FitzPatrick Institute of African Ornithology

UNIVERSITY OF CAPE TOWN

ANNUAL REPORT 2024

Contents

FRONT COVER: Jess Lund holds a male Greater Honeyguide, briefly captured for research at Niassa National Reserve in Mozambique. The honeyguide has been fitted with a GPS tracker as part of research on the human-honeyguide mutualism, supported by the new Max Planck – University of Cape Town Centre for Behaviour and Coevolution at the Fitz. This individual, colour-ringed green yellow metal (GYM), is the joint-oldest honeyguide in the Niassa study population (>8 years old) (Photo Claire Spottiswoode).

REPORT LAYOUT: HILARY BUCHANAN

Director's report

The year 2024 was one of exciting developments at the Fitz. We began an important new international partnership as the host of the first Max Planck Centre for Africa, hired two new staff and welcomed back a familiar face, Dr Susan Miller, in a new role. We also welcomed 5 new Masters and 13 new Conservation Biology Masters students and began to rebuild our post-doc community, with 4 post-docs registered in 2024. Alongside this, we continued our tradition of research productivity and excellence. Once again, we published > 100 papers in the peer-reviewed scientific literature: congratulations to all our authors, particularly to those of our students who published for the first time in their careers this year. Furthermore, we graduated 13 students from the Fitz this year, including 2 PhDs. For the fourth year running, the Purcell Prize for best PhD on a zoological topic at UCT went to a Fitz student, Dr Angela Moreras, who graduated in 2023 (award announced in February 2024 – congratulations to Andrea and her supervisor, A/Prof. Robert Thomson.

A new partnership - the Max Planck-University of Cape Town Centre for Behaviour and Co-evolution:

A landmark event of 2024 was the finalisation of the co-operation agreement between the Max Planck Society for the Advancement of Science and the University of Cape Town, for the establishment of the Max Planck-University of Cape Town Centre for Behaviour and Coevolution. The Centre is hosted by the FitzPatrick Institute of African Ornithology in partnership with the Max Planck Institute for Biological Intelligence (MPIBI) at Seewiesen in Germany.

Max Planck Centres are highly prestigious virtual centres of excellence, of which 18 currently exist globally, in 10 different countries. Our Centre at the Fitz is the first ever to be established on the African continent. The Centre was officially opened with a joint scientific workshop in Seewiesen in June, including an opening event attended by the President of the Max Planck Society and by a delegation from the South African Consulate in Germany. This will be followed by an event in Cape Town in the first quarter of 2025.

Co-led by Prof. Claire Spottiswoode at the Fitz, and Prof. Bart Kempenaers at the MPIBI, the Max Planck-University of Cape Town Centre for Behaviour and Coevolution supports research on the human-honeyguide mutualism (page 12, cover), brood parasitism (page 8) and Afrotropical bird phenology (page 22) projects, and brings multiple benefits to the Fitz. For example, we expect the Centre to bring in research funding of up to EU 1.9 million (~R 40 million) over the next five years, allowing the Fitz to expand our postgraduate student and post-doc community, fund post-graduate internships for African students and maintain capacity for core priorities such as providing stable leadership for the Conservation Biology MSc course. Max Planck Centres are funded for an initial period of 5 years, renewable once. See page 6 for the first report on the Centre's activities.

Staffing updates:

During Jan – March, we engaged in the challenging process of finding a new Administrative Assistant in the wake of Mrs Hilary Buchanan's retirement. Hilary was a core figure in the lives of countless Fitz students over more than two decades in the role. She officially retired at the end of 2023 but stayed on until the March 2024, while we completed the task of appointing her successor. In April, we welcomed Ms Nqubeko Hlekwayo into the role. Nqubeko was an instant hit with staff and students alike – efficient, conscientious and organised, and immediately part of the Fitz family. Sadly, a change in Nqubeko's personal circumstances meant she could no longer support working part-time and she resigned in December to take up a full-time position in the Graduate School of Business in 2025. Hilary agreed to return on a short post-retirement contract in early 2025 to assist us while we start the appointment process again.

A significant event of 2024 was the appointment of Dr Gabriel Jamie to the role of Lecturer, restoring the Fitz's core academic staff complement to full strength. Gabriel is a South African evolutionary biologist who completed his PhD through the University of Cambridge in 2018. We are delighted to be able to welcome him home. Gabriel's post is part-funded by UCT's contribution to the Max Planck Centre, and part-funded by a top up from the Employment Equity Fund.

Gabriel will take over the convenorship of the Conservation Biology MSc course in 2025 at the completion of Dr Sally Hofmeyr's contract, and I feel sure that he will prove a strong leader for this flagship programme. Sally and Gabriel worked closely together throughout the last quarter of 2024 to ensure a smooth handover for the course. We are all grateful to Sally for her able leadership of the course during this transitional period, and for the warmth and collegiality she brings to the Fitz. We look forward to continuing to work with her in new roles in future – watch this space!

The establishment of the Max Planck Centre also allowed us to welcome back Dr Susan Miller in a new role as the Centre's Scientific Coordinator. Susan is a familiar face at the Fitz, having provided excellent and tireless service, first as a post-doctoral fellow, then Manager of the DSI-NRF Centre of Excellence after Dr Rob Little's retirement, and most recently as coordinator for Claire Spottiswoode's ERC grant.

Celebrating the achievements of staff and students in 2024:

The Fitz continued to thrive in 2024, 64 years after our establishment. We are currently home to 18 major research programmes, all thriving under diversified funding in the post-Centre of Excellence era, