Additional fieldwork by Martim and MSc student Barbara Freitas has determined the distribution of the newly-discovered scops-owl on Príncipe Island, estimated its population size, and obtained information on its ecology.

- A project by MSc student Louis Bliard, working with Claire Doutrelant, Matthieu Paquet and Rita Covas, suggests that predator pressure influences the evolution of bird colouration on islands. These results have now been submitted for publication.
- In the project on *Nesospiza* finches on the Tristan da Cunha islands, effort continued to be made to understand the speciation scenario and the genomics underpinnings of the adaptive phenotypic variation in bill and body size. In addition to the previously produced reference genome assembly, whole genomes of several individuals each of the four taxa, *N. a. acunhae*, *N. a. dunnei* (Inaccessible Island), *N. questi*, and *N. wilkinsi* (Nightingale Island), were resequenced by Martin Stervander and Bengt Hansson using the Illumina HiSeq X10 platform.

#### Highlights:

- Genetic work confirmed that the specimen of scops owl captured on Príncipe Island is a new species, highly differentiated from species on São Tomé and the mainland.
- A paper on the origin of the Inaccessible Island Flightless Rail *Atlantisia rogersi* published in *Molecular Phylogenetics and Evolution* led by Martin Stervander attracted massive media attention, and obtained the highest Altmetric score for a paper in this journal.
- Alois Robert presented his work on the influence of community structure on acoustic signals at the IBAC conference in India and the Bioacoustics conference in Cape Town. The differences he has found in acoustic communication between island and mainland birds are the subject of two papers that were submitted for publication.
- Martin Stervander gave an invited presentation at the 2018 American Genetics Association meeting, the theme of which was the Origins of Adaptive Radiations. His presentation included data from *Nesospiza* buntings.



Martin Stervander's paper showed that the Inaccessible Island Flightless Rail evolved from South American ancestors some 1.5 million years ago (Photo: Peter Ryan).

- A new grant was obtained to study immunity among island birds.

#### Impact of the project

This project is uncovering novel patterns of adaptation in island birds and investigating the mechanisms underlying these adaptations. The results make a significant contribution to our understanding of the ecology and evolution of island environments. Given the high number of species endemic to islands worldwide and the threats to these faunas, our work will help to understand and conserve island species.

#### Key supporters

Forever Principe; National Geographic; CNRS (PEPS); University of Montpellier (PhD grant to Alois Robert); LIA Biodiversity.

#### Research team

Dr Rita Covas (FIAO and CIBIO, U. Porto)  
 Dr Martim Melo (FIAO and CIBIO, U.Porto)  
 Dr Claire Doutrelant (CNRS and FIAO)  
 Dr Claire Loiseau (CIBIO, U. Porto)  
 Dr Martin Stervander (U. Oregon)  
 Prof. Bengt Hansson (Lund)  
 Prof. Peter Ryan (FIAO)

**Students:** Alois Robert (PhD, CNRS and U. Montpellier); Sandra Reis (PhD, CIBIO, U.Porto); Barbara Freitas (MSc, CIBIO, U. Porto); Louis Bliard (MSc, CNRS and U. Montpellier).



# Smart beaks: non-visual senses in birds

Most birds, like most people, have excellent vision. This is part of what makes birds such an appealing group to study. However birds navigate their world using different senses as well. In this project, we investigate the non-visual senses of birds with a focus on tactile senses in their beaks. The main theme of the project is to understand the links between bill-tip anatomy and foraging ecology of the three species of southern African ibises: Hadedas *Bostrychia hagedash*, Sacred Ibis *Threskiornis aethiopicus* and Glossy Ibis *Plegadis falcinellus*. These species all have a honeycomb pattern of pitting in the bones of the bill tips which suggests they should be able to forage using the sixth sense “remote touch”: detection of small vibrations made by prey as they burrow or swim through the foraging substrate (soil, mud or water).

PhD student Carla du Toit started this project as an MSc student at the beginning of 2017, and upgraded to PhD at the start of 2018. Carla’s research focuses on the anatomy of the bill-tip organ in probe-foraging birds, both modern ibises and extinct species in the paleontological record. The bill-tip organ of probe-foraging birds is made up of mechano-sensory receptors embedded in densely clustered pits in the bone at the tip of the bill. Although the general structure of the bill-tip organ is similar across all probe foraging species that possess it, there is interspecific variation in the shape and orientation of the pits and the receptors within them. The overall aim of Carla’s thesis is to use ibises as a model to investigate the link between the morphology of the bill-tip organ and the birds’ foraging ecology, and to explore whether these patterns can be extrapolated to infer information about the foraging ecology of extinct bird species.

In 2018, Carla spent three months in the field, observing the specific foraging behaviour and sediment usage of Hadedas, Sacred and Glossy Ibises, to assess links between the morphology and histology of the bill-tip organ and the foraging ecology of the birds. She carried out 15 minute focal observations of individual birds and collected sediment samples where they were observed foraging. Carla discovered that the three species exhibit different foraging strategies and use of different sediments, and these differences correlate strongly with the changes in the structure of the bill-tip organ. For example, Glossy Ibises, which Carla previously found to have higher pitting than the other two

species on the inside surfaces of their beaks, were observed to spend the most time probing with their beaks held open. This indicates that the location of the pits on the beaks’ surfaces are a good indicator of specific foraging behaviours. A similar correlation was found for the depth of probing and length of beak pitting. Furthermore, the Glossy Ibises foraged in substrates with higher moisture content and greater penetrability than the other two species (with Hadedas probing in the hardest, driest substrates, and Sacred Ibises falling in between the other two species). This fits our hypothesis that an increase in extent of pitting in the bill-tip linked to more aquatic habitat use is, at least in part, due to the transmission of vibrations in the sediment in which the birds forage. This pattern will be further investigated by Carla in 2019, using captive birds.

Carla presented her results at two conferences in 2018. Her initial morphological results were presented at the BirdLife South Africa Learn About Birds meeting in Langebaan in March, 2018. In August, she travelled to Vancouver,



Carla and field assistant Terrianne Thavar collecting data at Strandfontein (Photo: Susie Cunningham).

Canada to present the preliminary results of her field work as a speed talk at the International Ornithological Congress.

The strong link between the morphology of the bony parts of the bill-tip organ and birds' foraging behaviour suggests we can use the structure of fossil beaks to infer information about the palaeoecology of extinct birds. In November 2018, Carla travelled to the USA to examine fossil specimens, as well as to compile a review of the mechano-sensory structures in the beaks of all modern bird families. The review will allow us to better understand the occurrence of these structures in modern birds. Furthermore, based on the phylogenetic position of some of the fossil specimens that Carla is studying, we may be able to make some very significant conclusions about the foraging ecology of some of the most basal members of the avian tree, shedding light on some large and contentious questions regarding the evolution of modern birds. This work is still ongoing, with the aim to publish in the next few months, completing one of Carla's thesis chapters.

### Highlights:

- Carla upgraded to PhD level in January 2018.
- A clear link was found between the morphology of the beaks and the specific foraging behaviours and sediment usage of the three ibis species, indicating that examining the bill-tip organ structure can be a useful proxy for understanding very fine scale changes in the foraging ecology of the birds.
- Carla presented her results at the International Ornithological Congress in Vancouver, Canada.
- Carla visited the Smithsonian Natural History Museum in Washington, DC and the American Museum of Natural History in New York. This enabled her to successfully capture data on the beaks of all modern bird families to perform a review. Excellently preserved material of fossil beaks at the Smithsonian were also examined and data collected. Alcohol-preserved material was also acquired from the Smithsonian to perform histological analyses on some hard to acquire species.

### Impact of the project

This work will help us better understand the links between anatomy, morphology and behaviour in birds. From a conservation and global change perspective, it will allow a better



Carla du Toit working in the Smithsonian Museum of Natural History (Photographer unknown).

understanding of the substrate conditions under which ibises are best equipped to forage successfully, improving understanding of potential mechanisms underlying the expansion of Glossy Ibises and Hadedas into the south and west of South Africa, and the likely impact of the current drought and ongoing climate drying on the foraging success of these species. Furthermore, the results could potentially be applied to other species of ibises, particularly where behavioural data is difficult to acquire, in order to better understand their requirements for foraging habitat, simply by studying specimens of their beaks, which can be obtained from museum collections. The comparative work on paleontological specimens will improve our understanding of the ecology of extinct birds, and shed light on both the evolution of this unique behaviour in modern birds, and potentially alter our understanding of the morphology and behaviour of some of the earliest ancestors of large clades of modern birds.

### Key supporters

DST-NRF CoE in Paleosciences.

### Research team

Dr Susan Cunningham (FIAO, UCT)  
Prof. Anusuya Chinsamy-Turan (BioSci, UCT)  
Dr Steve Portugal (Royal Holloway, U. London)  
Dr Anton du Plessis (U. Stellenbosch)

**Student:** Carla du Toit (PhD, UCT)

**Research Assistant:** Terrianne Thavar

# Impacts of power infrastructure

This project attempts to mitigate the impacts of power generation and transmission infrastructure on birds and other biota. Initial attention was focused on collision impacts associated with powerlines, which mainly affect large, open-country birds such as bustards and cranes that are unable to react rapidly when they encounter aerial obstructions. More recently the project has considered the impacts of renewable energy technologies, including wind and solar power generation.

Wind and solar power generation have much less broad-scale environmental impact than the coal-fired power stations on which South Africa relies for most of its power generation, but both technologies can have significant impacts at a local scale. The aim of this programme is to provide practical solutions to reduce the impacts of renewable energy projects, as well as energy transmission infrastructure, on birds in southern Africa. The programme is run in close collaboration with BirdLife South Africa's Birds and Renewable Energy programme and the Endangered Wildlife Trust. Modelling the impacts of wind farms on Verreaux's Eagles *Aquila verreauxii* is reported separately in the section "Conserving Verreaux's Eagles".

## Activities in 2018

- CB MSc student Sydney Davies completed her research project with Tanya Smith (EWT) on GPS-GSM tracking of Blue Cranes *Grus paradisea* in the Overberg. Christie Craig, a former CB MSc student, was recruited by the EWT to take this work forward, and will register for a PhD in 2020. More GPS-GSM tags were deployed on cranes in the Overberg, Swartland and eastern Karoo. The Bateleurs kindly arranged two flights in August and September to count Blue Cranes in the Swartland and Overberg, respectively. The Overberg population was estimated as  $39000 \pm 7000$  (SE) birds, roughly six times the population in 1993. We hope to be able to repeat these flights in 2019, and to include a summer count when the cranes are more dispersed, narrowing our confidence in the resultant population estimates. We are particularly grateful to Mark Rule for safely conducting the survey flights.
- A final report was delivered to ESKOM on Jess Shaw's large-scale experiment to test the efficacy of transmission line marking (using flappers or static flight diverters) to reduce

collision mortality. This study, set up in the De Aar region of the eastern Nama Karoo, was a partnership between ESKOM, the Endangered Wildlife Trust (EWT) and UCT. Jess, now based in Scotland, and former post-doc Tim Reid, now based in Australia, completed analyses of the collision data to show that marking lines reduces collisions of Blue Cranes, but has no significant benefit for Ludwig's Bustards *Neotis ludwigii*. A paper on this very important experiment should be completed in 2019.

- Vonica Perold and Peter Ryan worked with Sam Ralston-Paton (BLSA) to review bird mortality monitoring reports at wind turbine facilities around South Africa. So far 130 species of birds have been reported killed at 20 windfarms, with raptors and swifts making up the majority of casualties. Species accumulation models suggest that around 40% of species found in the vicinity of wind farms will be killed at least occasionally. The average mortality rate averaged 1.0 bird per turbine per year, but this increased to around



The Bateleurs flew two Blue Crane surveys in 2018. Here Mark Rule (pilot), Vonica Perold (census leader), Christie Craig (EWT) and Roelf Daling prepare for the long Overberg survey (Photo: Roelf Daling).

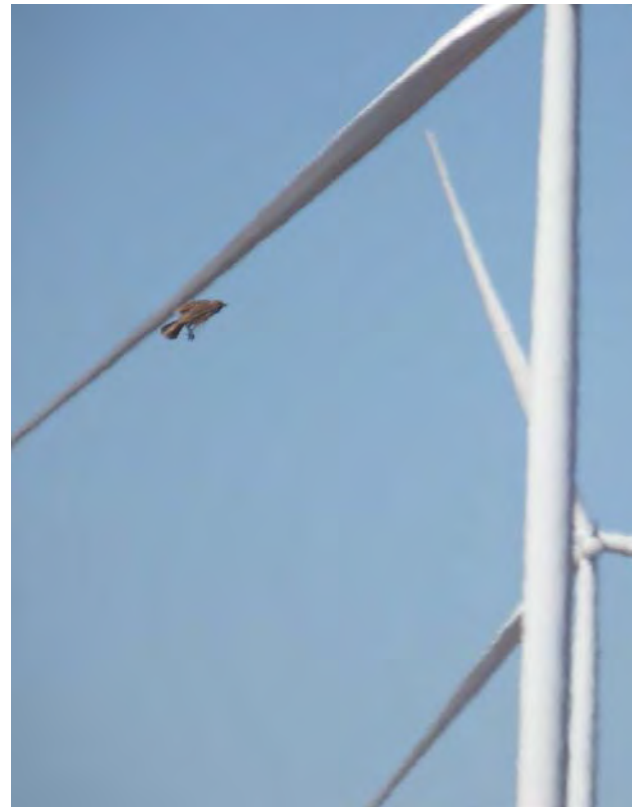


five birds per turbine per year once the biases introduced by imperfect carcass detection and scavenger removal were factored into the estimate.

- There have been few studies of windfarm impacts on birds in the Southern Hemisphere, so we can use the collision rates observed in South Africa to test the utility of a model estimating collision risks for terrestrial bird species developed using data from facilities in the Northern Hemisphere. The mortality rates recorded in South Africa were correlated with the predicted values, but the relationship was weak, with predicted values explaining only 8-15% of the variation in observed collision rates among species.
- Vonica also helped CB MSc student Corey Jeal to publish two papers arising from his study of a concentrated solar power (CSP) 'trough' facility, Bokpoort, near Groblershoop in the Northern Cape. The paper in press with *Ostrich* shows that the impacts on birds and other large charismatic animals are relatively small, with the biggest threat posed by drowning in the plant's evaporation ponds. Fitz RA Colleen Seymour assisted with the paper on changes in macro-invertebrate communities at the site, now in press with *Journal of Arid Environments*.
- Robin Colyn (BLSA) started fieldwork to better understand the factors determining the distributions of range-restricted larks in the Karoo regions of southern Africa. The Red Lark *Certhilauda burra* is a species of particular concern, given the large number of wind energy projects planned in the range of this localised, vulnerable species. Using a range-finder that also measures the angle of elevation, he was able to show that average flight height of displaying males is around 50 m, which definitely places them at risk of collisions (blade heights range from 25-60 m above the ground). Some larks were recorded displaying at more than 150 m elevation, and Robin is trying to determine the effect of wind strength on display height. Initial results suggest that birds might fly higher when wind speeds are low.

#### Highlights:

- Sydney Davies obtained her MSc on habitat use and movements of Blue Cranes in the Overberg.



A Red Lark displays against a backdrop of wind turbines north of Loeriesfontein (Photo: Robin Colyn).

- Elke Visser's paper showing the relatively minor impacts of utility-scale photovoltaic solar power generation on birds in the Northern Cape was published online in *Renewable Energy*.
- Two papers from Corey Jeal's CB MSc project on the impacts of a concentrated solar power 'trough' facility are now in press.

#### Key supporters

Endangered Wildlife Trust-Eskom Strategic Partnership; The Bataleurs, Hans Hoheisen Charitable Trust, Leiden Conservaiton Fund, Dave Myers.

#### Research team

Prof. Peter Ryan (FIAO, UCT)  
Dr Arjun Amar (FIAO, UCT)  
Robin Colyn (BLSA)  
Christie Craig (EWT)  
Dr Andrew Jenkins (FIAO, UCT)  
Dr Megan Murgatroyd (FIAO, UCT)  
Vonica Perold (FIAO, UCT)  
Samantha Ralston-Paton (BLSA)  
Dr Tim Reid (ANU, Canberra)  
Dr Jess Shaw (Scottish Natural Heritage)  
Tanya Smith (EWT)

**Student:** Sydney Davies (CB MSc, UCT)

# Conserving Verreaux's Eagles

In 2015 the Verreaux's Eagle *Aquila verreauxii* conservation status was changed from Least Concern to Vulnerable in southern Africa due to decreases in range and abundance recorded by the South African Bird Atlas Project. Our project on this species initially focused on investigating the potential impacts of land use change and habitat loss in the Western Cape. Generally regarded as a highly specialised raptor, habitat transformation was predicted to reduce availability of its preferred prey species, the Rock Hyrax *Procavia capensis*, resulting in reduced breeding productivity or increased foraging effort. Contrary to this prediction, our research in the Cederberg and Sandveld regions of the Western Cape found that Verreaux's Eagles were able to diversify their diet in agriculturally developed areas and found that their breeding productivity did not appear to be negatively affected by the levels of agricultural transformation currently experienced in the Sandveld region. A more recent and national threat is the development of wind farms, and efforts have now shifted toward modelling the potential impacts of wind developments on this species.

The demand for renewable power is increasing worldwide and the installed electricity generation from wind power is growing rapidly. In South Africa, there are now over 1,000 operational wind turbines across 22 wind farms. In addition, 112 renewables projects have been approved by the Renewable Energy Independent Power Producer Procurement Programme (REIPPP) to date. Thus the installed wind power

capacity in South Africa can be expected to continue to rise rapidly. Wind energy is often regarded as a sustainable solution to our increasing energy demands. However, it is evident worldwide that there are negative impacts on birds through collisions with rotor blades. In South Africa post construction monitoring has found that diurnal raptors are the most frequently killed bird guild, representing around 35% of all casualties recorded. This disproportionate effect on raptors is extremely worrying and we are consequently working towards predictive collision risk models for the most at risk species. Verreaux's Eagles are considered high risk due to multiple collisions that have already been sustained and their conservation status. This project aims to build a predictive mapping tool to enable turbine placement to occur in areas that will minimise the risk of collision for this species. To do this we are using high-resolution GPS tracking technology to understand flight behaviour, habitat use and the associated risk of wind turbine collisions. The aim is to produce an online collision risk model which can be used by the wind energy industry to obtain a collision risk map of any potential development areas early in the planning stage, thereby ensuring that wind turbines can be placed in locations that will minimise risk to flying eagles.



One of the relays installed to collect tracking data in the Overberg (Photo: Megan Murgatroyd).





One of the Verreaux's Eagles tracked by Megan Murgatroyd preparing its nest for breeding (Photo: Captured on timelapse nest camera by Lucia Rodrigues).

### Activities in 2018

- Fieldwork during 2018 included ongoing monitoring of the GPS tagged Verreaux's Eagles in the Karoo, Overberg and West Coast areas. Due to the large volume of data generated by the tags (over 1,000,000 fixes during 2018) data downloads are done via base stations (rather than directly via satellite). This requires frequent maintenance of remote field equipment.
- We worked with a number of 3<sup>rd</sup> year Computer Science students and their supervisor Dr Michelle Kuttel to build a prototype website that will allow developers to utilize our risk model for Verreaux's Eagles in the development area.

### Highlights:

- The tracking data set is now large enough to derive robust estimates of collision risk and thus the second version of the risk model was built using data from all 16 tagged eagles. This model was requested and used by wind farm developers in the Sutherland region of the Karoo. This confirmed the demand for such models. The final model will be available in 2019.
- We published a paper using our tracking data to examine when and where Verreaux's

Eagles use either thermal uplift or orographic lift for soaring titled 'Where eagles soar: Fine-resolution tracking reveals the spatiotemporal use of differential soaring modes in a large raptor' in *Ecology and Evolution*.

### Impact of the project

This project has added to our understanding of the ecology and habitat requirements of Verreaux's Eagles. The primary aim of the ongoing work is to contribute to reducing future injuries and mortalities of Verreaux's Eagles due to wind turbine collisions throughout their range. This will contribute to the long-term sustainability of wind energy development within Sub-Saharan Africa and will minimise the impact on one of the most widespread and vulnerable eagle species on the continent.

### Key supporters

ABAX Foundation; DST-NRF CoE grant; BirdLife South Africa; Hawk Mountain Sanctuary; Mainstream Renewables; Avisense Consulting; Tygerberg Bird Club.

### Research team

Dr Arjun Amar (FIAO, UCT)  
Dr Megan Murgatroyd (FIAO, UCT)



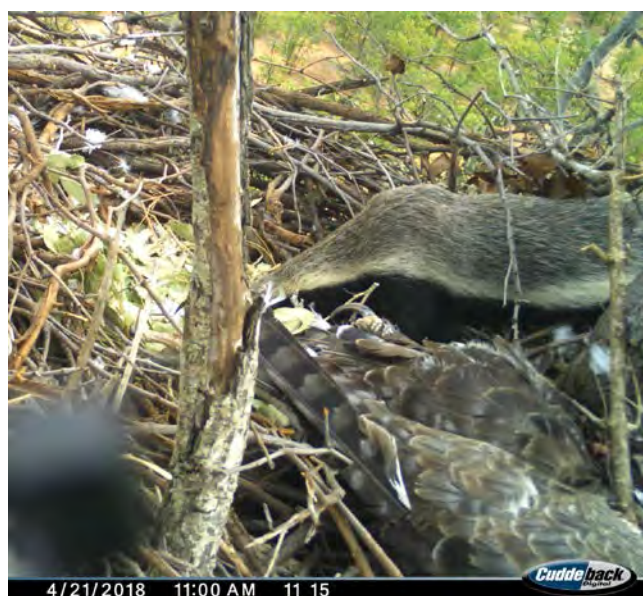
# Conserving Martial Eagles

The Martial Eagle project aims to understand the factors driving a decrease in the population of Martial Eagles *Polemaetus bellicosus* in South Africa, with a particular focus on the declines that have been observed within the largest protected area in the country, the Kruger National Park (KNP). This research is important to understand the role that protected areas have in species conservation and to understand specific threats and habitat requirements for the conservation of Martial Eagles.

The project was initiated in response to the decline in reporting rates of Martial Eagles between the Southern African Bird Atlas Projects (SABAP) 1 (1987–1992) and 2 (2007–2012). These surveys suggest population declines of up to 65% across South Africa. Declines were also observed inside large protected areas, such as the KNP, which experienced a 54% decline in reporting rate over this time.

We aim to improve our understanding of the threats faced by this species and how these threats may drive population declines even within protected areas, where species are usually expected to be conserved. Our original hypothesis for these declines was that Martial Eagles may be subject to increased mortality outside of protected areas, particularly during immature life stages when inexperienced eagles are likely to range into areas with increased human pressures. Contrary to this hypothesis, we have not found evidence for low survival during

these early life stages despite ranging widely beyond protected area boundaries. However, through GPS tracking of adult birds and nest monitoring, two potential factors that may be contributing to the observed population declines have been detected: low adult survival and poor breeding productivity. Adult mortalities, including persecution and electrocution, during unexpected wide-ranging movements outside of the KNP, may be contributing to declines. The poor breeding productivity comes in two forms: both a lower than average number of pairs making a breeding attempt and low success of those pairs which do try. We are continuing to work towards a long-term dataset on the breeding performance of this species in the KNP to enable an understanding of the environmental drivers of poor breeding performance, as well as continuing to GPS track eagles to determine the frequency and cause of mortalities.



Photos from a time-lapse nest camera showing the incubating adult Martial Eagle killed by a Honey Badger *Mellivora capensis*, which then returned to eat the egg.



An adult Martial Eagle being released by John Davies and Megan Murgatroyd after being fitted with a GPS tracker (Photo: Daryl van der Merwe).

### Activities in 2018

- In 2018 we monitored the breeding activity of 27 pairs of Martial Eagles in KNP. This included three new nests that were located (one via road surveys, one tourist reports and one found by SANParks staff). Monitoring of 12 territories was discontinued after the first check due to collapsed nests or fallen trees. With the help of EWT staff we were able to make four visits (rather than the usual three) to get the timing right for nest camera installations. The proportion of pairs that bred successfully in 2018 was found to be similar to the low breeding productivity recorded in previous years.
- We installed seven nest cameras to help understand the cause for breeding failure.
- A further two adult eagles were trapped – one was equipped with a GPS tracker and the other was fitted with an alphanumeric colour ring for re-sighting data. One chick was also fitted with an alphanumeric ring prior to fledging.
- CB MSc student Daryl van der Merwe joined the project. Under the supervision of Arjun Amar and Megan Murgatroyd, he is analysing all of the breeding data collected to date to explore if any environmental factors are associated with low breeding success.

### Highlights:

- We presented our findings at the International Raptor Research Foundation congress at Skukuza.

- We published key research findings that quantified the overall decline of the species across South Africa in *Bird Conservation International*.
- One unusual nesting failure was recorded; a honey badger climbed to the nest and killed the incubating adult eagle and ate the egg. This unexpected finding would not have been detected without the use of nest cameras.
- We also explored the diet of Martial Eagles across their African range using photos sourced from the internet. This paper was accepted for publication in *Condor* and will be published in 2019.

### Impact of the project:

Our research indicates that protected areas alone are unlikely to conserve this species and that additional conservation measures, such as education programmes, or trans-boundary policy should be put in place to ensure the successful conservation of this species.



A Martial Eagle fledgling being measured by Megan Murgatroyd (Photo: Daryl van der Merwe).

### Key supporters

ABAX Foundation; DST-NRF CoE grant; Endangered Wildlife Trust.

### Research team

Dr Arjun Amar (FIAO, UCT)  
 Dr Megan Murgatroyd (FIAO, UCT)  
 John Davies (Endangered Wildlife Trust)  
 Dr Gareth Tate (FIAO, UCT, Endangered Wildlife Trust)  
 Dr Lindy Thompson (Endangered Wildlife Trust)

**Student:** Daryl van der Merwe (CB MSc, UCT).



# Vulture conservation

We are currently experiencing what some have described as an African Vulture Crisis. The rapid decrease in vulture numbers across Africa was recently highlighted when parties to the Convention of Migratory Species unanimously adopted the Multi-species Action Plan to Conserve African-Eurasian Vultures (Vulture MsAP). Several populations of vultures have declined by up to 95% over the last few decades. Unlike the Asian Vulture Crisis, where the collapse of vulture populations had a single main cause (veterinary drug – diclofenac), there appear to be multiple drivers for the situation in Africa, with the importance of each varying between species and regions.

Vultures provide important eco-system services and their declines or disappearances will have a dramatic effect on people and wildlife in Africa. The FitzPatrick Institute is committed to help conserve vultures in Africa by engaging in a number of research projects on multiple species in several countries in southern Africa.

Working with Raptors Botswana, we are involved in a research programme to conserve Botswana's significant populations of vultures. All five species in the country are endangered or critically endangered. Central to this research is an attempt to quantify changes in vulture populations in Botswana over the last 20 years by repeating road transects undertaken in the early 1990s, as well as to undertake repeat aerial surveys of some important colonies.

We remain a key partner in the conservation of the Bearded Vulture *Gypaetus barbatus* in southern Africa. Sonja Krüger completed her PhD research on the conservation of this population at the Fitz in 2014 and we continue to collaborate with her (Ezemvelo KZN Wildlife) and others on the conservation of this important population. More recently, research has focused on the feasibility of captive breeding and of establishing an 'insurance' population away from the Maloti-Drakensberg Mountain population. This project builds on the research Christiaan Brink conducted for his Conservation Biology MSc in 2015.

With collaborators VulPro, EWT, CSVet and Ezemvelo KZN Wildlife, we have collated, updated and verified a national database of vulture supplementary feeding stations (SFS) in South Africa. This spatial data on feeding sites and their provisioning rates will provide a valuable tool in conservation planning and will facilitate future research in determining the



Andrea Santangeli holds a Lappet-faced Vulture chick that has been removed from its nest to fit a GPS tracking unit by the Vultures Namibia Team in the Namib Naukluft National Park, Namibia (Photo: Michelle Harmse).

effect of SFS on aspects of vulture biology such as demography and behaviour.

## Activities in 2018

- Beckie Garbett submitted her PhD focussing on the conservation of vultures in Botswana.
- PhD student Christiaan Brink updated and verified a vulture restaurant database for South Africa. Christiaan interviewed more than 200 supplementary feeding station





A young White-backed Vulture feeding on “safe food” provided at a supplementary feeding site in the Associated Private Nature Reserves (Photo: Gareth Tate).

managers regarding their provisioning rates, perceptions with regards to SFS management and motivations. Results from this study, describing the state of the network of supplementary feeding sites in South Africa, are currently being drafted for publication..

- Leungo Leepile submitted two papers from his MSc research to the journals *Bird Conservation International* and *Ostrich*.
- Led by Vultures Namibia, currently 8 fledgling Lappet-faced Vultures are fitted with GPS tracking units within the Namib Naukluft National Park to study early-life movements and survival in this harsh landscape.

### Highlights

- Beckie Garbett was awarded her PhD and in 2019 will take up a position as Vulture Conservation Programme Coordinator for BirdLife International in Nairobi, Kenya.
- CB MSc students Tapiwa Zimunya and Leungo Leepile were both awarded their degrees at the December 2018 graduation ceremony, with both research projects focused on the conservation of vultures.
- Leungo Leepile, Beckie Garbett and Christiaan Brink presented their research at the Raptor Research Foundation conference in Kruger National Park in November 2018.
- Together with colleagues from Raptors Botswana, Beckie Garbett and Arjun Amar published two papers from Beckie’s PhD thesis – one on lead levels of White-backed Vultures, which was published in *The Science*

*of the Total Environment* and another on the changes in Raptor abundance in Botswana, published in *Biological Conservation*.

- Christie Craig, Robert Thomson and Andrea Santangeli published two papers. One looked at the drivers and extent of poison use in Namibia’s communal farmers published in *Ambio*. The other explored how these communal farmers view vultures, the ecosystem services they provide, and the cultural uses of vulture parts, published in *Ostrich*.
- A paper on the lead levels in Bearded Vultures in South Africa by Sonja Krüger and Arjun Amar was published in *The Journal of Raptor Research*.

### Impact of the project

Our research aims to understand important ecological issues affecting vultures, quantify population trends of multiple species, and identify key drivers of their population declines. Using our research on vulture restaurants, poisons use, blood lead levels and hunting, and more recently with our research on reintroductions, we hope to deliver solutions to help reverse the declines in these species in Africa. The outcomes of these projects will help us understand why, what, where and how vulture threats occur, with implications for targeting cost-effective conservation actions.

### Key supporters

DST-NRF CoE grant; NRF Innovation Scholarship; JW Jagger Grant; Denver Zoo; Raptors Botswana; Rufford Grant; Wilderness Wildlife Trust; Mohammed bin Zayed Species Conservation Fund; Columbus Zoo; Leslie Brown Memorial Grant; Peregrine Fund; IDEA Wild; British Ecological Society; Ezemvelo KZN Wildlife; Endangered Wildlife Trust; N3TC through Wildlands, Vultures Namibia.

### Research team

Dr Arjun Amar (FIAO, UCT)  
 Dr Robert Thomson (FIAO, UCT)  
 Dr Andrea Santangeli (U. Helsinki, Finland)  
 Dr Sonja Krüger (EKZN Wildlife)  
 Ms Kerri Wolter (VulPro)  
 Dr Glyn Maude (Raptors Botswana)  
 Dr Richard Reading (Raptors Botswana)  
 Dr Gareth Tate (Endangered Wildlife Trust)  
 Dr Ara Monadjem (U. Swaziland)  
 Dr Andrew Tucker (CSVet, Pretoria)

**Students:** Beckie Garbett (PhD, UCT); Christiaan Brink (PhD, UCT); Leungo Leepile (CB MSc, UCT); Tapiwa Zimunya (CB MSc, UCT).

# Southern Ground-Hornbill conservation

Southern Ground-Hornbills *Bucorvus leadbeateri* are large, group-living birds which require large territories and relatively undisturbed areas with large trees for breeding and roosting. These two requirements are increasingly rare, given high rates of habitat destruction during the past century which has accelerated in recent decades. Southern Ground-Hornbills have experienced a two-thirds reduction in their national range and presumably population size in the past 100 years and are thus considered globally Vulnerable, having been up-listed to Endangered in South Africa. A long-term study at the Fitz, initiated in 2000, has been investigating their habitat use, reproductive success, natal and breeding dispersal. Recently, we started investigating their behaviour in more detail, specifically how individuals contribute to vital group functions such as territory defence and reproduction.

One of the main motivations at the origin of this research programme was to assess whether artificial nests were an alternative to natural cavities, which have become increasingly scarce. Our study area is the Associated Private Nature Reserves (APNR) covering 200 000 ha adjacent to the central Kruger National Park. The nest boxes proved successful, with 12-15 of the 20 groups that were provided with nest boxes attempting to breed each year.

This project is closely linked to the Mabula Ground-Hornbill Project. As part of this collaboration we provide the second-hatched chicks that invariably die of starvation in the wild from our population, to be captive-reared and later released in new areas.

The current focus of the project is on better understanding the species' social structure and individual contributions to breeding success and territory defence. MSc student Kyle-Mark Middleton is investigating these questions under the supervision of Dr Rita Covas, Prof. Claire Spottiswoode and Dr Fanny Rybak. Kyle has obtained many hours of recordings of the different groups' dawn chorus and has travelled to Paris to learn how to analyse the vocalisations with Fanny Rybak. The first results reveal intriguing differences between the sexes, and among the vocalisations of different individuals. The next step is to do play-back experiments to assess if the birds also perceive these vocalisations as different. These experiments were planned for the beginning of the breeding season, but anomalous weather with very late rains and high temperatures led to a delayed onset of breeding, and only a small number of groups attempted to breed. The play-back experiments have therefore been postponed to the following season.

## Activities in 2018

- Kyle Middleton completed the first year of his MSc degree researching the breeding behaviour and vocalisations of the groups in the APNR allowing him to upgrade to a PhD degree in early 2019.
- Kyle travelled to Paris, France to join Fanny Rybak, where he was introduced to group vocalisation analysis. Initial analysis of the vocalisations (Figure 1) suggest that different territorial groups have unique 'signatures', and that male and female calls are performed at different frequencies.
- The first playback experiments were conducted to investigate whether groups are able to recognise neighbour groups from stranger groups through vocalisations.
- Increased efforts were continued to identify individuals by non-invasive techniques such as the use of camera-traps to photograph the birds' face and obtain distinctive individual features of their bill or cask shape, red pouch, 'side-burns', etc. This will be used to study individual contributions to nestling feeding.

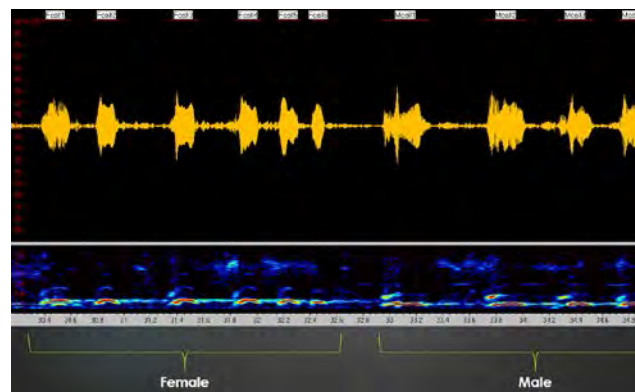


Figure 1. Waveform and spectrogram of male and female chorus calls.



Figure 2. Photo from the camera trap at Charloscar nest.

- Camera traps were placed in camouflaged boxes at five nests before the breeding season began which record birds provisioning food at the nest (Figure 2).
- Initial camera trap analysis shows that adult males contribute more to the feeding of the incubating female and chick than sub-adult helpers. It also appears that the female plays little part in feeding the chicks once she has stopped incubating.
- Genetic sample collection for known individuals is continuing through non-invasive methods, such as from shed feathers, the collection of fresh faeces when following groups and at roosts, and by swabbing eggs. This is to determine relatedness between individuals and how this influences investment in cooperative behaviour.
- Kyle presented a poster and speed-talk at the African Bioacoustics Conference in Cape Town on the vocalisations and individual contributions of the ground-hornbills.
- Kate Carstens had three papers from her PhD on breeding success, the timing of breeding and natal dispersal accepted for publication in the *Journal of Ornithology*, *Bird Conservation International* and *Ostrich*.

#### Highlights:

- The 2017/18 breeding season saw 14 active nests with nine chicks successfully fledged and three second-hatched chicks were harvested for the reintroduction programme.
- Egg candling was used for the first time to provide a more accurate estimate of the hatch date for harvesting and methods are being developed to sex birds whilst still in the egg.
- The project saw its 100<sup>th</sup> chick fledge from an

artificial nest in the APNR since its establishment in 2000.

- The APNR has contributed 41 hatched chicks to the reintroduction programme.
- Ongoing repairs to and replacement of artificial nest boxes ensure that ground-hornbills can continue to thrive in an area which has a paucity of natural nest cavities.
- The TV show 50/50 featured the combined efforts to conserve the ground hornbill species.
- Rob Little and Kyle Middleton participated in developing a Biodiversity Management Plan (BMP) for the Southern Ground-Hornbill with the Department of Environmental Affairs (DEA), relevant provincial conservation agencies and other stakeholders during May 2018 which will be implemented in collaboration with the DEA and SANBI.

#### Impact of the project

This project has provided a significant contribution to the demographic gains of the Southern Ground-Hornbill population at the APNR as a result of the installation of artificial nests and has demonstrated the efficacy of these nest boxes as a conservation tool, particularly in areas that have a shortage of large trees with natural cavities. These results contributed to the national Southern Ground-Hornbill Species Action Plan and to the Southern Ground-Hornbill Reintroduction Plan and assist with their implementation. Rob Little represents the Fitz on the national Southern Ground-Hornbill Working Group and is also Vice Chairman of the Mabula Ground-Hornbill Project management board. During 2018, the project gave five presentations to the general public to create awareness and published four articles in the magazine *Klaserie Chronicle* which is distributed to surrounding private reserves and the greater Hoedspruit community. The project has also gained interest from reserves surrounding the APNR which are showing increased attention towards the species and their conservation.

#### Key supporters

DST-NRF CoE grant; The Foundation for Science and Technology FCT, Portugal; Associated Private Nature Reserves; Senelala Estates.

#### Research team

Dr Rita Covas (FIAO, UCT and CIBIO, U.Porto)  
Prof. Claire Spottiswoode (FIAO, UCT)  
Dr Fanny Rybak (U. Paris-Sud, France)  
Dr Rob Little (FIAO, UCT)

**Students:** Kyle Middleton (MSc, UCT).

**Research Assistant:** Carrie Hickman.



# Conserving Benguela endemic seabirds

All three seabirds endemic to the Benguela upwelling ecosystem that rely on anchovies and sardines are threatened by local reductions in the availability of their preferred prey. Small pelagic fish abundance has decreased off the southern African west coast, where fishing effort is concentrated and most seabird breeding islands are located. As a result, it is crucial to understand the foraging behaviour of breeding seabirds and how their populations respond to changes in fish abundance and distribution.

Recent studies indicate that the South African sardine population comprises two stocks, one off the west coast and one off the south coast. The lack of spatial management of the fishery has resulted in over-exploitation of the west coast stock. In 2018, the sardine fishing industry was closed for three months in an attempt to alleviate the pressure on the stock, but conditions for African Penguins *Spheniscus demersus*, Cape Gannets *Morus capensis* and Cape Cormorants *Phalacrocorax capensis* breeding at west coast location remain poor. However, not all seabirds in the region are decreasing. Greater Crested (or Swift) Tern *Thalasseus bergii* numbers have increased over the last few decades, despite feeding on the same small pelagic fish prey as the three endemic species. Understanding the drivers behind these population changes is the crucial first step necessary to mitigating population declines. This is a large, multi-faceted programme with key participants including Pierre Pistorius, Lorien Pichegru and Maëlle Connan (NMU), David Grémillet (CNRS Montpellier), former post-docs Tim Cook (Paris) and Richard Sherley (Bristol), collaborators at BLSA (Ross Wanless, Christina Hagen) and DEA (Azwianewi Makhado and Rob Crawford), as well as several post-doctoral students..

## Activities in 2018

- After completing his PhD at the Fitz, Alistair McInnes has held a CoE post-doctoral position at NMU studying the use of seabirds as real-time monitors of pelagic fish availability. Working mainly at Stony Point, Betty's Bay, home to the only increasing population of African Penguins, he continues to use cameras and GPS loggers and locally-designed weigh-bridges to measure how hard penguins have to work to catch prey.
- NMU postdoc, Dr Giannina Passuni, mentored by Lorien Pichegru and NMU's Nadine Strydom, has been investigating the stomach contents of anchovies eaten by African Penguins to understand the diet of the penguins' main prey. These data will be analysed together with acoustic estimates of the abundance and distribution of small pelagic fish and the foraging areas of tracked penguins. Working with SAEON's Algoa Bay node, she also sampled nutrient concentrations and plankton diversity and biomass around St Croix Island eight times over a year to evaluate the influence of nutrient inputs from the largest African Penguin colony on the feeding environment for larval anchovy and sardine. Her ultimate aim is to understand how changing environmental conditions will affect top predators.
- The experimental closure of commercial fishing for small pelagic fish around key penguin breeding islands continued in 2018, with the waters around St Croix Island once again opened to fishing, after three years of closure. This corresponded with a marked increase in penguin foraging distances, confirming the significant benefit of fishing exclusions around penguin colonies, especially when fish are scarce. The results of the experiment taking place in Algoa Bay from 2008 to 2018 will be published in 2019. Determining a threshold below which fishing exclusions should be implemented to benefit penguins could be integrated in a Dynamic Ocean Management plan that allows fishing to occur around colonies when fish abundance is high, thereby reducing the cost to the fishery.
- NMU PhD student Gwendoline Traisnel published a paper on African Penguin 'personalities' in *Ethology* and investigated if these traits influenced foraging behaviour. Her resultant paper, currently in press with *Ibis*, shows that resource acquisition strategies are linked to personality types only in female African penguins. Bolder females follow a more



### mixed species baitball

A video grab from footage taken by an African Penguin approaching a 'bait ball' of anchovy with two Cape Cormorants and a Sooty Shearwater. Post-doc Alistair McInnes deployed cameras designed by PhD student Stefan Schoombie on penguins breeding at Stony Point.

sinuous foraging path than shy birds, and dive more extensively. Gwendoline also investigated if consistency in foraging strategies could relate to personalities and benefit breeding success. Her paper in *Marine Ecological Progress Series* showed that females exhibit greater foraging flexibility than males, possibly adapting to their brood's needs. When environmental conditions were poor, parents with consistent, repeatable foraging strategies had higher breeding success, presumably because regular feeding events favoured chick growth.

- Gwendoline also published a note in *Marine Ornithology* showing how a heat wave early in the breeding season led to the mass abandonment of a large part of the Bird Island colony of African Penguins. When these birds returned for a second breeding attempt later in the season, they killed some chicks from earlier breeding attempts, in an unanticipated impact of climate change.
- NMU PhD student Katharina Reusch completed a second field season on the foraging ecology of Kelp Gulls *Larus dominicanus*. She deployed GPS loggers and collected stomach and blood samples from incubating Kelp Gulls from colonies varying in their access to human-

produced food. Her preliminary findings reveal a wide variety of food items, independent of the distance to towns or refuse dumps. She has processed >600 blood samples from adults for stable isotopes to compare the signatures across seven study colonies.

- Lorien Pichegru mentored two Honours students in the Department of Mechatronics at NMU who designed a heart-rate recorder and a GPS/depth recorder for African Penguins.
- Pierre Pistorius continued monitoring Cape Gannets at Bird Island in Algoa Bay, and collected further tracking and demographic data from this colony. Jonathan Botha, a former MSc student on this project, demonstrated interesting differences in foraging behaviour during the guard and post-guard phases in *Frontiers in Marine Science*. Gavin Rishworth, another former MSc student, also published a paper on the VHF-based monitoring of Cape Gannets in the *Journal of Marine Systems* showing the relative importance of sex, offspring age and weather conditions on the time that adult gannets spend at sea while provisioning their offspring. Post-doc Andrea Thiebault used tracking data from these birds, in conjunction with data from small video-

cameras deployed on the birds, to derive new methods for identifying seabird behaviours at sea. She also continued her research into acoustic communication in gannets.

- NMU Post-doc Ralph Vanstreels had a productive year applying his veterinary skills in studying health and conservation aspects relevant to seabirds. Danielle van den Heever, under the supervision of Pierre Pistorius at NMU, completed her MSc on the at-sea habitat use by Wedge-tailed Shearwaters *Ardenna pacifica* breeding at Reunion and the Seychelles.
- Ilana Engelbrecht continued working on her MSc with Pierre Pistorius on foraging strategies and within-pair synchronization in Cape Gannets at Bird Island. The project is based on the extensive set of foraging trip durations of individuals tagged with VHF transponders.
- David Grémillet and Lorient Pichegru attempted to continue their long-term study tracking the foraging ranges of Cape Gannets breeding on Malgas Island, which was initiated in 2002. The intention was to deploy GPS on individuals of known-age to explore how experience influences foraging success. However, breeding on Malgas Island was greatly delayed in 2018, with very few birds in the colony, probably as a result of predation by Cape fur seals within the colony. More than 1000 gannet eggs also were found to be predated by Kelp Gulls, many more than usual, possibly as a consequence of the disturbance by seals.
- Former PhD student Davide Gaglio, who graduated in 2017, published four more papers on Greater Crested Tern foraging ecology and diet, and was instrumental in a paper estimating the tern's survival rate led by visiting post-doc Ana Payo-Payo.
- MSc student Laurie Johnson finished writing up her MSc, co-supervised by Maëlle Connan and Peter Ryan. In it, she tests the assumption that stable isotope signals in feathers remain constant, and uses stable isotopes to study the diets of predators in the Namibian Islands Marine Protected Area.
- Emmanuel Adekola arrived from Nigeria to start a PhD on moult in birds, with a focus on Cape Gannets.

### Highlights:

- MSc students Danielle van den Heever (NMU) and Oyena Masiko (CB UCT) graduated in 2018.

Danielle obtained a distinction for her thesis on Wedge-tailed Shearwater foraging ecology.

- Peter Ryan gave a plenary talk at the 29th IOC in Vancouver on seabird conservation from a Southern Hemisphere perspective, drawing on work from this programme and the Southern Ocean programme.
- Lorient Pichegru was lead editor of a popular book, *Amazing Features and Creatures of Algoa Bay*, that highlights the diversity of marine species and habitats in Algoa Bay.
- Lorient also attended the 5th International Marine Conservation Congress in Kuching, Malaysia, where she gave a talk on the benefits of fishery exclusion zones to African Penguins. The presentation will be published in *Frontiers in Marine Science*.
- Ex-CoE student, Gavin Rishworth, published a synthesis of his MSc work on time-activity budgets in Cape gannets in the *Journal of Marine Systems*.
- Ralph Vanstreels identified a novel candidate species of *Anasplasma*, a bacterium transmitted by ticks, in the erythrocytes of African Penguins. This is the first time this genus has been identified in birds, and was published in *Parasites and Vectors*.

### Key supporters

BirdLife International; BirdLife South Africa; DST-NRF CoE grant; Raggycharters Whale Watching.

### Research team

Dr Pierre Pistorius (NMU)  
 Prof. Res Altwegg (SEEC, UCT)  
 Prof. Peter Ryan (FIAO, UCT)  
 Dr Lorient Pichegru (NMU)  
 Dr Maëlle Connan (NMU)  
 Dr Timothée Cook (U.Paris)  
 Dr Rob Crawford (Oceans & Coasts, DEA)  
 Dr Jon Green (U. Liverpool)  
 Dr David Grémillet (FIAO, UCT and CNRS)  
 Dr Azwianewi Makhado (Oceans & Coasts, DEA)  
 Dr Alistair McInnes (NMU Post-doc)  
 Dr Florian Orgeret (NMU Post-doc)  
 Dr Giannina Passuni (NMU Post-doc)  
 Dr Richard Sherley (U. Bristol)  
 Dr Andrea Thiebault (NMU Post-doc)  
 Dr Ralph Vanstreels (NMU Post-doc)  
 Dr Ross Wanless (FIAO, UCT and BLSA)

**Students:** Emmanuel Adekola (PhD, UCT); Katharina Reusch (PhD, NMU); Gwendoline Traisnel (PhD, NMU); Ilana Engelbrecht (MSc, NMU); Tayla Ginsburg (MSc, NMU); Laurie Johnson (MSc, UCT); Danielle van den Heever (MSc, NMU); Oyena Masiko (CB MSc, UCT).



# Shorebirds under threat

Human population densities are greatest in coastal areas and around wetlands. As a result, many coastal and water birds face significant threats from human disturbance as well as habitat loss and degradation. Migrant shorebirds are particularly at risk because they require secure breeding and non-breeding areas, as well as staging points along their migration routes. As a result, we have seen sharp declines in many migrant shorebird populations in South Africa, mirroring a widespread global trend. This programme continues ‘Disturbing the Peace’, which focused mainly on managing the impacts of direct human disturbance on shorebirds, but also examines the plight of long-distance migrant shorebirds in the region.

The project on managing disturbance to shore-breeding waders in the Garden Route area has largely shifted to the implementation phase, with field research stopping in 2017. PhD student Selena Flores analysed the data collected with the Nature’s Valley Trust (NVT) to understand the factors driving population decreases in coastal populations of White-fronted Plovers *Charadrius marginatus*. Research staff and volunteers from the NVT continue to implement mitigation measures through the 2017/18 and 2018/19 breeding seasons, and to monitor the impact of these measures on White-fronted Plover breeding success. Encouragingly, early indications are that the conservation intervention work is successful, with increases in breeding success on some beaches.

## Activities in 2018

- Selena Flores monitored White-fronted Plovers on the coast around Plettenberg Bay for the third breeding season in succession. She is testing how plover breeding behaviour differs over a disturbance gradient. While Selena’s efforts now focus on completing her PhD thesis, the NVT research team continues the work on the ground. The 2018/2019 breeding season saw mixed results – Nature’s Valley breeding success has stabilised over the last two seasons to between 25 and 30% (up from around 9% pre-intervention work), while lack of enforcement and sheer volume of conflict on Lookout Beach in Plettenberg Bay saw the plovers have a bad year there. Strong stakeholder engagement, driven by the NVT team, continued linking up with BirdLife South Africa’s Bird of the Year Programme.

- Gary Allport asked the Fitz to host a project to investigate the population size and movements of Steppe Whimbrels *Numenius phaeopus alboaxillaris*, the very poorly known subspecies of Whimbrel thought to breed in the steppes of western Asia. Gary ‘rediscovered’ a few Steppe Whimbrels in southern Mozambique in 2016, and since then a few have been recorded at wetlands in Mozambique and at Richard’s Bay. A funding application was made to cover the costs of tracking a few birds to discover their breeding grounds, and to conduct a survey of the main wetlands in Mozambique to get a better idea of the population size.

## Highlights:

- PhD student Selena Flores continued working up her data on the impacts of human disturbance on White-fronted Plovers.
- Gary and Peter obtained a grant from the Mohamed Bin Zayed Species Conservation Fund to track Steppe Whimbrels.

### Key supporters

BirdLife Plettenberg Bay; DST-NRF CoE grant; Wader Quest, Nature’s Valley Trust.

### Research team

Prof. Peter Ryan (FIAO, UCT)  
Dr Gary Allport (BirdLife International)  
Dr Mark Brown (Nature’s Valley Trust)  
Dr Robert Thomson (FIAO, UCT)

**Student:** Selena Flores (PhD, UCT).

**Research assistants:** Brittany Arendse, Kellyn Whitehead, Bruno Mels.

# Conserving Southern Ocean seabirds

Seabirds are among the most threatened groups of birds because they face challenges both at their breeding sites and at sea. Almost one-third of all seabirds are on the global Red List, and they comprise nearly half of all threatened birds in South Africa. The Fitz's Seabird Research Programme assesses the severity of threats faced by seabirds, and attempts to provide practical management solutions to reduce these threats. Southern Ocean species are mainly threatened at sea by fishing mortality and climate change. Monitoring seabirds provides a window into the health of the Southern Ocean.

Most field work takes place through the South African National Antarctic Programme (SANAP) at the Prince Edward Islands, Tristan da Cunha and Gough Islands. Fitz's seabird research on Marion Island, the larger of the two Prince Edward Islands, has continued unbroken since the early 1980s, when a series of long-term seabird study colonies were established by John Cooper. Servicing these long-term studies through a succession of three-year research projects is challenging, and currently is by three collaborative projects with CoE team members at NMU (Pierre Pistorius and Maëlle Connan) and DEA (Azwianewi Makhado) as well as Environmental Conservation Officers appointed by DEA. This project overlaps with the Island Conservation project (p. 45).

## Activities in 2018

- Former PhD student Dom Rollinson published a paper on the movements of White-chinned Petrels *Procellaria aequinoctialis* from Marion Island, showing that they remain in the African sector of the Southern Ocean year-round. This is important for understanding the impact of fisheries bycatch because this is the species most often killed on longlines in the region.
- Former NMU PhD student Jonathan Handley published a paper on interactions between Gentoo Penguins and lobster krill at the Falkland Islands, using video cameras deployed on the penguins. Interestingly, the lobster krill defend themselves using their pincers and reduce their risk of being preyed upon by forming tight clusters. His results were widely reported in the popular media.
- NMU post-doc Ryan Reisinger published a paper in *Diversity and Distributions* describing the at-sea habitats modelling of seabirds and seals at the Prince Edward Islands using all historical tracking data. This highlighted important areas in the Southern Indian Ocean for conservation-based marine spatial planning. The models developed during this study are now being used in a larger global project, the Retrospective Analysis of Antarctic Tracking Data (RAADT).
- Pierre Pistorius contributed to a paper in *Nature Climate Change* demonstrating the importance of climate change on the distribution of King Penguins *Aptenodytes patagonicus*. It predicts that warming ocean temperatures will drive King Penguin prey southwards with the Antarctic Polar Front, forcing adults to commute longer distances to provision their offspring. This increased energetic expenditure is expected to impact on reproductive output and lead to major changes in the distribution of this species. Results of this study featured in over 100 media outlets.
- Peter Ryan contributed data to a meta-analysis published in *Nature Climate Change* showing that seabirds generally exhibit little change in breeding phenology in relation to climate change, suggesting that they are likely to be increasingly susceptible to mis-matches between the timing of breeding and peaks in prey availability. He also contributed to another meta-analysis of foraging ranges of seabirds from 10 families published in *Marine Policy*, which assessed whether there were common spatial characteristics that could be used for conservation planning.
- Newi Makhado published the first account of the at-sea distribution and habitat preferences of Indian Yellow-nosed Albatrosses *Thalassarche carteri* breeding at Prince Edward Island. These birds were shown to concentrate their foraging along the Agulhas Bank, explaining their vulnerability as fisheries bycatch.
- Two papers led by Henri Weimerskirch arising from the ACE cruise were published: one documented the massive decline in what in the 1980s was the largest King Penguin colony in the world on Île aux Cochons, and one reported long-term trends in albatross populations in the French sub-Antarctic territories.
- Tegan Carpenter-Kling continued her PhD work on foraging ranges and diet of seabirds breeding at Marion Island. She spent three months

working with Clive Trueman on the isotope component of her study, and another three months in the Crozet archipelago, 1 000 km east of Marion Island, where she collected data on Gentoo Penguins *Pygoscelis papua*.

- Stefan Schoombie continued his PhD on fine-scale foraging behaviour of albatrosses and petrels. He wrote a programme to estimate bank angles in flying seabirds from video footage from bird-borne cameras which allows us to determine how dynamic soaring birds such as albatrosses change their flight behaviour in relation to local wind conditions.
- Kim Stevens continued with her PhD on the demography and at-sea movements of Grey-headed Albatrosses *Thalassarche chrysostoma*.
- Ditiro Moloto, one of the original cohort of Limpopo students who came to the Fitz as an exchange student in 2014, completed writing up her MSc on the structural adaptations of flight feathers for flight underwater in procellariiform seabirds.
- Alexis Osborne made good progress with his MSc on the impact of breeding status on moult in Wandering Albatrosses and giant petrels, but failed to complete it before leaving for Gough Island as a field assistant for the RSPB in September 2018.
- Lilli Ruiters started an MSc at NMU on the foraging behaviour of King Penguins at Marion Island. This is the first study of their foraging behaviour during the early breeding season and important in terms of identifying how reliant King Penguins from Marion Island are on productive foraging waters associated with the Antarctic Polar Front.
- PhD student Ben Dilley, although working mainly on landbirds at Nightingale Island, collected valuable data on the island's seabirds, including population estimates and tracking data.
- Chris Jones and Michelle Risi completed a year as field assistants on Marion Island in May 2018, then left for another year on Gough Island for the RSPB in September. They continue to write up numerous papers arising from their work on the islands, and Michelle is steadily working through the long-term study colony data for Northern Giant Petrels *Macronectes halli* on Marion Island.

#### Highlights:

- Chris Jones was awarded his MSc for his study on the two prion species recently found breeding together on Gough Island.



One of two Tristan Albatross chicks on Inaccessible Island in 2018. Among the surface-nesting seabirds, only populations of Antarctic Terns *Sterna vittata* and perhaps Northern Rockhopper Penguins *Eudyptes moseleyi* have decreased over the last decade (Photo: Peter Ryan).

- Peter Ryan gave a plenary talk at the 29<sup>th</sup> IOC in Vancouver on seabird conservation from a Southern Hemisphere perspective, drawing on work from this programme and the Benguela seabird programme.
- Sixteen papers on Southern Ocean seabirds and their conservation were published in 2018.

#### Key supporters

Agreement on the Conservation of Albatrosses and Petrels (ACAP); ACE Foundation; CNRS; DST-NRF CoE grant; European Union; RSPB; South African National Antarctic Programme; WWF Australia.

#### Research team

Prof. Peter Ryan (FIAO, UCT)  
 Dr Pierre Pistorius (NMU)  
 Prof. Res Altwegg (SEEC, UCT)  
 Dr Maëlle Connan (NMU)  
 Dr Theresa Burg (U. Lethbridge, Canada)  
 Dr Sarah Converse (Oregon)  
 Dr Richard Cuthbert (formerly at RSPB)  
 Dr Jacob González-Solis (U. Barcelona)  
 Dr Akiko Kato (CNRS, Chize)  
 Dr Azwianewi Makhado (Oceans & Coasts, DEA)  
 Dr Richard Phillips (British Antarctic Survey)  
 Dr Rob Ronconi (Canadian Wildlife Service)  
 Dr Yan Ropert-Coudert (CNRS, Chize)  
 Dr Antje Steinfurth (FIAO, UCT)  
 Dr Ross Wanless (FIAO, UCT and BLSA)  
 Dr Henri Wiemerskirch (CNRS, Chize)  
 Prof. Rory Wilson (Swansea U.)

**Students:** Tegan Carpenter-Kling (PhD, NMU); Stefan Schoombie (PhD, UCT); Kim Stevens (PhD, UCT); Chris Jones (MSc, UCT); Ditiro Moloto (MSc, UCT); Alexis Osborne (MSc, UCT); Makabongwe Siggala (MSc, NMU); Lilli Ruiters (MSc, NMU).



# Conserving islands and their birds

Oceanic islands hold a disproportionately large amount of terrestrial biodiversity, yet are extremely vulnerable to introduced species: more than 90% of recent bird extinctions have been of island birds. Fortunately, eradicating invasive species can restore island ecosystems, provided there are strict controls on the subsequent import of people and materials. Birds are flagships for the conservation-management and restoration of island ecosystems. Our work focusses on South Africa's Prince Edward Islands and the UK Overseas Territory of Tristan da Cunha and Gough Island.

This programme is mainly concerned with the impacts of introduced predators, especially House Mice *Mus musculus*, but also is involved in the eradication or control of introduced plants and invertebrates. The impacts of House Mice on seabirds were only discovered in the early 2000s, following research by Fitz students in collaboration with the Royal Society for the Protection of Birds (RSPB) at Gough Island. Since then, they have been found to attack seabirds on Marion Island, and plans are underway to try to eradicate the species at both islands.

## Activities in 2018

- Peter Ryan accompanied New Zealand expert Keith Springer and BirdLife SA's Andrea Angel to Marion Island in April-May 2018 to prepare for the planned mouse eradication on Marion Island. Keith produced draft project and operational plans for the eradication, building on John Parkes' feasibility report drafted in 2014. Peter and Andrea conducted bait uptake trials to demonstrate that all mice will eat bait, including cave trials to ensure mice in caves are reached by aerial baiting. Andrea also set up husbandry trials to assess the feasibility of taking Lesser Sheathbills *Chionis minor* into captivity.
- Autumn surveys were conducted for the fourth successive year to monitor the spread of mouse attacks on large chicks of Grey-headed *Thalassarche chrysostoma* and sooty albatrosses *Phoebastria* spp. at Marion Island.
- Marion Island's Environmental Conservation Officer (ECO) Charlotte Heijnes was trained to conduct various studies, including assessing the start and end of mouse breeding across an altitudinal gradient, bait preference and toxicity trials, and monitoring cloud heights through the proposed winter baiting window. In late May 2018 she was joined by a second ECO, Monica Leitner. Together they repeated toxicity trials for mice on Marion Island and found that all mice died even at relatively low doses of brodifacoum, suggesting that the unexpected results obtained in 2017 were a result of the diet being fed to the mice in the lab. They also ran a series of husbandry trials with caged sheathbills, which suggest that it will be very challenging to keep a large number of captive sheathbills during an eradication attempt.
- Ben Dilley and Delia Davies completed their second field season on Nightingale Island in early 2018 as part of an EU-BEST project awarded to Tristan Conservation to collect basic biology information on the Endangered Wilkins' Bunting *Nesospiza wilkinsi*. Ben returned to Nightingale in September 2018 to obtain a third year of re-sighting data which will allow survival estimates to be made for the two cohorts of chicks banded in 2016/17 and 2017/18.
- Peter Ryan led a three-month trip to Inaccessible Island from September to December 2018 to continue his decadal monitoring of the island's birds, which commenced in the late 1980s. He was accompanied for the first three weeks by Maëlle Connan (NMU), and for the rest of the visit by PhD student Ben Dilley. On the trip to Tristan, they were able to advise the RSPB team heading to Gough, which included Dr Stefan Oppel, who has taken over the lead on research for the RSPB at Gough, and the contingent sent to prepare for the mouse eradication in 2020.
- The most worrying development on Inaccessible Island since Peter's last visit in 2011 was the ongoing spread and rapid increase in impact of the introduced Soft Brown Scale *Coccus hesperidum* and its

associated sooty mould *Seiridium phylicae* on *Phylica arborea* trees. The fruit of these trees are crucial for the large-billed buntings on Inaccessible and Nightingale Islands. In 2018, fruit loads in the worst affected area were barely 20% of those found on unaffected trees, and many large trees had died. Only two male large-billed birds remained in this area, both apparently mated to small-billed females. It appears that the scale insect invasion is breaking down the ecological segregation among bunting morphs in this area. This is of grave concern for Wilkins' Bunting *Nesospiza wilkinsi* on Nightingale Island, which has a total population of only around 400 individuals. In 2017/18, Ben and Delia found that Soft Brown Scale had spread throughout most of Nightingale Island, and urgent steps are being taken to explore the viability of using tiny parasitic wasps to control scale insect populations on both islands.

### Highlights:

- Ben Dilley completed his PhD on the impacts of mice on seabirds at Marion and Gough Islands.
- At the end of 2018, the RSPB finally appointed an operations manager for the project to eradicate mice from Gough Island in 2020. The project will be supported logistically by the South African Department of Environmental Affairs (DEA).
- Less good news is the fact that *Sagina procumbens* control/eradication operations were scaled back on Gough Island, despite the apparent success of spraying with a herbicide cocktail. Hopefully this decision will be re-evaluated after the mouse eradication, depending on the rate of spread of *Sagina* over the intervening two years.
- More worrying news is that Chris Jones and Michelle Risi observed the first evidence of mice attacking an adult Northern Giant Petrel on Marion Island in 2017, and Jaimie Cleeland and the RSPB team on Gough recorded the first mouse attack on an adult Tristan Albatross *Diomedea dabbenena* at Gough Island in early 2018. The implications of these records were discussed in a paper in *Antarctic Science*.
- The June 2018 issue of *National Geographic* included an article on seabirds featuring the impacts of mice on Marion Island's seabirds. Peter Ryan and Ross Wanless obtained a US \$125,000 grant to assist with planning for the Marion eradication attempt.



While on Inaccessible Island, Ben Dilley and Peter Ryan tried to estimate the population of Tristan Thrushes or Starchies *Turdus eremita* as part of a landbird project for Tristan Conservation (Photo: Peter Ryan).

- PhD student Stefan Schoombie led on a paper on Avian Pox in seabirds on Marion Island that was published in *Antarctic Science*, and Ben Dilley's paper reporting how mice are causing low breeding success among burrowing petrels on Marion Island also appeared in *Antarctic Science* in 2018.
- Peter Ryan contributed to a paper in *PLoS ONE*, published in early 2019, identifying priority islands for restoration through eradication of introduced predators, led by Nic Holmes from Island Conservation.

### Key supporters

Agreement on the Conservation of Albatrosses and Petrels; BirdLife International; DST-NRF CoE grant; EU-BEST; Royal Society for the Protection of Birds; South African National Antarctic Programme; UK Overseas Territories Environment Programme.

### Research team

Prof. Peter Ryan (FIAO, UCT)  
Dr Alex Bond (formerly at the RSPB)  
Dr Richard Cuthbert (formerly at the RSPB)  
Trevor Glass (Tristan Conservation Department)  
Dr Stefan Oppel (RSPB)  
Dr Ross Wanless (FIAO, UCT and BLSA)

**Student:** Ben Dilley (PhD).

**Research assistants:** Jaimie Cleeland, Kate Lawrence and Fabrice Lebouard (Gough 2017/18), Chris Jones, Michelle Risi and Alexis Osborne (Gough 1018/19) and Delia Davies (Nightingale).

# Hot Birds – Climate change and desert birds

The 'Hot Birds Research Project' (HBRP) integrates behavioural and physiological approaches to understand and predict the impacts of climate change on arid-zone birds in southern Africa and globally. The main focus of the HBRP is bird communities of the Kalahari Desert, but we also work in other habitats and in arid regions of North America and Australia.

## *Fitness and the importance of behaviour*

The UCT branch of the HBRP Team focuses on understanding the links between temperature, behaviour and fitness. Since 2010, we have shown that many bird species face temperature thresholds/inflection points in the mid-30°C range, above which they experience sublethal fitness costs. These costs include reduced foraging success in Southern Fiscals *Lanius collaris*, Southern Yellow-billed Hornbills *Tockus leucomelas*, Southern Pied Babbblers *Turdoides bicolor*, and Fork-tailed Drongos *Dicrurus adsimilis*, accompanied by inability of adults to maintain body mass (hornbills and pied babbblers); declines in nestling provisioning rates (hornbills, fiscals and drongos), growth rates of nestlings, size and quality of fledglings, and fledging success (hornbills and fiscals). New data collected in 2018 by MSc student Ryno Kemp suggests loss of mass at temperatures > 35°C also applies to extreme arid-zone specialists such as Red Larks *Calendulauda burra*. The underlying mechanism driving these sublethal fitness costs appears to be behavioural trade-offs made by adults to minimise exposure to the physiological costs of high temperatures. These trade-offs result in missed foraging opportunities through reductions in activity and use of shaded locations suboptimal for foraging (fiscals, hornbills, drongos); and/or handicaps on foraging efficiency imposed by the use of respiratory evaporative cooling (babbblers and hornbills).

In 2018, the team continued research into the mechanisms underlying these patterns to improve our ability to predict the vulnerability of a wide range of arid-zone species to ongoing climate change. We engaged two new PhD students: Nicholas Pattinson and Benjamin Murphy. Nick worked as a field assistant in the summer of 2017/18 to continue the long-term monitoring of changes in breeding success and ultimately population dynamics of Southern Yellow-billed Hornbills at Kuruman River Reserve. Nick registered in early 2018 and

began his fieldwork in October focussing on the physiological mechanisms underlying the correlations between temperature and breeding outcomes in hornbills, including aspects of stress and immune physiology, feather quality and carry-over effects. He is also trying to disentangle the effects of drought and concomitant low food availability from the effects of high air temperatures using a supplementary feeding experiment. Nick is supervised by Susie Cunningham and Andrew McKechnie.

Ben Murphy joined the team in mid-2018 and is working with the HBRP in collaboration with the Fork-tailed Drongo Project to investigate how Fork-tailed Drongo parents mitigate the impacts of high temperatures on their own foraging behaviour in order to maintain nestling growth rates (more information on pages 15-16). Ben is supervised by Susie Cunningham and Tom Flower. Andrew McKechnie and Susie Cunningham also recruited a new MSc student, Jessica Roberts, who will investigate trade-offs between foraging and thermoregulation in Dune Larks *Calendulauda erythrochlamys* in the Namib sand landscapes, starting in 2019.



PhD student Ben Murphy watching a Fork-tailed Drongo weigh herself on a perch scale (Photo: Susie Cunningham).



### *The buffering effects of sociality*

In late 2018, PhD student Amanda Bourne began her final fieldwork season studying the ways in which cooperative social behaviour could buffer the fitness costs of high temperatures. Amanda works with 20 groups of habituated Southern Pied Babblers on the Kuruman River Reserve. The babblers are cooperative breeders with natural variation in group size that makes them an ideal model species to study the effect of cooperation on physiological costs of heat stress and fitness costs of behavioural thermo-regulation. Amanda has validated a non-invasive technique for measuring field metabolic rate using doubly-labelled water with oral dosing and faecal sampling, removing the need to capture and handle study animals. This study was accepted for publication in *Functional Ecology* at the end of 2018. Data collection in the field using this technique will allow the team to correlate daily energy expenditure with individual time budgets and foraging success in addition to environmental conditions. Preliminary data from measurements of nestling daily growth rates suggest profoundly negative consequences of heat stress on nestling development and survival, regardless of group size. In addition, monitoring of breeding attempts has revealed that 'hot nests' are half as likely to hatch as those incubated during cooler periods. Amanda is examining long term data from the Pied Babbler Project in addition to her own data to investigate effects of group size on the recovery of individuals and groups after hot dry periods.

### *Hot Birds in the southern scrubland biomes*

PhD student Krista Oswald, registered at Rhodes University, continued her work on Cape Rockjumpers *Chaetops frenatus* under the supervision of Ben Smit, Susie Cunningham, Shelley Edwards and Alan Lee. Krista is currently polishing up her chapter on temperature-related changes in rockjumper behaviour and finishing her gene-sequencing to examine meta-population structure. In 2018, Krista also completed her final year of reproductive data collection. Her reproductive data are showing some interesting results, the main being that Boomslang *Dispholidus typus* are a key predator of rockjumper nestlings, responsible for the majority of 49 nest failures recorded during 2016-2018. These snakes are particularly active on warm days, suggesting an unexpected, indirect link between reduced reproductive success and



A hot Southern Pied Babbler panting to evaporate water and dissipate heat on a warm afternoon (Photo: Nick Pattinson).

increasing temperatures. Krista is also writing up the results of her PhD research for publication.

### *Thermoregulation in the heat*

The Hot Birds team is developing a behavioural index of heat stress in birds. Establishing whether functional links exist between inter- and intraspecific variation in heat dissipation and body temperature regulation was the focus of PhD student Michelle Thompson during 2017. Michelle maintained populations of nine bird species in large outdoor aviaries during the Kalahari summer to examine the interactions between behavioural and physiological thermoregulation. On hot days, most species reduced activity and increased shade-seeking sufficiently to manage heat load without resorting to hyperthermia. Michelle also examined the effect of water availability on thermoregulation in these nine species, with a short-term lack of water causing two passerines (White-browed Sparrow-weavers *Plocepasser mahali* and Cape Glossy Starlings *Lamprotornis nitens*) to maintain lower body temperatures on afternoons when water availability was restricted. In contrast, two columbids (Namaqua Oena capensis and Laughing Doves *Streptopelia senegalensis*) increased body temperature when water was not available. Michelle's data reveal that Kalahari species vary substantially in the suite of behavioural and physiological strategies they use to thermoregulate.



A colour-ringed Sociable Weaver. Post-doc Margaux Rat found that social networks of this highly gregarious species fragment under thermally stressful conditions (Photo: Alexandre Vaz).

### *Societies and climate change*

Post-doc Margaux Rat completed her work investigating the impact of climate change on the social structure of group-living Kalahari birds, with a focus on Sociable Weavers *Philetairus socius*. Margaux's work combined correlative field observations with experimental laboratory-controlled approaches to examine the impact of variation in temperature on the nature and frequency of social interactions and ultimately the impact on social networks of Sociable Weavers. Results from the field component of the project suggest that when individuals experience extreme and unstable environmental temperatures they interact less with their conspecifics. This is reflected in the cohesiveness of their social network as it becomes less dense and breaks down into more separate components. Margaux is now finalising her manuscripts for publication.

### *White-browed Sparrow-weavers*

Matt Noakes completed data collection for his PhD on the thermal physiology of sparrow-weavers during 2018, taking advantage of the University of Pretoria's recently-completed Small Animal Physiological Research Facility (SAPRF). This state-of-the-art climate-controlled facility allows us to explore the plasticity of avian thermoregulatory responses with insights into the capacity of birds for adaptive

physiological responses to changing climates at a level previously not possible. Matt is due to submit his PhD in mid-2019. Also during 2018, BSc Hons student Monique van Dyk completed her research into the effects of humidity on evaporative cooling in the sparrow-weavers. After solving the technical issues related to experimentally manipulating humidity in respirometry chambers, Monique was able to demonstrate that increasing humidity made thermoregulation a far more costly exercise, as the birds had to work harder to dissipate heat via panting. A manuscript based on Monique's data was submitted to *Journal of Comparative Physiology B* in late 2018.

Another sparrow-weaver project that continued during 2018 was Mpho Malematja's MSc on their digestive flexibility. In April, Prof. Enrique Caviedes-Vidal travelled from Argentina to Pretoria to help Mpho complete the digestive enzyme assays she needed to test predictions about how the sparrow-weavers adjust their gut physiology in response to changes in diet. Mpho spent most of the year writing up her MSc, which will be submitted in the first few months of 2019.

### *Red Larks:*

MSc student Ryno Kemp continued his study of the vulnerable Red Lark *Calendulauda burra* in 2018. His work mainly focused on the larks' thermal physiology, and a paper on these findings has been accepted in *Journal of Comparative Physiology B*. Also during 2018, he habituated larks to the point where he was able to train them to weigh themselves, and collected a large data set on the larks' behaviour and the thermal landscapes in which they operate. The study will put us in a position to better understand the Red Lark's habitat requirements and how the species will respond to climate change, thereby providing the basis for developing and implementing more effective conservation management plans.

### *Climate change past, present and future*

Shannon Conradie completed her MSc (which was awarded *cum laude*) in which she examined heat stress risk in desert birds under past, present and future climates. Shannon's work uses existing physiological and behavioural data on acute (12 species) and chronic (3 species) heat stress thresholds in southern African desert birds collected by the Hot Birds team over the last nine years. The major finding to emanate





PhD students Ben Murphy (left) and Nick Pattinson ring a Southern Yellow-billed Hornbill with colour bands for individual identification (Photo: Amanda Bourne).

from this study is that, for birds in southern African deserts, sub-lethal fitness costs associated with exposure to sustained hot weather pose a far greater threat than mass mortality events during extreme heat waves. This situation contrasts with that in the American southwest, where birds will face a risk of lethal dehydration on upwards of 50 days per year by the end of the century, and the similar scenario for Australia. A manuscript based on Shannon's MSc has been submitted to *Proceedings of the National Academy of Sciences USA*. In 2019, Shannon will be registering for a PhD that will expand on the findings of her MSc.

#### Highlights:

- New PhD students Nick Pattinson and Ben Murphy registered at UCT.
- The HBRP organized and ran a symposium on mechanistic responses of birds to climate

change at the International Ornithological Congress in Vancouver in August 2018. The symposium was co-chaired by Susie Cunningham and Janet Gardner.

- Post-doc Dr Zenon Czenze joined the team at the University of Pretoria, and will be pursuing a number of projects related to the thermal physiology of birds and bats in the next few years.
- Andrew McKechnie presented a seminar at the Australian National University in Canberra.
- The team published 14 papers in 8 journals: *the Journal of Experimental Biology*, *Scientific Reports*, *Physiology and Behaviour*, *Ostrich*, *Emu*, *Journal of Ornithology*, *Canadian Journal of Zoology*, and the *Journal of Arid Environments*.

#### Key supporters

DST-NRF CoE grant, SARChI Chair in Conservation Physiology, UCT URC, U. Pretoria, NRF Thuthuka Grant.

#### Research Team

Prof. Andrew McKechnie (U. Pretoria)  
 Dr Susie Cunningham (FIAO, UCT)  
 Dr Janet Gardner (Australian National University)  
 Dr Alex Gerson (U. Massachusetts)  
 Dr Alan Lee (FIAO, UCT and SANBI)  
 Dr Rowan Martin (FIAO, UCT)  
 Dr Todd McWhorter (U. Adelaide)  
 Dr Margaux Rat (FIAO, UCT and U. Pretoria)  
 Dr Ben Smit (Rhodes)  
 Dr Blair Wolf (U. New Mexico)

**Students:** Amanda Bourne (PhD, UCT); Ben Murphy (PhD, UCT); Nick Pattinson (PhD, UCT); Celiwe Ngcamphalala (PhD, Pretoria); Matthew Noakes (PhD, Pretoria); Ryan O'Connor (PhD, Pretoria); Michelle Thompson (PhD, Pretoria); Krista Oswald (PhD, Rhodes); Shannon Conradie (MSc, Pretoria); Ryno Kemp (MSc, Pretoria); Mpho Malematja (MSc, Pretoria); Barry van Jaarsveld (MSc, Pretoria); Emma Jepsen (BSc Hons, Pretoria); Monique van Dyk (BSc Hons, Pretoria).

**Research Assistants:** Lauren Bailey, Cathy Bester, Shelby Bohn, Cameron Brock, Rachel Bucksey, Josephine Bruning, John Diener, Lizzie Diener, Carla Dodd, Pieter Erasmus, Paige Ezzey, Samantha Fourie, Marc Freeman, Aurora Garcia-Berro Nava, Clerize Kemp, Craig Kenny, Noxolo Kinzela, , Vuyiseka Mbiko, Sakhile Mkhize, Lesedi Moagi, Alia Moller, Sophie Monsarrat, Ana Morales Gonzales, Angela Moreras, Iris Seto, Maxine Smit, Lauren Stansfield, Alyssa Stulberg, Jack Thorley, Alex Thouxau, Mervyn Uys, Natasha Visser, Laura Wade.



# Global change and urban birds

Anyone who has spent time at the University of Cape Town will know about the Red-winged Starlings *Onychognathus morio* on Upper Campus. These birds have developed a reputation amongst the UCT community for being sly, lunch-thieving pests and many students can recount a story of having a starling swoop past their heads on Jammie Plaza in pursuit of a Super Sandwich or some other treat. Since 2017 we have been conducting research on our favourite campus mascots, looking at how city-slicking birds such as these cope with highly variable food quality and quantity in urban environments and under increasing heat stress as Cape Town's climate warms.

Red-winged Starlings are an excellent example of a species that has taken advantage of the opportunities offered by urban environments. While many birds avoid urban areas due to disturbance, pollution, habitat transformation and other threats that they pose, some actively exploit cities. In their natural environment, Red-winged Starlings nest on cliffs in rocky and mountainous areas, but in cities they nest on buildings. Similarly, while they would normally feed primarily on fruit and insects, they have learned that cities offer rich opportunities for scavenging on anthropogenic food.

Understanding the consequences they face as a result of replacing their natural diet with this "junk-food" is one of the aims of our research on the campus starlings. A second aim is to investigate how they cope with the lack of food on campus over weekends and holidays. Finally, we are interested in how heat stress, promoted both by the urban "heat island" effect in an already warm climate, and ongoing climate warming, interacts with urbanisation to affect the birds.

Through intensive trapping efforts in 2017 and 2018, we now have a core population of >250 individually colour-ringed starlings on campus. This has allowed us to identify that the campus starling community includes both breeding residents and a large "floating" population whose presence fluctuates with time of day. "Floater" birds ringed on campus also use areas in Rondebosch and Observatory, and gather in large numbers on parts of campus in the early evenings, for reasons which currently remain mysterious. Colour-ringing has also allowed us to monitor breeding pairs and their productivity; frequent mate changes; and to



MSc student Miqkayla Stofberg weighs a habituated starling in front of the John Day Building (Photo: Billi Krochuk).

assess whether the ratio of anthropogenic to natural food fed to chicks matches that of the adult diet. The laboratory-based component of the project is being carried out in collaboration with Lund University, Sweden, as part of a bilateral project funded by the NRF and STINT (Swedish Foundation for International Cooperation in Research and Higher Education).

## Activities in 2018

- The colour ringed population consists of 208 adults and 53 chicks that were ringed in 2017 and 2018.
- Through a prolonged process of habituation, we have trained several birds to jump onto a scale and "weigh themselves", allowing us to obtain daily mass gain data and to conduct a supplementary feeding experiment conducted by Miqkayla Stofberg and Johan Jensen.



Campus favourites VMBB (violet over metal; blue over blue) and her mate RMBP (red over metal; blue over pink). This pair breed annually on top of a light in the tunnel under the Chemistry Building and entertain Fitz staff on their walk in to the John Day building. (Photos: Sam Hockey).

- Miqkayla Stofberg's BSc Hons project found dietary changes on weekends and weekdays in non-breeding birds, with a near-significant knock-on effect on mass gain but surprisingly few implications for daily time-activity budgets. The manuscript is currently under review in *Urban Ecosystems*.

### Highlights:

- We received funding from the NRF and STINT for a three-year joint South Africa-Sweden Research Collaboration focusing on urban avian ecology (Swedish PI: Assoc. Prof. Caroline Isaksson, Lund University). The mid-term seminar was held in De Hoop Nature Reserve in October 2018 where we worked on a review paper within the joint research team and advised joint students on their research projects.
- In collaboration with a computer science project we established an app "Starling Stalker" to record the resightings of our colour ringed birds. The app can be downloaded from: <https://play.google.com/store/apps/details?id=fitzpatrick.redwingstarlingapp>

### Impact of the project

Studying a resident and high-profile population of starlings that are well-known on campus has allowed us to involve the wider university community in a citizen science project, making

our research more visible and relevant. The accessibility of the project and its fieldwork has also resulted in an ideal training opportunity for younger students wanting to gain experience in behavioural research and bird observation/handling under careful supervision. Through the help of such volunteers, the project has managed to collect a large volume of data in its first two years.

### Key co-sponsors

DST-NRF CoE grant; NRF-STINT South Africa-Sweden Research Collaboration; Claude Leon Foundation.

### Research team

A/Prof. Arjun Amar (FIAO, UCT)  
Dr Martin Andersson (MEEL, Lund University)  
Dr Susan Cunningham (FIAO, UCT)  
Dr Arne Hegemann (MEEL, Lund University)  
A/Prof. Caroline Isaksson (MEEL, Lund University)  
Dr Johan Nilsson (OIKOS office, Lund University)  
Dr Petra Sumasgutner (FIAO, UCT)  
Dr Robert Thomson (FIAO, UCT)  
Dr Hannah Watson (MEEL, Lund University)

**Students:** Johan Jensen (MSc, Lund); Miqkayla Stofberg (MSc, UCT); Sarah Catto (CB MSc, UCT).

**Research Assistants:** Dr Sally Hofmeyr; Natasha Pindral; Jessleena Suri.

**Volunteers:** Adam Begg, Laura Figenschou, Tsilavo Razafimanantsoa, UCT Mountain and Ski Club, Olivia Venter, Vince Ward, and many others.

# Understanding the ecological impacts of Pied Crows

Pied Crow *Corvus albus* numbers are increasing in many parts of South Africa. Recent work at the Fitz suggests that the increase in Pied Crow numbers is a result of global warming and other anthropogenic factors including the availability of nest sites on electrical infrastructure and increased food availability in urban areas and from road kills. In combination, these factors have seen the Pied Crow increase its abundance in some regions and expand its range locally. Our project investigates the expansion of this species, sometimes termed a 'native invader' species, and tries to understand what impacts these changes might have for other biodiversity.

As a generalist predator, Pied Crows may impose heavy predation pressure on a variety of prey species. Anecdotal evidence suggests that Pied Crows present a risk to threatened species, such as endangered breeding waders and range-restricted tortoises. Recently, researchers and conservation organisations have begun drawing attention to the knowledge gap with regards to the ecological impacts of Pied Crows, emphasizing the need for more studies. Indeed, there is little information about the basic life history of Pied Crows, which is an essential component for understanding the potential impacts of a predator. We aim to contribute to

filling these knowledge gaps. Previous Fitz research has focused on quantifying predation on tortoises and avian nest predation. Our current research builds on that research, which suggested that crows may benefit from scavenging on the carcasses of road kills. To test this idea, we are exploring whether nesting densities or breeding demography differ depending on proximity to roads of different types (tar or gravel) and their associated levels of road kills.

Our research is focussed in the Hantam Karoo (Succulent Karoo), where crow densities are known to have increased substantially. Within



Almost all Pied Crow nests in the study area around Calvinia are on telephone or electrical poles (Photos: Rona van der Merwe).





Road kills may be an important source of food for Pied Crows. We are exploring the rates of road kills on tar and gravel roads and how this affects Pied Crow abundance and breeding performance. Here two crows compete with a White-necked Raven *Corvus albicollis* (Camera trap photo).

our study area we have crows nesting adjacent to tar roads and to gravel roads and we are examining the numbers of road kills found on these different roads, as well as monitoring the abundance and breeding performance of the crows which nest by these different road types.

#### Activities in 2018

- Rona van der Merwe continued collecting data (breeding data and road kill records) for her MSc dissertation.
- None of the 15 crow nests monitored in 2018 showed any evidence of tortoise predation by breeding pairs.
- GPS tagging of Pied Crows to determine home ranges was suspended in 2018 after trapping crows proved to be more challenging than expected.

#### Highlights:

- Rona has documented road kills from >4000 km of road transects and found that, as expected, road kills were higher on tar than

gravel roads.

- Rona monitored 29 Pied Crow nests along gravel and tar roads from 2017– 2018, which will allow breeding performance to be compared between these two road types.

#### Impact of the project

This research aims to build on our understanding of drivers of increasing Pied Crow abundances in certain regions of South Africa and determine the associated conservation problem, and if so, what management actions might be most effective to deal with these concerns.

#### Key supporters

DST-NRF CoE grant, Francois van der Merwe.

#### Research team

Dr Arjun Amar (FIAO, UCT)

Dr Robert Thomson (FIAO, UCT)

**Student:** Rona van der Merwe (MSc, UCT).

# Understanding urban raptor populations

Urban development is increasing across the globe and poses a major threat to biodiversity, which is often relatively depauperate in human-modified landscapes. In fact, next to climate change, the United Nations consider urbanisation the biggest environmental challenge to maintaining biodiversity of our time. More people live in urban than in rural areas globally, and the trend towards urbanisation is faster in Africa and Asia than in any other regions of the world.

The Cape Peninsula is located on the southern tip of the African continent, where climate change is predicted to be particularly rapid and severe. In this project we focus on the responses of raptors to increasing urbanisation under climate change. On the Cape Peninsula, urban breeding Peregrine Falcons *Falco peregrinus* and Black Sparrowhawks *Accipiter melanoleucus* have been monitored over 30 and 18 years, respectively. During this time, the populations of both species within the study area have increased markedly. We use these two long-term data sets on individually marked birds to investigate the effects of urban-living and weather on breeding phenology, reproductive performance, survival and population trends.

Beside habitat loss and fragmentation, wildlife in urban areas might also be negatively affected

by altered bio-geochemical cycles and the introduction of novel urban stressors such as light, noise and chemical pollutants. Urban-exploiting or adaptable species that are able to make use of abundant resources in the short-term, might thus still suffer from other hidden costs of urban living which could undermine their long-term health and persistence in an urban environment. We use the Black Sparrowhawk study system and a biomarker approach to investigate such possible health impacts. The species seemingly thrives in the city, taking advantage of the availability of nesting trees in alien *Eucalyptus* and pine plantations and the high prey abundance of pigeons and doves. Taking small blood samples from adults and their offspring, we have quantified eco-physiological parameters such as immune assays, oxidative stress and dietary antioxidants. The eco-physiological component of this research has been carried out in collaboration with Lund University, Sweden, as part of a bilateral project funded by the NRF and STINT which will run between 2017-2020



A colour ringed Peregrine Falcon in Mitchell's Plain. Andrew Jenkins has been monitoring the population on the Cape Peninsula for the last 30 years (Photo: Andrew Jenkins).

## Activities in 2018:

- In 2018, we ringed 46 Black Sparrowhawk chicks from 42 active territories and installed 12 nest cameras to collect data on prey provisioning rates.
- Andrew Jenkins conducted his 30<sup>th</sup> field season monitoring and colour ringing Peregrine Falcons on the Cape Peninsula.
- Rebecca Muller undertook her Conservation Biology MSc project in collaboration with the University of Kwa-Zulu Natal, unravelling urban productivity of Crowned Eagles. The collaborative research team included Dr Shane McPherson and Prof. Colleen Downs.
- We presented our research at the 4<sup>th</sup> Learn About Birds (LAB) conference in Langebaan, Western Cape, at the 27<sup>th</sup> International Ornithological Congress (IOC) in Vancouver,





Carina Nebel and Petra Sumasgutner inspecting stress bars in the growing feathers of a Black Sparrowhawk chick. Fellow students and raptor enthusiasts are invited to join the ringing events, here Gabriella Leighton is photographing the process. (Photo: Sanjo Rose).

Canada, and at the Annual Meeting of the Raptor Research Foundation (RRF) in Skukuza, RSA.

- Together with Assoc. Prof. Caroline Isaksson, we continued the three-year joint South Africa-Sweden Research Collaboration focusing on urban avian ecology, funded by the NRF and STINT. The mid-term workshop was held in De Hoop Nature Reserve in October 2018 where we worked on a review paper within the joint research team and advised joint students on their research projects.

### Highlights:

- We organised a symposium at the International Ornithological Congress (IOC) in Vancouver, Canada (Topic: “Human-raptor interactions: From conservation priorities to conflict mitigation”) with Prof. Steve Redpath and Petra Sumasgutner as key-note speakers.
- Sanjo Rose published her 2015 BSc Honours thesis “Exploring the influence of urbanization on morph distribution and morph-specific breeding performance in a

polymorphic African raptor” in *Journal of Raptor Research*.

### Impact of the project

Our project is one of the first to examine individual health and productivity of a bird species in relation to urbanisation in Africa. Our results have considerable implications for potential changes in phenology or productivity for the regions’ avifauna as African urbanisation continues.

### Key supporters

DST-NRF CoE grant; NRF-STINT South Africa-Sweden Research Collaboration, Claude Leon Foundation.

### Research team

Dr Arjun Amar (FIAO, UCT)  
Dr Petra Sumasgutner (FIAO, UCT)  
Dr Res Altwegg (SEEC, UCT)  
Dr Andrew Jenkins (ADU, UCT)

**Volunteers:** Ann Koeslag, Margaret MacIver, Antje Madden, Bernard Madden.

**Students:** Carina Nebel (PhD, UCT).

**Research Assistant:** Dr Shane MacPherson.



# Plastics in the environment

Plastics are used in a plethora of applications because they are lightweight, durable, have excellent barrier properties and are relatively cheap. These properties also make inappropriately handled waste plastics a significant environmental threat. Plastic litter persists for many years, is readily dispersed by water and wind, and has been accumulating in the sea for decades. It entangles and is eaten by a wide diversity of marine fauna, killing them directly, or reducing their appetite. Concerns about 'microplastics' introducing persistent organic pollutants (POPs) into marine foodwebs, combined with the discovery of 'garbage patches' in all the main ocean gyres, has sparked renewed interest in the subject in the last decade or so.

Much remains to be learned about the threats that plastics pose to marine ecosystems, but we know enough to act to reduce the amount of waste plastic entering the environment. The most significant impacts of plastics on marine organisms arise from plastic ingestion, so it is important to understand why organisms ingest plastic. Tracking trends in plastic ingestion provides perhaps the best indication of the efficacy of mitigation measures introduced to reduce the amount of plastic in the oceans. However, it is not always feasible to sample plastic ingested by organisms, so we also monitor plastic in the environment, both at sea and washed up on beaches. Much of the recent research in this project has focused on understanding how plastics move through the environment, and how this affects estimates of plastic abundance.

## Activities in 2018

- Eleanor Weideman started an MSc on freshwater plastic pollution, sampling micro-, meso- and macroplastics along the Orange and Vaal Rivers in April and November 2018. She also repeated Gael Arnold's 1998 sampling of plastic loads in three storm water drains in Cape Town, and monitored the amounts of litter in the Black River system in relation to rainfall events.
- Peter Ryan presented two papers at the 6th International Marine Debris Conference in San Diego in March 2018: one on the results of the Antarctic Circumnavigation Expedition, which integrated the abundance and mass of plastics at sea around Antarctica, and one on the need to measure both the mass and number of plastic items when sampling plastics, noting that macroplastic items account for the vast majority of plastic mass in the environment.
- Peter attended the first meeting of the Scientific Committee for the Ocean (SCOR) working group

on floating debris (FLOTSAM), held just before the San Diego meeting.

- Peter also attended a week-long meeting of the UN's GESAMP Working Group 40 in Bangkok in June 2018. He drafted the section on beach monitoring with Martin Thiel and Alexander Turra, and contributed to other sections of the report on monitoring methods for marine plastics, which was published in early 2019.
- Peter was contracted by the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA) to review the impacts of plastics on species covered by AEWA. This led to a global review of plastic entanglement records in birds, based largely on web-based image searches conducted in 17 languages, which was published in *Marine Pollution Bulletin*.
- Peter also wrote a review article on the plastics waste problem for *African Birdlife*, and gave several talks on plastic pollution to community groups, and other interested parties.
- Vonica Perold once again ran a project on sampling plastics at sea during the SEAmester at Sea cruise in July 2018, obtaining excellent reviews from the student trainees on the cruise. She also used the opportunity to collect data on meso- and macro-plastic abundance off the east coast of South Africa.
- Monthly clean-ups of intertidal litter at Muizenberg corner run in conjunction with The Beach Cooperative continued throughout 2018, but scoring litter ceased in April, once three years of data had been collected. Only plastics ingested by Sandy Anemones *Bunodactis reynaudi* were collected throughout 2018; these data will be analysed by honours student Christie Munroe in 2019.
- During a three-month trip to Inaccessible Island from September to December 2018, Peter and Maëlle Connan (NMU) repeated surveys of all beach litter along a 1.1 km stretch of coast



The 204 pieces of plastic found in one dead Great Shearwater on Inaccessible Island. It contained so much plastic that more was in the stomach (left Petri dish and most larger items adjacent) than in the gizzard (right Petri dish) (Photo: Peter Ryan).

between Tern Rock and West Point, an area first surveyed for litter in 1984. Some 7500 litter items were collected weighing an estimated 5 tonnes, including more than 2000 drink bottles. All items small enough to move were placed in one of 10 collection points and subsequently burned with the assistance of Tristan's Conservation Department staff. A photo-inventory was made of items remaining that were too large to move, or were partly buried and could not be removed. The oldest litter item was made in 1971, but most items were of recent manufacture. Drink bottles were the most abundant class of newly stranded items, with most coming from the orient (mainly China). The marked proliferation in Chinese litter compared to previous surveys (when material from South America predominated), suggests that oriental fishing fleets operating in the South Atlantic are responsible for much of the new beach litter stranding at Tristan.

- Pellets regurgitated by Brown Skuas *Catharacta antarctica* were collected to assess the types and abundance of plastic in their prey species. Plastic found in pellets containing the remains of only one bird were assumed to have come from that bird. Five seabirds and one land bird (the Inaccessible Rail *Atlantisia rogersi*) were found to consume plastic. Plastic loads were greatest in Great Shearwaters *Ardeanna gravis* (average of 21 items per adult), White-faced Storm Petrels *Pelagodroma marina* (4 items per adult) and Broad-billed Prions *Pachyptila vittata* (3 items per adult; 10 per chick). Compared to previous surveys, plastic loads have increased in Great Shearwaters (doubling compared to 2009 and

2011), but not other species breeding at the island. The shearwaters probably show a different trend because in spring they reflect conditions on their wintering grounds in the north Atlantic Ocean.

#### Highlights

- Maëlle Connan and Peter Ryan had a project funded through the South African National Antarctic Programme (SANAP) to study diet and plastic ingestion by petrels breeding in the Southern Ocean south of Africa.
- Three papers were published in 2018: two in *Marine Pollution Bulletin* and one in *Environmental Pollution*.
- A paper summarising 20 years of meso-plastic sampling around the South African coast showed that most such plastic derives from local sources, which means we have the ability to clean up most of the plastic items that are ingested by birds and turtles in our immediate environment.

#### Key supporters

Plastics SA, ACE Foundation.

#### Research team

Prof. Peter Ryan (FIAO, UCT)  
 Assoc. Prof. Coleen Moloney (MaRe, UCT)  
 Dr Maëlle Connan (NMU)  
 Aaniyah Omardien (The Beach Collective)  
 Prof. Hideshige Takada (Tokyo)  
 Dr Stefano Aliani (CNR-ISMAR)  
 Guiseppe Suaria (CNR-ISMAR)

**Student:** Eleanor Weideman (MSc, UCT).

**Field assistants:** Vonica Perold, Christie Munro.

# Conservation Biology Masters programme 2018

The 2018 intake of CB students comprised 12 students from South Africa, the USA and Austria. Students from six countries including South Africa were offered and accepted places in the 2018/19 class in late 2017. Due to visa and personal issues three international students pulled out immediately prior to the start of the course in January 2018, resulting in the loss of three of these six nationalities from the class mix. We also lost one student part-way through the year for personal reasons. We were able to replace some of these losses with local students and although less diverse than usual, the cohort were strong academically, with five students achieving distinctions for the coursework component! At the time of writing, the majority of the class have submitted their dissertations and are awaiting their examiners reports

The 2019 cohort of students arrived mid-January 2019, including 11 students from five nationalities: South Africa, Zimbabwe, Cape Verde, the UK and the USA. This year we also welcome our first student carrying out the course part-time. We are pioneering this approach to ensure that women who have very young children are not excluded from studying towards this degree due to the very intensive nature of the course.

## *Course structure and teachers*

The course continues to be taught by a wide range of module leaders from both within and

outside UCT. In 2018, module leaders included David Cumming (Big Picture and Philosophy of Science); Wendy Foden (Conservation Leadership); Susie Cunningham (Biodiversity Basics); Robert Thomson (Community Ecology); Arjun Amar (Statistical Analyses and Project Planning); Sebataolo Rahlao and John Hoffman (Invasion Ecology); Colin Attwood (Marine Conservation); Guy Balme and Ross Wanless (Conservation in Practice); Chevonne Reynolds and Hayley Clements (Landscape Ecology and GIS); Cecile Reed (Freshwater Conservation); Dalton Gibbs (Urban Ecology and Conservation); Jane Turpie (Resource Economics); Gladman Thondhlana (Conservation and Society); Claire Spottiswoode (Project Planning); Peter Ryan (Demography and PVA); Lindsey Gilson (Climate Change); and Jacqui Bishop (Conservation Genetics). In addition, many other people continue to contribute through guest lectures, field trips and discussions. This diversity of perspectives adds greatly to the value of the course.

## *Challenges and opportunities*

Home Affairs regulations continue to cause problems for international students, mostly related to extremely long delays in obtaining study visas. Two Zimbabwean students who were offered and accepted places on the course for 2019 had to defer their places due to this. On the positive side, the new module on Urban Ecology and Conservation run by Dalton Gibbs from the City of Cape Town in 2018 was rated highly by the class and we are very pleased that Dalton has agreed to teach again in 2019. Overall, we remain committed to offering a balanced programme exploring the social and ecological aspects of Conservation Biology, and to producing world class graduates in this field.

## *Highlights*

Research carried out by CB MSc students for their dissertations continues to produce publication-quality results. In 2018, at least ten papers directly arising from CB projects were published or accepted for publication in local and international journals. We are excited that our CB students' research is being disseminated widely and can improve conservation outcomes in Africa and globally.



Dalton Gibbs took the 2018 CB class on a field trip to Rondevlei Nature Reserve as part of the Urban Ecology and Conservation module (Photo: Susie Cunningham).





The 2018 MSc CB class accompanied by Susie Cunningham, Dayo Osinubi and new MSc student Abigail Ramudzuli on Devil's Peak during their Orientation week (Photo: Peter Ryan).

### MSc Conservation Biology projects 2018

- Grey, Kerry-Ann:** Has a recent shift in local climate regime allowed incipient range expansion of *Aloidendron dichotomum*? (Supervisors: Susan Cunningham, Guy Midgley, Wendy Foden)
- Hoffenberg, Amy:** Reconstructing the long-term history of water quality and availability using fossil diatoms at an agricultural site in the Cape lowlands. (Supervisors: Lindsey Gillson, Cherie Forbes)
- Hörbst, Sandra:** Visual health assessment of parous female southern right whales (*Eubalaena australis*) off the southern Cape coast, South Africa. (Supervisors: Coleen Moloney, Els Vermeulen)
- Mabaso, Xolani:** Under the skin of a culture: perceptions of fake leopard skin alternatives in the Shembe Baptist Church. (Supervisor: Justin O'Riain)
- Muller, Rebecca:** The urban ecology of crowned eagles. (Supervisors: Arjun Amar, Petra Sumasgutner, Shane McPherson)
- Ncube, Thinabakho:** The effect of fire frequency and seasonality on the population dynamics of the critically endangered Clanwilliam cedar. (Supervisor: Vernon Visser)
- Schroeder, Michelle:** Causes and rates of cheetah *Acinonyx jubatus* mortality in South African reserves. (Supervisors: Justin O'Riain, Vincent van der Merwe, Vincent Naude)
- Steyn, Clara:** Changes in food-web structure and energy flow in kelp forest ecosystems on the south-west coast of South Africa following the invasion of *Jasus lalandii*. (Supervisors: Lynne Shannon, Laura Blamey)
- van der Merwe, Daryl:** Environmental factors affecting breeding success in Martial Eagles. (Supervisors: Arjun Amar, Megan Murgatroyd)
- Venter, Olivia:** Effects of burrowing sandprawns *Callichirus kraussi* on urban estuarine water quality. (Supervisor: Deena Pillay)
- Weiss, Joshua:** Spatio-temporal changes in riparian vegetation of the Kruger National Park: drivers and implications for biodiversity. (Supervisors: Michael Cramer, Dave Thompson)

# Niven Library

The Niven Library is the intellectual and emotional heart of the Fitz. It is making the transition to the digital era, providing an ever increasing array of information, both publications and data, to users on the internet all over the world. Taking over the core functions of the South African Bird Ringing Unit (SAFRING) from January 2018 adds to its increasing digital footprint. The Niven Librarian, Susan Mvungi, left the Fitz on 31 December to move to the UCT Graduate School of Business. Her replacement, Janine Dunlop, started at the Fitz in March 2019. We thank Susan for her services and wish her well in her new endeavour. We welcome Janine to the Fitz family.

The Niven Library is widely regarded as the most important ornithological literature collection in the Southern Hemisphere, and houses the collections built up by the Fitz and the Southern African Ornithological Society/BirdLife SA over the last 60 years. The librarian is now also responsible for supporting SAFRING, including maintaining the bird ringer database, responding to requests from ringers and the general public regarding ringing, uploading ringing data onto the SAFRING database using the SAFRING website or a Structured Query Language (SQL) database, ordering rings for ring stock collection, attending to ring orders made by ringers, and entering ring recovery data. In these tasks, they are assisted by an NRF intern.

## Collection Development and Donations

Conservation Biology MSc theses for 2017 were archived in pdf format and are hosted on the server accessed through a link on the Niven Library catalogue. Phelisa Hans, the Niven Library Assistant, made good progress digitising student theses and Biological Sciences Honours projects. She also continued to digitise the Richard Brooke reprint collection which consists of 18<sup>th</sup> and 19<sup>th</sup> century articles and manuscripts which are not available on the catalogue. She is nearing completion of her studies for a degree in Library and Information Science with the University of the Western Cape.

The Library purchased 41 books and 3 books were donated for review in *Ostrich*. Over 200 books were donated, as well as relevant journals, review books and artefacts. Surplus books were sold in the annual book sale which raised R3 010. We are very grateful to the following:

- Peter Steyn donated his personal notes on birds of prey 1950-1960, nest records 1960-1961, breeding records and observations whilst at school 1950-1955, and Potberg vulture notes 1955-1961.
- John Cooper donated several journals and newsletters and helped fill in the gaps to the collection. He also donated his Marion Island data files.
- Peter Shaughnessy donated the 1987 *Report of the Select Committee on the Guano Islands*.
- Tygerberg Bird Club donated 14 books, of which four were new to the collection, and a further four new books were received as part of an anonymous donation of 20 books.
- Other donations were received from the Bolus Library, the West Midland Bird Club, Jacana Media, Joan Ackroyd, Elaine Cherrington, Pete Hancock, Martim Melo, Mr Miller, Patrick Morant, Dieter Oschadleus, Dane Paijmans and Annette Versluis.

## Library Use

The Niven Library was used for 90 presentations, lectures, meetings and seminars during 2018. The Library was also used to shoot four participant interviews for the virtual learning Climate Oxfam Massive Open Online Course (MOOC).

Bird paintings from the Library and from the Fitz were used in an exhibition of botanical art titled *Wild Harvest: nectar, berries, capsules and seeds*. It was a collaborative event between the South African National Biodiversity Institute (SANBI) and the Botanical Artists Association of Southern Africa (BAASA). The Peter Steyn egg collection was viewed by external UCT students on a number of occasions.



### Requests for Information

Despite the declining use of physical books and theses thanks to the increased availability of these materials online, the Library received 3 220 requests for information in 2018 from all over the world, with 762 pdfs of papers supplied by email to users nationally and internationally. The use of nest record cards has increased from previous years. Searches for article unique DOIs, calculation of H-indices, citation information confirmation, URL links to articles, journal impact factors, UCT Libraries book location,

Interlibrary loan requests, nest record cards, UCT library loan renewals, and other general requests were received.

	2018	2017	2016
Monographs	122	151	218
Theses	14	16	16
Journals	428	425	304
Audio-visual	5	2	13
Nest Record cards	28	2	8
Total	597	596	559



### The newly appointed librarian, Janine Dunlop (Photo: Gonzalo Aguilar).

After Janine obtained her BA, followed by a Postgraduate Diploma in Library Science from UCT in 1990, she went to work at Cape Town City Libraries. She then joined UCT libraries in 1994, where she worked in the Interlibrary Loans department. During her time there, she completed her Honours in Library Science. Her next role at UCT Libraries was as an archivist in Special Collections, where she worked for 10 years. In 2012, she was appointed as manager of the Digitisation Unit, where the UCT's theses and dissertations and the libraries' archival collections were digitised and made available online.

In 2014, she moved to UCT's Centre for Educational Testing for Access and Placement (CETAP), where she was the communications manager for four years, writing and editing reports, creating departmental marketing material, and managing a variety of websites and social media platforms. In 2016, she completed her Master's in Information Technology through the University of Pretoria, which included a mini-dissertation about the role of UCT Libraries in supporting researchers' academic use of social media.

Although the communications role proved a stimulating challenge, Janine missed her calling as a librarian, and she jumped at the chance to move back into the library work space. While she doesn't have a particular interest in birds, Janine looks forward to managing the Niven Library and bringing it into the digital age.



# SAFRING Report

SAFRING, the South African Bird Ringing Unit, administers bird ringing within southern Africa, supplying rings and services to volunteer and professional ringers. SAFRING curates all the southern African ringing records digitally and maintains a close relationship with other ringing schemes internationally. It performs a critical function for bird research in Southern Africa and indeed throughout the rest of Africa.

Although the first ringed bird (a White Stork *Ciconia ciconia*) was recovered in South Africa in 1909, the first birds were only ringed in southern Africa in 1948, under the auspices of the Southern African Ornithological Society. In 1973, bird ringing outgrew its amateur origins, and was taken over by the CSIR (Council for Scientific Industrial Research). Originally dubbed NUBRA, the National Unit for Bird Ringing Administration, SAFRING was housed at the Fitz until the late 1980s, when it was taken over as part of the fledgling Avian Demography Unit (ADU, later to become the Animal Demography Unit). Director Prof. Roy Siegfried envisaged the Fitz as an academic institute, equivalent to the Edward Grey Institute at Oxford University, and thought that bird ringing belonged in a monitoring unit similar to the British Trust for Ornithology. Sadly, it became increasingly difficult for the ADU to secure funds to support a full-time ringing administrator, and the Fitz was asked by UCT to take over the running of SAFRING following the retrenchment of Dieter Oschadleus in early 2018. Given the lack of dedicated funds towards this task, it was decided that the day-to-day running of SAFRING be devolved to the Niven Librarian, with the assistance of an NRF-funded intern.

While the official transfer of SAFRING to the Fitz occurred overnight, the bureaucracy of the financial transfer has taken far longer to finalize. The main challenges were to close old accounts and set up new accounts to finance the purchase of existing ring stocks from the Faculty of Science, and to order new rings to replace depleted stocks. Several financing options from UCT and the Faculty of Science were considered, but ultimately the Fitz has provided R350 000 of bridging funding to SAFRING to cover these 'starting' expenses. Of this money, some R190 000 was used to buy existing SAFRING ring and equipment stocks, while the remainder is being used to order new rings. Once the



Chevonne Reynolds assists Billi Krochuk disentangle a sunbird from a mist net, watched by Andrew de Blocq (Photo: Peter Ryan).

situation stabilizes, SAFRING will also explore re-stocking other ringing equipment, such as mist-nets, because sourcing this equipment within South Africa has become problematic for ringers. SAFRING will be pay back the bridging finance at R50 000 per year to the Fitz through income from ring and equipment sales over a 7-year period starting in 2019.

A full 2018 SAFRING report featuring ringing effort summaries and publications produced using SAFRING data will be produced by the end of 2019.

## Highlight:

- Sanjo Rose and Alan Lee led a database project that summarises bird biometrics. The resulting paper, to be published in *Ostrich*, presents biometric data for 674 southern African bird species

## SAFRING team

Dr Robert Thomson (Coordinator, FIAO, UCT)  
Susan Mvungi (Niven Librarian, FIAO, UCT)  
Leigh Kelly (NRF intern, April-December)  
Sanjo Rose (NRF intern, January-March)  
Nosipho Mali (ADU, SAFRING website maintenance)

## Research team:

Dr Alan Lee  
Dr Dieter Oschadleus

# Scientific publications 2018

Names in **bold** are members of the Fitztstitute Centre of Excellence. IF = Impact Factor.

## Final Journal Published Papers

- Abdu, S., McKechnie, A.E., Lee, A.T.K. and Cunningham, S.J.** 2018. Can providing shade at water points help Kalahari birds beat the heat? *Journal of Arid Environments* 152: 21-27. (IF 1.835)
- Amar, A. and Cloete, D.** 2018. Quantifying the decline of the Martial Eagle *Polemaetus belliscosus* in South Africa. *Bird Conservation International* 28: 363-374. (IF 1.088)
- Amélineau, F., Fort, J., Mathewson, P.D., Speirs, D.C., Courbin, N., Perret, S., Porter, W.P., Wilson, R.J. and **Grémillet, D.** 2018. Energyscapes and prey fields shape a North Atlantic seabird wintering hotspot under climate change. *Royal Society Open Science* 5: 171883. (IF 2.243)
- Bernardino, J., Bevanger, K., Barrientos, R., Dwyer, J.K., Marques, A.T., Martins, R.C., **Shaw, J.M.**, Silva, J.P. and Moreira, F. 2018. Bird collisions with power lines: state of the art and priority areas for research. *Biological Conservation* 222: 1-13. (IF 4.022)
- Booth, J.M., **Steinfurth, A.**, Fusi, M., Cuthbert, R.J. and McQuaid, C.D. 2018. Foraging plasticity of breeding Northern Rockhopper Penguins, *Eudyptes moseleyi*, in response to changing energy requirements. *Polar Biology* 41:1815-1826. (IF 1.949)
- Botha, J.A. and Pistorius, P.A.** 2018. Variability in the foraging distribution and diet of cape gannets between the guard and post-guard phases of the breeding cycle. *Frontiers in Marine Science* 5: 15.
- Brooke, M.d.L., Bonnaud, E., **Dilley, B.J.**, Flint, E.N., Holmes, N.D., Jones, H.P., Provost, P., Rocamora, G., **Ryan, P.G.**, Surman, C. and Buxton, R.T. 2018. Seabird population changes following mammal eradications on islands. *Animal Conservation* 21: 3-12. (IF 2.835)
- Brooke, M.d.L., Bonnaud, E., **Dilley, B.J.**, Flint, E.N., Holmes, N.D., Jones, H.P., Provost, P., Rocamora, G., **Ryan, P.G.**, Surman, C. and Buxton, R.T. 2018. Enhancing the value of future island eradications needs improved understanding of past outcomes. *Animal Conservation* 21: 19-20. (IF 2.835)
- Cherel, Y., Barbraud, C., Lahournat, M., Jaeger, A., Jaquemet, S., **Wanless, R.M.**, Phillips, R.A., Thompson, D.R. and Bustamante, P. 2018. Accumulate or eliminate? Seasonal mercury dynamics in albatrosses, the most contaminated family of birds. *Environmental Pollution* 241: 124-135. (IF 5.099)
- Clements, H.S. and Cumming, G.S.** 2018. Traps and transformations influencing the financial viability of tourism on private-land conservation areas. *Conservation Biology* 32: 424-436. (IF 4.842)
- Coetzee, A., Barnard, P. and Pauw, A.** 2018. Urban nectarivorous bird communities in Cape Town, South Africa, are structured by ecological generalization and resource distribution. *Journal of Avian Biology* 49:e01526. (IF 2.228)
- Courbin, N., Besnard, A., Péron, C., Saraux, C., Fort, J., Perret, S., Tornos, J. and **Grémillet, D.** 2018. Short-term prey field liability constrains individual specialization in resource selection and foraging site fidelity in a marine predator. *Ecology Letters* 21:1043-1054. (IF 9.449)
- Cunningham, S.** 2018. Birds of the arid zones: living life on the edge. *Ostrich* 89: 297-298. (IF 0.833)
- Da Costa Lopes, D., **Martin, R.O.**, Indjai, B., Monteiro, H., Henriques, M., Regalla, A. and Catry, P. 2018. Food diversity of Timneh parrots (*Psittacus timneh*) in the Bijagós archipelago, Guinea-Bissau. *African Journal of Ecology* 56: 1039-1043. (IF 0.69)
- Craig, C.A., Thomson, R.L. and Santangeli, A.** 2018. Communal farmers of Namibia appreciate vultures and the ecosystem services they provide. *Ostrich* 89: 211-220. (IF 0.833)
- Crawford, R.J.M., **Makhado, A.B.** and Oosthuizen, W.H. 2018. Bottom-up and top-down control of the Benguela ecosystem's seabirds. *Journal of Marine Systems* 188: 133-141. (IF 2.174)
- Cristofari, R., Liu, X., Bonadonna, F., Cherel, Y., **Pistorius, P.**, Le Maho, Y., Raybaud, V., Stenseth, N.C., Le Bohec, C. and Trucchi, E. 2018. Climate-driven range shifts of the king penguin in a fragmented ecosystem. *Nature Climate Change* 8: 245-251. (IF 19.304)
- Dean, W.R.J. and Milton, S.J.** 2018. Ants (Formicidae) as food for birds in southern Africa: opportunism or survival? *Ostrich* 89: 1-4. (IF 0.833)
- Dean, W.R.J., Seymour, C.L. and Joseph, G.S.** 2018. Linear structures in the Karoo, South Africa and their impacts on biota. *African Journal of Range and Forage Science* 35: 223-232. (IF 0.961)
- Dilley, B.J., Schoombie, S., Stevens, K., Davies, D., Perold, V., Osborne, A., Schoombie, J., Brink, C.W., Carpenter-Kling, T. and Ryan, P.G.** 2018. Mouse predation affects breeding success of

- burrow-nesting petrels at sub-Antarctic Marion Island. *Antarctic Science* 30: 93-104. (IF 1.461)
- Djukic, I., Kepfer-Rojas, S., Schmidt, I.K., Larsen, K.S., Beier, C., Berg, B., Verheyen, K., **Milton, S.** *et al.* 2018. Early stage litter decomposition across biomes. *Science of the Total Environment* 628-629: 1369-1394. (IF 4.9)
- Duriez, O., Peron, G., **Grémillet, D.**, Sforzi, A. and Monti, F. 2018. Migrating ospreys use thermal uplift over the open sea. *Biology Letters* 14: 20180687. (IF 3.089)
- Engesser, S., **Ridley, A.R.**, Manser, M., Manser, A. and Townsend, S. 2018. Internal acoustic structuring in pied babbler recruitment cries specifies the form of recruitment. *Behavioral Ecology* 29:1021-1030. (IF 3.311)
- Enstipp, M.R., Descamps, S., Fort, J. and **Grémillet, D.** 2018. Almost like a whale-first evidence of suction feeding in a seabird. *Journal of Experimental Biology* 221: jeb182170. (IF 3.32)
- Espinaze, M.P.A., Hellard, E.**, Horak, I.G. and **Cumming, G.S.** 2018. Domestic mammals facilitate tick-borne pathogen transmission networks in South African wildlife. *Biological Conservation* 221: 228-236. (IF 4.022)
- Flood, R.L.** and **Ryan, P.G.** 2018. Age-related timing of primary moult in Shy Albatross *Thalassarche [c.] Cauta/steady* longline casualties from South Africa. *Marine Ornithology* 46: 201-206.
- Flood, R.L.** and Zufelt, K. 2018. New estimate of the number of breeding pairs of Great-winged Petrel *Pterodroma macroptera* on Tristan Island, South Atlantic. *Marine Ornithology* 46: 109-111.
- Fogell, D.J., **Martin, R.O.**, Bunbury, N., Lawson, B., Sells, J., McKeand, A.M., Tatayah, V., Trung, C.T. and Groombridge, J.J. 2018. Trade and conservation implications of new beak and feather disease virus detection in native and introduced parrots. *Conservation Biology* 32: 1325-1335. (IF 4.842)
- Forsman, J.T., Seppänen, J.-T., Mönkkönen, M., **Thomson, R.L.**, Kivelä, S.M., Krams, I. and Loukola, O.J. 2018. Is it interspecific information use or aggression between putative competitors that steers the selection of nest-site characteristics? A reply to Slagsvold and Wiebe. *Journal of Avian Biology* 49: e01558. (IF 2.228)
- Fraser, C.I., Morrison, A.K., Hogg, A.M., Macaya, E.C., van Seville, E., **Ryan, P.G.**, Padovan, A., Jack, C., Valdivia, N. and Waters, J.M. 2018. Antarctica's ecological isolation will be broken by storm-driven dispersal and warming. *Nature Climate Change* 8: 704-708. (IF 19.304)
- Frugone, M.J., Lowther, A., Noll, D., Ramos, B., **Pistorius, P.**, Dantas, G.P.M., Petry, M.V., Bonadonna, F., Steinfurth, A., Polanowski, A., Rey, A.R., Lois, N.A., Pütz, K., Trathan, P., Wienecke, B., Poulin, E. and Vianna, J.A. 2018. Contrasting phylogeographic pattern among *Eudyptes* penguins around the Southern Ocean. *Scientific Reports* 8: 17481. (IF 4.259)
- Fuchs, J.**, de Swardt, D.H., **Oatley, G.**, Fjeldsø, J. and **Bowie, R.C.K.** 2018. Habitat-driven diversification, hybridization and cryptic diversity in the Fork-tailed Drongo (Passeriformes: Dicruridae: *Dicrurus adsimilis*). *Zoologica Scripta* 47:266-284. (IF 2.837)
- Gaglio, D.**, **Cook, T.R.**, **McInnes, A.**, **Sherley, R.B.** and **Ryan, P.G.** 2018. Foraging plasticity in seabirds: a non-invasive study of the diet of greater crested terns breeding in the Benguela region. *PLoS ONE* 13: e0190444. (IF 2.806)
- Gaglio, D.**, **Cook, T.R.**, **Sherley, R.B.** and **Ryan, P.G.** 2018. How many can you catch? Factors influencing the occurrence of multi-prey loading in provisioning Greater Crested Terns. *Ostrich* 89: 145-149. (IF 0.833)
- Gaglio, D.**, **Sherley, R.B.**, **Cook, T.R.**, **Ryan, P.G.** and **Flower, T.** 2018. The costs of kleptoparasitism: a study of mixed-species seabird breeding colonies. *Behavioral Ecology* 29: 939-947. (IF 3.311)
- Gaglio, D.**, **Sherley, R.B.**, **Ryan, P.G.** and **Cook, T.R.** 2018. A non-invasive approach to estimate the energetic requirements of an increasing seabird population in a perturbed marine ecosystem. *Scientific Reports* 8: 8343. (IF 4.259)
- Garbett, R.**, Herremans, M., Maude, G., Reading, R.P. and **Amar, A.** 2018. Raptor population trends in northern Botswana: A re-survey of road transects after 20 years. *Biological Conservation* 224: 87-99. (IF 4.022)
- Garbett, R.**, Maude, G., Hancock, P., Kenny, D., Reading, R. and **Amar, A.** 2018. Association between hunting and elevated blood lead levels in the critically endangered African white-backed vulture *Gyps africanus*. *Science of the Total Environment* 631-632: 1654-1665. (IF 4.9)
- Garcia-Heras, M-S.**, Arroyo, B., **Simmons, R.E.**, Camarero, P.R., Mateo, R. and Mougeot, F. 2018. Blood concentrations of PCBs and DDTs in an avian predator endemic to southern Africa: associations with habitat, electrical transformers and diet. *Environmental Pollution* 232: 440-449. (IF 5.099)
- Grémillet, D.**, Lescroël, A., Ballard, G., Dugger, K.M., Massaro, M., Porzig, E.L. and Ainley, D.G. 2018. Energetic fitness: field metabolic rates assessed via 3D accelerometry complement conventional fitness metrics. *Functional Ecology* 32:1203-1213. (IF 5.63)



- Grémillet, D.**, Ponchon, A., Palenczny, M., Palomares, M.-L.D., Karpouzi, V. and Pauly, D. 2018. Persisting worldwide seabird-fishery competition despite seabird community decline. *Current Biology* 28: 4009-4013. (IF 8.851)
- Handley, J.M., Thiebault, A.**, Stanworth, A., Schutt, D. and **Pistorius, P.** 2018. Behaviourally mediated predation avoidance in penguin prey: *in situ* evidence from animal-borne camera loggers. *Royal Society Open Science* 5: 171449. (IF 2.504)
- Hansen, S., Roets, F., **Seymour, C.L.**, Thébault, E., van Veen, F.J.F. and Pryke, J.S. 2018. Alien plants have greater impact than habitat fragmentation on native insect flower visitation networks. *Diversity and Distributions* 24: 58-68. (IF 4.391)
- Hirschauer, M.T., **Zimunya, T.**, Wolter, K. and Monadjem, A. 2018. Sexing cape vulture *Gyps coprotheres* based on head morphometrics. *Ostrich* 89: 187-190. (IF 0.833)
- Ibáñez-Álamo, J.D., Pineda-Pampliega, J., **Thomson, R.L.**, Aguirre, J.I., Díez-Fernández, A., Faivre, B., Figuerola, J. and Verhulst, S. 2018. Urban blackbirds have shorter telomeres. *Biology Letters* 14: 20180083. (IF 3.089)
- Izquierdo, L., **Thomson, R.L.**, Aguirre, J.I., Díez-Fernández, A., Faivre, B., Figuerola, J. and Ibáñez-Álamo, J.D. 2018. Factors associated with leucism in the common blackbird *Turdus merula*. *Journal of Avian Biology* 49: e01778. (IF 2.228)
- Jenkins, A.R., Reid, T.**, du Plessis, J., Colyn, R., Benn, G. and Millikin, R. 2018. Combining radar and direct observation to estimate pelican collision risk at a proposed wind farm on the Cape West Coast, South Africa. *PLoS ONE* 13: e0192515. (IF 2.806)
- Jones, S.M., Cumming, G.S.** and Peters, J.L. 2018. Host community heterogeneity and the expression of host specificity in avian haemosporidia in the Western Cape, South Africa. *Parasitology* 145:1876-1883. (IF 2.713)
- Joseph, G.S.**, Mauda, E.V., **Seymour, C.L.**, Munyai, T.C., Dippenaar-Schoeman, A. and Foord, S.H. 2017. Landuse change in Savannas disproportionately reduces functional diversity of invertebrate predators at the highest trophic levels: spiders as an example. *Ecosystems* 21: 930-942. (IF 4.198)
- Joseph, G.S., Seymour, C.L.**, Coetzee, B.W.T., Ndlovu, M., Deng, L., Fowler, K., Hagan, J., Brooks, B.J., Seminara, J.A. and Foord, S.H. 2018. Elephants, termites and mound thermoregulation in a progressively warmer world. *Landscape Ecology* 33: 731-742. (IF 3.615)
- Ke, A., Sibiya, M.D., **Reynolds, C.**, McCleery, R.A., Monadjem, A. and Fletcher, R.J. Jr. 2018. Landscape heterogeneity shapes taxonomic diversity of non-breeding birds across fragmented savanna landscapes. *Biodiversity and Conservation* 27:2681-2698. (IF 2.265)
- Keogan, K., Daunt, F., Wanless, S., Phillips, R.A., Walling, C.A., Agnew, P., **Ryan, P. et al.** 2018. Global phenological insensitivity to shifting ocean temperatures among seabirds. *Nature Climate Change* 8: 313-318. (IF 19.304)
- Krüger, L., Ramos, J.A., Xavier, J.C., Grémillet, D., González-Solís, J., Petry, M.V., Phillips, R.A., **Wanless, R.M.** and Paiva, V.H. 2018. Projected distributions of Southern Ocean albatrosses, petrels and fisheries as a consequence of climatic change. *Ecography* 41: 195-208. (IF 4.902)
- Lardy, S.**, Gasparini, J., Corbel, H., Frantz, A., Perret, S., Zahn, S., Criscuolo, F. and Jacquin, L. 2018. Telomere erosion varies with sex and age at immune challenge but not with maternal antibodies in pigeons. *Journal of Experimental Zoology*. 327: 562-569. (IF 2.8)
- Le Bot, T., Lescroël, A. and **Grémillet, D.** 2018. A toolkit to study seabird-fishery interactions. *ICES Journal of Marine Science* 75:1513-1525. (IF 2.76)
- Lee, A.T.K.** 2018. Book review: why birds matter: avian ecological function and ecosystem services. *Ostrich* 89: 203-204. (IF 0.833)
- Lee, A.T.K.**, Wright, D.R. and Reeves, B. 2017. Habitat variables associated with encounters of hottentot buttonquail *turnix hottentottus* during flush surveys across the fynbos biome. *Ostrich* 89: 13-18. (IF 0.833)
- Leite, A., Cáceres, A., **Melo, M.**, Mills, M.S.L. and Monteiro, A.T. 2018. Reducing Emissions from Deforestation and forest Degradation (REDD+) in Angola: insights from the Scarp Forest conservation hotspot. *Land degradation and Development* 29: 4291-4300. (IF 7.27)
- Lewis, T.C., **Melo, M.**, de Lima, R.F. and Bremner-Harrison, S. 2018. Habitat associations of the critically endangered São Tomé Fiscal *Lanius newtoni*: comparing standard and playback-confirmed point counts. *African Journal of Ecology* 56: 404-408. (IF 0.69)
- Lloyd, K.J.**, Altwegg, R., **Doutrelant, C.** and **Covas, R.** 2017. Factors affecting the foraging distance and duration of a colonial bird, the sociable weaver, in a semi-arid environment. *African Journal of Ecology* 56: 659-663. (IF 0.69)
- Lopes, D.C., **Martin, R.O.**, Henriques, M., Monteiro, H., Regalla, A., Tchanchalam, Q., Indjai, B., Cardoso, S., Manuel, C., Cunha, M., Cunha, D. and Catry, P. 2017. Nest-site characteristics and aspects of the breeding biology of the endangered Timneh Parrot *Psittacus timneh* in Guinea-Bissau. *Ostrich* 89: 33-40. (IF 0.833)

- Makhado, A.B.**, Crawford, R.J.M., Dias, M.P., Dyer, B.M., Lamont, T., **Pistorius, P.**, **Ryan, P.G.**, Upfold, L., Weimerskirch, H. and **Reisinger, R.R.** 2018. Foraging behaviour and habitat use by Indian yellow-nosed Albatrosses (*Thalassarche carteri* breeding at Prince Edward Island). *Emu* 118: 353-362. (IF 0.989)
- Mariette, M., Pessato, A., Buttemer, W.A., **McKechnie, A.E.**, Udino, E., Bennett, A.T.D., Collins, R.N., Meillère, A. and Buchanan, K.L. 2018. Parent-embryo acoustic communication: a specialised heat vocalisation allowing embryonic eavesdropping. *Scientific Reports* 8: 17721. (IF 4.259)
- Martin, R.O.** 2018. The wild bird trade and African parrots: past, present and future challenges. *Ostrich* 89: 139-143. (IF 0.833)
- Martin, R.O.** 2018. Grey areas: temporal and geographical dynamics of international trade of Grey and Timneh Parrots (*Psittacus erithacus* and *P. timneh*) under CITES. *Emu* 118: 113-125. (IF 0.989)
- Martin, R.O.**, Senni, C. and D'Cruze, N.C. 2018. Trade in wild-sourced African grey parrots: insights via social media. *Global Ecology and Conservation* 15: e00429. (IF 2.174)
- Mauda, E.V., **Joseph, G.S.**, **Seymour, C.L.**, Munyai, T.C. and Foord, S.H. 2018. Changes in landuse alter ant diversity, assemblage composition and dominant functional groups in African savannas. *Biodiversity and Conservation* 27: 947-965. (IF 2.265)
- McClure, C.J.W., Westrip, J.R.S., Johnson, J.A., Schulwitz, S.E., Virani, M.Z., Davies, R., Symes, A., Wheatley, H., Thorstrom, R., **Amar, A.**, Buij, R., Jones, V.R., Williams, N.P., Buechley, E.R. and Butchart, S.H.M. 2018. State of the world's raptors: distributions, threats, and conservation recommendations. *Biological Conservation*. (IF 4.022)
- McKechnie, A.E.** and **Amar, A.** 2018. Missing the bigger picture: a response to Beale (2018). *Ostrich* 89: 151-152. (IF 0.833)
- McWhorter, T.J., Gerson, A.R., Talbot, W.A., Smith, E.K., **McKechnie, A.E.** and Wolf, B.O. 2018. Avian thermoregulation in the heat: evaporative cooling capacity and thermal tolerance in two Australian parrots. *Journal of Experimental Biology* 221: jeb168930. (IF 3.32)
- Mondreti, R., Davidar, P. and **Grémillet, D.** 2018. Illegal egg harvesting and population decline in a key pelagic seabird colony of the eastern Indian Ocean. *Marine Ornithology* 46: 103-107.
- Monti, F., Duriez, O., Dominici, J-M., Sforzi, A., Robert, A., Fusani, L. and **Grémillet, D.** 2018. The price of success: integrative long-term study reveals ecotourism impacts on a flagship species at a UNESCO site. *Animal Conservation* 21: 448-458. (IF 2.835)
- Monti, F., **Grémillet, D.**, Sforzi, A., Sammuri, G., Dominici, J.M., Bagur, R.T., Navarro, A.M., Fusani, L. and Duriez, O. 2018. Migration and wintering strategies in vulnerable Mediterranean osprey populations. *Ibis* 160: 554-567. (IF 2.279)
- Murgatroyd, M.**, Photopoulou, T., Underhill, L.G., Bouten, W. and **Amar, A.** 2018. Where eagles soar: fine-resolution tracking reveals the spatiotemporal use of differential soaring modes in a large raptor. *Ecology and Evolution* 8: 6788-6799. (IF 2.44)
- Murgatroyd, M.**, Roos, S. Evans, R., Sansom, A., Whitfield, D.P., Sexton, D., Reid, R., Grant, J. and **Amar, A.** 2018. Sex-specific patterns of reproductive senescence in a long-lived reintroduced raptor. *Journal of Animal Ecology* 87: 1587-1599. (IF 4.474)
- Navarro, R.A.**, Meijer, H.A.J., Underhill, L.G. and Mullers, R.H.E. 2018. Extreme water efficiency of Cape gannet *Morus capensis* chicks as an adaptation to water scarcity and heat stress in the breeding colony. *Marine and Freshwater Behaviour and Physiology* 51: 30-43. (IF 0.958)
- Nelson-Flower, M.J.**, **Flower, T.P.** and **Ridley, A.R.** 2018. Sex differences in the drivers of reproductive skew in a cooperative breeder. *Molecular Ecology* 27:2435-2446. (IF 6.086)
- Nelson-Flower, M., Wiley, E.M., **Flower, T.P.** and **Ridley, A.R.** 2018. Individual dispersal delays in a cooperative breeder: ecological constraints, the benefits of philopatry and the social queue for dominance. *Journal of Animal Ecology*. (IF 4.474)
- O'Connor, R.S.**, Brigham, R.M. and **McKechnie, A.E.** 2018. Extreme operative temperatures in exposed microsites used by roosting rufous-checked nightjar *Caprimulgus rufigena*: implications for water balance under current and future climate conditions. *Canadian Journal of Zoology* 96: 1122-1129. (IF 1.347)
- O'Connor, R.S.**, Brigham, R.M. and **McKechnie, A.E.** 2018. Roosting in exposed microsites by a nocturnal bird, the rufous-cheeked nightjar: implications for water balance under current and future climate conditions. *Canadian Journal of Zoology* 96: 1122-1129. (IF 1.347)
- Oppel, S., Bolton, M., Carneiro, A.P.B., Dias, M.P., Green, J.A., Masello, J.F., Phillips, R.A., Owen, E., Quillfeldt, P., Beard, A., Bertrand, S., Blackburn, J., Boersma, P.D., Borges, A., Broderick, A.C., Catry, P., Cleasby, I., Clingham, E., Creuwels, J., Crofts, S., Cuthbert, R.J., Dallmeijer, H., **Davies, D.**, Davies, R., **Dilley, B.**, Dinis, H.A., Dossa, J., Dunn, M.J., Efe,

- M.A., Figueiredo, F.L., Frederico, A.P., Gjerdrum, C., Godley, B.J., Granadeiro, J.P., Guilford, T., Hamer, K.C., Hazin, C., Hedd, A., Henry, L., Henández-Montero, M., Hinke, J., Kokubun, N., Leat, E., Metzger, B., Militão, T., Montrond, G., Muilli, W., Padget, O., Pearmain, E., Pollet, I.L., Puetz, K., Quintana, F., Ratcliffe, N., Ronconi, R.A., **Ryan, P.G.**, Saldanha, S., Shoji, A., Sim, J., Small, C., Weber, N., Weber, S., Zango, L., González-Solís, J., Croxall, J. 2018. Spatial scales of marine conservation management for breeding seabirds. *Marine Policy* 98: 37-46. (IF 2.235)
- Osinubi, S.T.** 2018. Book Review: Avian Cognition. *Ostrich* 89: 295-296. (IF 0.833)
- Osinubi, S.T.**, McGraw, K.J., Ottosson, U., Brown, J.A., Briskie, J.V. and Chapman, H.M. 2018. Carotenoid-based plumage pigmentation and concentration as a function of sex and habitat type in the Yellow-breasted Boubou *Laniarius atrofasciatus*. *Ostrich* 89: 259-264. (IF 0.833)
- Oswald, K.N., **Lee, A.T.K.** and Smit, B. 2018. Seasonal physiological responses to heat in an alpine range-restricted bird: the Cape Rockjumper (*Chaetops frenatus*). *Journal of Ornithology* 159: 1063-1072. (IF 1.468)
- Oswald, K.N., **Lee, A.T.K.** and Smit, B. 2018. Comparison of physiological responses to high temperatures in juvenile and adult Cape Rockjumpers *Chaetops frenatus*. *Ostrich* 89: 377-382. (IF 0.833)
- Pakanen, V-M., Jaakkonen, T., Saarinen, J., Rönkä, N., **Thomson, R.L.** and Koivula, K. 2018. Migration strategies of the Baltic dunlin: rapid jump migration in the autumn but slower skipping type spring migration. *Journal of Avian Biology* 49: e01513. (IF 2.228)
- Payo-Payo, A.**, Sanz-Aguilar, A., **Gaglio, D.**, Sherley, R.B., **Cook, T.R.**, Altwegg, R. and **Ryan, P.G.** 2018. Survival estimates for the greater crested tern *Thalasseus bergii* in southern Africa. *African Journal of Marine Science* 40: 43-50. (IF 0.833)
- Péron, C., Authier, M. and **Grémillet, D.** 2018. Testing the transferability of track-based habitat models for sound marine spatial planning. *Diversity and Distributions* 24: 1772-1787. (IF 4.391)
- Pietersen, D.W.**, Little, I.T., Jansen, R. and **McKechnie, A.E.** 2017. Predicting the distribution of the vulnerable yellow-breasted pipit (*Anthus chloris*) using species distribution modelling. *Emu* 118: 166-172. (IF 0.989)
- Potgieter, L.J., Gaertner, M., Irlich, U.M., **O'Farrell, P.J.**, Stafford, L., Vogt, H. and Richardson, D.M. 2018. Managing urban plant invasions: a multi-criteria prioritization approach. *Environmental Management* 62: 1168-1185. (IF 1.878)
- Reisinger, R.R.**, Raymond, B., Hindell, M.A., Bester, M.N., Crawford, R.J.M., **Davies, D.**, de Bruyn, P.J., **Dilley, B.J.**, Kirkman, S.P., **Makhado, A.B.**, **Ryan, P.G.**, **Schoombie, S.**, **Stevens, K.**, Sumner, M.D., Tosh, C.A., Wege, M., **Whitehead, T.O.**, Wotherspoon, S. and **Pistorius, P.A.** 2018. Habitat modelling of tracking data from multiple marine predators identifies important areas in southern Indian Ocean. *Diversity and Distribution* 24: 535-550. (IF 4.391)
- Reynolds, C.** 2018. Book review: Flamingos: behavior, biology and relationship with humans. *Ostrich* 89: 97-98. (IF 0.833)
- Reynolds, C.** and **Ryan, P.G.** 2018. Micro-plastic ingestion by waterbirds from contaminated wetlands in South Africa. *Marine Pollution Bulletin* 126: 330-333. (IF 3.146)
- Reynolds, C.**, Fletcher, R.J. Jr., Carneiro, C.M., Jennings, N., Ke, A., LaScaleia, M.C., Lukhele, M.B., Mamba, M.L., Sibiya, M.D., Austin, J.D., Magagula, C.N., Mahlaba, T., Monadjem, A., Wisely, S.M. and McCleery, R.A. 2018. Inconsistent effects of landscape heterogeneity and land-use on animal diversity in an agricultural mosaic: a multi-scale and multi-taxon investigation. *Landscape Ecology* 33: 241-255. (IF 3.615)
- Rishworth, G.M.** and **Pistorius, P.A.** 2017. Intrinsic and extrinsic controls on foraging effort in an iconic Benguela seabird. *Journal of Marine Systems* 188: 142-148. (IF 2.439)
- Rollinson, D.P.**, **Dilley, B.J.**, **Davies, D.** and **Ryan, P.G.** 2018. Year-round movements of white-chinned petrels from Marion Island, south-western Indian Ocean. *Antarctic Science* 30: 183-195. (IF 1.461)
- Ronconi, R.A., **Schoombie, S.**, Westgate, A.J., Wong, S.N.P., Koopman, H.A. and **Ryan, P.G.** 2018. Effects of age, sex, colony and breeding phase on marine space use by Great Shearwaters *Ardenna gravis* in the south Atlantic. *Marine Biology* 165: 58. (IF 2.136)
- Ryan, P.G.** 2018. Entanglement of birds in plastics and other synthetic materials. *Marine Pollution Bulletin* 135: 159-164. (IF 3.146)
- Ryan, P.G.**, **Perold, V.**, **Osborne, A.** and Moloney, C.L. 2018. Consistent patterns of debris on South African beaches indicate that industrial pellets and other mesoplastic items mostly derive from local sources. *Environmental Pollution* 238: 1008-1016. (IF 5.099)
- Schoombie, S.**, **Dilley, B.J.**, **Davies, D.** and **Ryan, P.G.** 2018. The foraging range of Great shearwaters (*Ardenna gravis*) breeding on Gough Island. *Polar Biology* 41: 2451-2458. (IF 1.949)



- Schoombie, S., Schoombie, J., Oosthuizen, A., Suleman, E., Jones, M.G.W., Pretorius, L., Dilley, B.J. and Ryan, P.G.** 2018. Avian pox in seabirds on Marion Island, southern Indian Ocean. *Antarctic Science* 30: 3-12. (IF 1.461)
- Shaw, J.M., Reid, T.A., Schutgens, M., Jenkins, A.R. and Ryan, P.G.** 2018. High power line collision mortality of threatened bustards at a regional scale in the Karoo, South Africa. *Ibis* 160: 431-446. (IF 2.279)
- Sherley, R.B., Barham, B.J., Barham, P.J., Campbell, K.J., Crawford, R.J.M., Grigg, J., Horswill, C., McInnes, A., Morris, T.L., Pichegru, L., Steinfurth, A., Weller, F., Winker, H. and Votier, S.C.** 2018. Bayesian inference reveals positive but subtle effects of experimental fishery closures on marine predator demographics. *Proceedings of the Royal Society B* 285: 20172443. (IF 4.94)
- Simba, L.D., Foord, S.H., Thébault, E., van Veen, F.J.F., **Joseph, G.S. and Seymour, C.L.** 2018. Indirect interactions between crops and natural vegetation through flower visitors: the importance of temporal as well as spatial spillover. *Agriculture, Ecosystems and Environment* 253: 148-156. (IF 4.099)
- Smart, J. and **Amar, A.** 2018. Diversionary feeding as a means of reducing raptor predation at seabird breeding colonies. *Journal of Nature Conservation* 46: 48-55. (IF 1.657)
- Smit, B., **Whitfield, M.C., Talbot, W.A., Gerson, A.R., McKechnie, A.E. and Wolf, B.O.** 2018. Avian thermoregulation in the heat: phylogenetic variation among avian orders in evaporative cooling capacity and heat tolerance. *Journal of Experimental Biology* 221: jeb174870. (IF 3.32)
- Stervander, M., **Ryan, P.G., Melo, M. and Hansson, B.** 2018. The origin of the world's smallest flightless bird, the Inaccessible Island Rail *Atlantisia rogersi* (Aves: Rallidae). *Molecular Phylogenetics and Evolution* 130: 92-98. (IF 4.419)
- Sullivan, B.J., Kibel, B., Kibel, P., Yates, O., Potts, J.M., Ingham, B., Domingo, A., Gianuca, D., Jiménez, S., Lebepe, B., Maree, B.A., Neves, T., Peppes, F., Rasehlomi, T., Silva-Costa, A. and **Wanless, R.M.** 2018. At-sea trialling of the Hookpad: a 'one-stop' mitigation solution for seabird bycatch in pelagic longline fisheries. *Animal Conservation* 21: 159-167. (IF 2.835)
- Sumasgutner, P., Adrion, M. and Gamauf, A.** 2018. Carotenoid coloration and health status of urban Eurasian kestrels (*Falco tinnunculus*). *PLoS ONE* 13: e0191956. (IF 2.806)
- Sumasgutner, P., Rose, S., Koeslag, A. and Amar, A.** 2018. Exploring the influence of urbanization on morph distribution and morph-specific breeding performance in a polymorphic African raptor. *Journal of Raptor Research* 52: 19-30. (IF 0.745)
- Sutherland, W.J., Butchart, S.H.M., Connor, B., Culshaw, C., Dicks, L.V., Dinsdale, J., Doran, H., Entwistle, A.C., Fleishman, E., Gibbons, D.W., Jiang, Z., Keim, B., Le Roux, X., Lickorish, F.A., Markillie, P., Monk, K.A., Mortimer, D., Pearce-Higgins, J.W., Peck, L.S., Pretty, J., **Seymour, C.L.**, Spalding, M.D., Tonneijck, F.H. and Gleave, R.A. 2018. Review: A 2018 horizon scan of emerging issues for global conservation and biological diversity. *Trends in Ecology and Evolution* 33: 47-58. (IF 15.268)
- Talbot, W.A., Smith, E.K., **McKechnie, A.E.** and Wolf, B.O. 2018. Avian thermoregulation in the heat: metabolism, evaporative cooling and gular flutter in two small owls. *Journal of Experimental Biology* 221: jeb171108. (IF 3.23)
- Thiebault, A., Dubroca, L., Mullers, R., Tremblay, Y. and **Pistorius, P.** 2018. "m2b" package in R: deriving multiple variables from movement data to predict behavioural states with random forests. *Methods in Ecology and Evolution* 9: 1548-1555. (IF 5.708)
- Thompson, M., Cunningham, S. and McKechnie, A.E.** 2018. Interspecific variation in avian thermoregulatory patterns and heat dissipation behaviours in a subtropical desert. *Physiology and Behavior* 188: 311-323. (IF 2.341)
- Tokura, W., Jack, S.L., Anderson, T. and Hoffman, M.T.** 2018. Long-term variability in vegetation productivity in relation to rainfall, herbivory and fire in Tswalu Kalahari Reserve. *Koedoe* 60: a1473. (IF 0.882)
- Tolvanen, J., Seppänen, J.-T., Mönkkönen, M., **Thomson, R.L., Ylönen, H. and Forsman, J.T.** 2018. Interspecific information on predation risk affects nest site choice in a passerine bird. *BMC Evolutionary Biology* 18: 181. (IF 3.221)
- Traisnel, G. and Pichegru, L.** 2018. Does it always pay to defend one's nest? A case study in African penguin. *Ethology* 124:74-83. (IF 1.398)
- Traisnel, G. and Pichegru, L.** 2018. Possible drivers of nest usurpation in African penguins *Spheniscus demersus*. *Marine Ornithology* 46: 85-88.
- Traisnel, G., Pichegru, L., Visser, H.J. and Edwards, L.C.** 2018. Colour aberrations in African penguins *Spheniscus demersus*. *Marine Ornithology* 46: 19-22.
- Van Maziijk, R., Smyth, L.K., **Weideman, E.A.** and West, A.G. 2018. Isotopic tracing of stormwater in the urban Liesbeek River. *Water SA* 44: 674-679. (IF 0.958)
- Vanstreels, R.E.T., Junior, F.C.F., de Angeli Dutra, D., Epiphany, S., Braga, E.M., **Pistorius, P.A.** and

- Catão-Dias, J.L. 2018. Investigation of *Babesia* sp. In pygoscelid penguins at the South Shetland Islands. *Polar Research* 37: 1500267. (IF 2.146)
- Vanstreels, R.E.T., Parsons, N.J. and **Pistorius, P.A.** 2018. A three-legged African penguin *Spheniscus demersus*. *Marine Ornithology* 46: 23-26.
- Vanstreels, R.E.T., Yabsley, M.J., Parsons, N.J., Swanepoel, L. and **Pistorius, P.A.** 2018. A novel candidate species of *Anaplasma* that infects avian erythrocytes. *Parasites and Vectors* 11: 525. (IF 3.08)
- Vanstreels, R.E.T., Yabsley, M.J., Swanepoel L., **Stevens, K.L., Carpenter-Kling, T., Ryan, P.G.** and **Pistorius, P.A.** 2018. Molecular characterization and lesions associated with *Diomedeenema diomedae* (Aproctoidea: Desmidocercidae) from grey-headed albatrosses (*Thalassarche chrysostoma*) on Subantarctic Marion Island. *International Journal for Parasitology* 7: 155-160. (IF 3.73)
- Weimerskirch, H., Delord, K., Barbraud, C., Le Bouard, F., **Ryan, P.G.** and Fretwell, P. 2018. Status and trends of albatrosses in the French southern territories, Western Indian Ocean. *Polar Biology* 41: 1963-1972. (IF 1.949)
- Weimerskirch, H., Le Bouard, F., **Ryan, P.G.** and Bost, C.A. 2018. Massive decline of the world's largest king penguin colony at Ile aux Cochons, Crozet. *Antarctic Science* 30: 236-242. (IF 1.461)
- Wiley, E.M. and **Ridley, A.R.** 2018. The benefits of pair bond tenure in the cooperatively breeding pied babbler (*Turdoides bicolor*). *Ecology and Evolution* 8: 7178-7185. (IF 2.44)
- Wimberger, K., **Carstens, K.F.**, Carstens, J.C. and **Boyes, R.S.** 2018. Nest boxes for Cape Parrots *Poicephalus robustus* in the Hogsback area, Eastern Cape, South Africa. *Ostrich* 89: 79-85. (IF 0.833)
- Yapi, T.S., **O'Farrell, P.J.**, Dziba, L.E. and Esler, K.J. 2018. Alien tree invasion into a South African montane grassland ecosystem: impact of Acacia species on rangeland condition and livestock carrying capacity. *International Journal of Biodiversity Science, Ecosystem Services and Management* 14: 105-116.

## Online Published Papers

- Abdu, S., Lee, A.T.K.** and **Cunningham, S.J.** 2018. The presence of artificial water points structures an arid-zone avian community over small spatial scales. *Ostrich*. (IF 0.833)
- Attisano, A., Thiel, F., Sato, N., Okahisa, Y., **Bolopo, D.**, Tanaka, K.D., Kuehn, R., Gula, R., Ueda, K. and Theuerkauf, J. 2018. Breeding biology of the Fan-tailed Gerygone *Gerygone flavolateralis* in relation to parasitism by the shining Bronze-cuckoo *Chalcites lucidus*. *Journal of Ornithology*. (IF 1.468)
- Bourne, A., McKechnie, A.E., Cunningham, S.J., Ridley, A.R.**, Woodborne, S.M. and Karasov, W.H. IP. Non-invasive measurement of metabolic rates in wild, free-living birds using doubly labelled water. *Functional Ecology*. (IF 5.63)
- Caravaggi, A., Cuthbert, R.J., **Ryan, P.G.**, Cooper, J. and Bond, A. 2018. The cumulative impacts of introduced house mice on the breeding success of nesting seabirds on Gough Island. *Ibis*. (IF 2.279)
- Cerda-Cuellar, M., Moré, E., Ayats, T., Aguilera, M., Muñoz-González, S., Antilles, N., **Ryan, P.G.** and González-Solís, J. 2018. Do humans spread zoonotic enteric bacteria in Antarctica? *Science of the Total Environment* 654: 190-196. (IF 4.9)
- Clucas, G.V., Younger, J.L., Kao, D., Emmerson, L., Southwell, C., Wienecke, B., Rogers, A.D., Bost, C-A., Miller, G.D., Polito, M.J., Lelliott, P., **Handley, J.**, Crofts, S., Phillips, R.A., Dunn, M.J., Miller, K.J. and Hart, T. 2018. Comparative population genomics reveals key barriers to dispersal in Southern Ocean penguins. *Molecular Ecology*. (IF 6.086)
- Covas, R.** and Doutrelant, C. 2018. Testing the sexual and social benefits of cooperation in animals. *Trends in Ecology and Evolution*. (IF 15.268)
- Craig, C.A., Thomson, R.L.**, Girardello, M. and Santangeli, A. 2018. The drivers and extent of poison use by Namibia's communal farmers: implications for averting the African vulture crisis. *Ambio*. (IF 3.687)
- Crawford, R.J.M., Dyer, B.M., Geldenhuys, L., Oosthuizen, W.H. and **Makhado, A.B.** 2018. Seabird breeding populations decrease along the arid coastline of South Africa's Northern Cape province. *Ostrich*. (IF 0.833)
- Da Costa Lopes, D., **Martin, R.O.**, Indjai, B., Monteiro, H., Henriques, M., Regalla, A. and Catry, P. 2018. Food diversity of Timneh parrots (*Psittacus timneh*) in the Bijagós archipelago, Guinea-Bissau. *African Journal of Ecology*. (IF 0.69)
- Enstipp, M.R., Descamps, S., Fort, J. and **Grémillet, D.** 2018. Almost like a whale-first evidence of suction feeding in a seabird. *Journal of Experimental Biology* 221: jeb182170. (IF 3.32)
- Grémillet, D.**, Collet, J., Weimerskirch H., Courbin, N., **Ryan, P.G.** and Pichegru, L. 2018. Bird-borne ship

- radar detectors show surprisingly few vessel encounters in Cape gannets competing with fisheries. *PLoS ONE* (IF 2.806)
- Jones, C.W.**, Risi, M.M., Cleeland, J. and **Ryan, P.G.** 2018. First evidence of mouse attacks on adult albatrosses and petrels breeding on sub-Antarctic Marion and Gough Islands. *Polar Biology*. (IF 1.949)
- Krochuk, B.A., Bolopo, D., Lowney, A.M.**, Meyers, P.R., **Spottiswoode, C.N.**, Raman, R.M.G. and **Thomson, R.L.** 2018. Why defaecate on your doorstep? Investigating an unusual behaviour in Africa's smallest falcon. *Ostrich*. (IF 0.833)
- Lee, A.T.K.**, Reeves, B. and Wright, D.R. 2018. Hottentot buttonquail *Turnix hottentottus*: endangered or just overlooked. *Bird Conservation International*. (IF 1.088)
- Leite, A., Cáceres, A., **Melo, M.**, **Mills, M.S.L.** and Monteiro, A.T. 2018. Reducing Emissions from Deforestation and forest Degradation (REDD+) in Angola: insights from the Scarp Forest conservation hotspot. *Land degradation and Development*. (IF 7.27)
- Lopes, D.C., **Martin, R.O.**, Henriques, M., Monteiro, H., Cardoso, P., Tchantchalam, Q., Pires, A.J., Regalla, A. and Catry, P. 2018. Combining local knowledge and field surveys to determine status and threats to timneh parrots *Psittacus timneh* in Guinea-Bissau. *Bird Conservation International*. (IF 1.088)
- Monti, F., Duriez, O., Dominici, J-M., Sforzi, A., Robert, A., Fusani, L. and **Grémillet, D.** 2018. The price of success: integrative long-term study reveals ecotourism impacts on a flagship species at a UNESCO site. *Animal Conservation*. (IF 2.835)
- O'Connor, R.S.**, Brigham, R.M. and **McKechnie, A.E.** IP. Roosting in exposed microsites by a nocturnal bird, the rufous-cheeked nightjar: implications for water balance under current and future climate conditions. *Canadian Journal of Zoology*. (IF 1.347)
- Oswald, K.N., Lee, A.T.K.** and Smit, B. 2018. Comparison of physiological responses to high temperatures in juvenile and adult Cape Rockjumpers *Chaetops frenatus*. *Ostrich*. (IF 0.833)
- Péron, C., Authier, M. and **Grémillet, D.** 2018. Testing the transferability of track-based habitat models for sound marine spatial planning. *Diversity and Distributions*. (IF 4.391)
- Pietersen, D.W., McKechnie, A.E.**, Jansen, R., Little, I.T. and Bastos, A.D.S. 2018. Multi-locus phylogeny of African pipits and longclaws (Aves: Motacillidae) highlights taxonomic inconsistencies. *Ibis*. (IF 2.279)
- Smit, B., Woodborne, S., Wolf, B.O. and **McKechnie, A.E.** 2018. Differences in the use of surface water resources by desert birds is revealed using isotopic tracers. *PeerJPreprints*.
- Visser, E., Perold, V.**, Ralston-Paton, S., Cardenal, A.C. and **Ryan, P.G.** 2018. Assessing the impacts of a utility-scale photovoltaic solar energy facility on birds in the Northern Cape, South Africa. *Renewable Energy*. (IF 4.357)
- Waller, C.L., Griffiths, H.J., Waluda, C.M., Thorpe, S.E., Loaiza, I., Moreno, B., Pacherres, C.O., **Ryan, P.**, Suaria, G., Isobe, A. and Hughes, K.A. 2018. Microplastics in the Southern Ocean. *Antarctic Environments Portal*.



# Popular publications 2018

Names in **bold** are members of the FitzPatrick Centre of Excellence.

- Baptista, N.L. and **Mills, M.S.L.** 2018. Angolan White-headed Barbet *Lybius[leucocephalus] leucogaster* rediscovered. *Bulletin of the African Bird Club* 25(2): 225-229.
- Bourne, A.** 2018. High temperatures suppress growth equally in male and female Southern pied babbler nestlings. *British Ornithologists' Union Blog* <https://www.bou.org.uk/blog-bourne-babblers/> (Posted 05 November 2018).
- Bourne, A.**, Martin, J., and Nash, A-E. 2018. Review of ISBE 2018 in Minneapolis. *ISBE Newsletter* 30(2): 16-18.
- Brink, C., Amar, A.** and **Thomson, R.** 2018. The FitzPatrick Report: On a plate: can fine dining offer hope to Africa's vultures. *African Birdlife* 6(2): 18.
- Coetzee, A.** and **Barnard, P.** 2018. Nectar quandary: surviving the suburbs. *African Birdlife* 6(5): 71-72.
- Cunningham, S.** The FitzPatrick Report: Lunch-boxing clever. *African Birdlife* 6(6): 18.
- De Blocq, A.** 2018. Cape gannet: uplisted to endangered. *African Birdlife* 6(3): 16-17.
- Du Toit, C.** and **Cunningham, S.J.** 2018. Touchy feely. *Wild Magazine* Spring 2018.
- Evans, C.** 2018. Caught off-guard. *African Birdlife* 6(3): 56-57.
- Flores, S.** 2018. Living in harmony. *Safari News* Spring Edition 2: 28.
- Garbett, B.** and **Amar, A.** 2018. The FitzPatrick Report: Ban the bullet: yet another threat to African vultures. *African Birdlife* 6(5): 18.
- Garbett, B.** and **Amar, A.** 2018. Raptors and vultures declining. *Safari News* Summer Edition 2: 6.
- Hering, J., Hering, H., de Lima, R.F. and **Melo, M.** 2018. Little-known African bird: Príncipe white-eye *Zosterops ficedulinus* – a rare island endemic. *Bulletin of the African Bird Club* 25(1): 75-81.
- Jenkins, A.** 2018. Top of the Table. *Wild Magazine* Winter 2018 43: 62-65.
- Jenkins, A.** 2018. Wide, open De Mond. *African Birdlife* 6(5): 24-33.
- Lee, A.** Killing crows. *African Birdlife* 7(1): 12-14.
- Lee, A.** 2018. Stress in the city. *African Birdlife* 6(4): 13.
- Little, R.** 2018. Newcastle Disease & Laughing Doves. *Batis* November 2018 84: 26.
- Little, R.** 2018. Birding in South Africa's National Parks. *Country Life* <https://www.countrylife.co.za/adventure/birding-south-africas-national-parks> (Posted 18 April 2018)
- Little, R.** 2018. Laughing Doves and Newcastle disease. *Promerops* 312: 8.
- Little, R.** 2018. Wild goose chase. *Safari News* Spring Edition 2: 6.
- Little, R.** 2018. Have you seen these birds? *Safari News* Winter Edition 1: 9.
- Little, R.** 2018. Don't forget our feathered friends. *SANParks Times* Autumn Edition March 2018: 6.
- Little, R.** 2018. Tick Fever. *Wild Magazine* Summer 2018/2019 45: 68-75.
- Little, R.** 2018. Grey-wings for ever. *Wingshooter* November/December 24(4): 10-13.
- Lowney, A.** and **Thomson, R.** 2018. How weavers help keep skinks safe from pygmy falcons. *Diamond Route Newsletter* February 2018: 10.
- McKechnie, A.** 2018. Boom, cackle and whine: birds make themselves heard above wind farm noise. *African Birdlife* 6(4): 11.
- McKechnie, A.** 2018. Track and trace: new technologies for studying bird movements. *African Birdlife* 6(4): 26-30.
- Murgatroyd, M.** 2018. Conserving martial eagles. *Sky News* Aug/Sept 2018: 14-17.
- Pistorius, P.** 2018. The FitzPatrick Report: A seabird's perspective: animal-borne cameras shed light on seabird behaviour. *African Birdlife* 6(3): 18.
- Reynolds, C.** 2018. Atlas insights: balancing biodiversity and agriculture. *African Birdlife* 6(5): 34.
- Rollinson, D.P.** 2018. Seabird sightings off southern and central Mozambique, August – October 2015. *Bulletin of the African Bird Club* 25(2): 193-204.
- Ryan, P.** 2018. Cape cormorants extend their range. *African Birdlife* 7(1): 10.
- Ryan, P.** 2018. Collapse of the world's largest King Penguin colony. *African Birdlife* 7(1): 11.
- Ryan, P.** 2018. The FitzPatrick Report: Fact finding: the IOC and big data. *African Birdlife* 7(1): 18-20.
- Ryan, P.** 2018. Review: Kowa Genesis 33 Prominar 10X33 binoculars. *African Birdlife* 7(1): 73.

**Ryan, P.** 2018. What limits long-range migrants? Growth in North Pacific salmon stocks impacts short-tailed shearwater numbers. *African Birdlife* 6(6):10-11.

**Ryan, P.** 2018. Home on loan. *African Birdlife* 6(6): 24-27.

**Ryan, P.** 2018. What a waste: Plastic pollution update. *African Birdlife* 6(6): 32-41.

**Ryan, P.** 2018. Professor Peter Ryan Comments. *African Birdlife* 6(4): 6.

**Ryan, P.** 2018. Duck, down: white-backed duck diving behaviour. *African Birdlife* 6(4): 12.

**Ryan, P.** 2018. Check your mate. *African Birdlife* 6(4): 10.

**Ryan, P.** 2018. Binocular review: Kowa BD42x10 Prominar. *African Birdlife* 6(4): 71.

**Ryan, P.** 2018. Review: Swarovski CL Companion binoculars. *African Birdlife* 6(3): 72-73.

**Ryan, P.** 2018. Jouanin's petrel – or is it? *African Birdlife* 6(3): 10-11.

**Ryan, P.** 2018. On the shelf. *African Birdlife* 6(2): 14-15.

**Ryan, P.** 2018. Shorebirds in Action. *African Birdlife* 6(2): 15.

**Ryan, P.** 2018. Review: Zeiss Conquest Gavia 85 T spotting scope. *African Birdlife* 6(2): 69.

**Ryan, P.** 2018. Red-winged Starlings' prolonged nest use. *Promerops* 312: 21-22.

**Ryan, P.** 2018. Leucistic red-knobbed coot. *Promerops* 312: 22.

**Ryan, P.** 2018. Summer breeding Orange-breasted sunbirds. *Promerops* 311: 13.

**Thomson, R.** 2018. The FitzPatrick Report: Using social media: scared skinks eavesdrop on wary weavers. *African Birdlife* 6(4): 18.

**Thomson, R.L.** 2018. Hotel Kgalagadi. *Wild Magazine* Autumn 2018 42: 56-62.

**Thomson, R. and Lowney, A.** 2018. Kalahari tree skinks manage risk using sociable weaver cues. *SANParks Times* Autumn Edition March 2018: 13.

Van der Merwe, N. and **Wanless, R.** 2018. Birdlife South Africa news: a fundraising mountain for mouse free Marion. *African Birdlife* 6(6): 64-65.

**Wanless, R.** 2018. How much is enough? *African Birdlife* 6(2): 61.

#### **Books:**

**Little, R.** 2018. *Birding in South Africa's National Parks*. Johannesburg, South Africa: Jacana Media. ISBN 978-1-4314-2689-8.

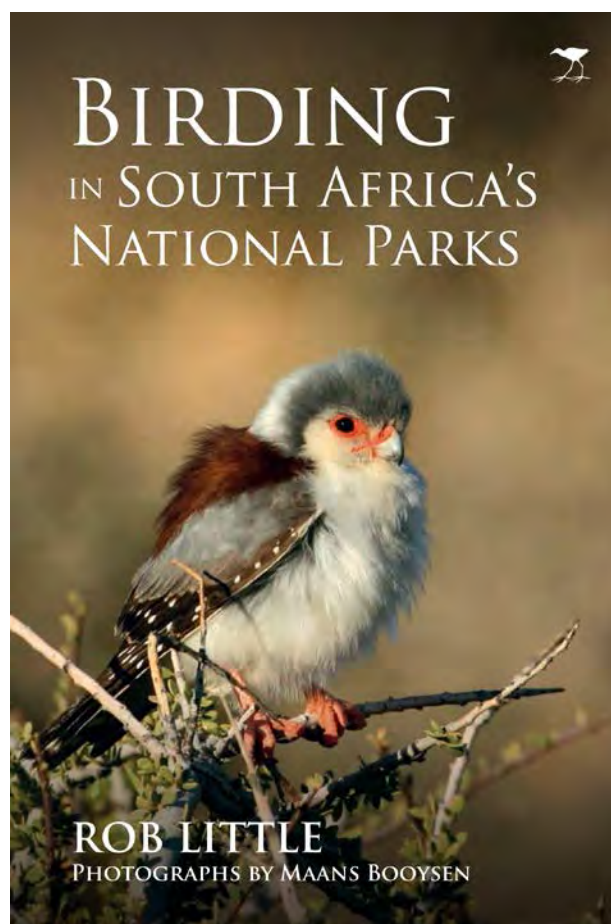
#### **Book Chapters:**

**Amar, A., Buij, R., Suri, J., Sumasgutner, P. and Virani, M.Z.** 2018. Conservation and ecology of African Raptors. In: *Birds of prey*. Edited by J. Sarasola, J. Grande, and J. Negro, Springer, Cham, pp. 419-455.

Favaro, L. and **Pichegru, L.** IP. Penguins: Behavioural ecology and vocal communication. In: *Encyclopedia of Animal Cognition and Behavior*. Edited by J. Vonk, and T. Shackelford, Springer, pp.1-9.

Reid, H., **Bourne, A.**, Miller, H., Podvin, K., Scorgie, S., and Orindi, V. 2018. A framework for assessing the effectiveness of ecosystem-based approaches to adaptation. In: *Resilience: the science of adaptation to climate change*. Edited by Z. Zommers and K. Alverson, Mercy Corps, United Kingdom, pp. 207-216.

**Rose, S., Sumasgutner, P., Koeslag, A. and Amar, A.** 2018. Does seasonal decline in breeding performance differ for an African Raptor across an urbanization gradient? In: *Behavioural and ecological consequences of urban life in birds*. Edited by C. Isaksson, A.D. Rodewald and D. Gil, Frontiers Media, Lausanne, pp. 259-267.



# Key 2018 supporters

The FitzPatrick Institute is extremely grateful for the generous support from co-sponsors. Without this support it would not be possible to maintain our high levels of research, teaching and scientific output.

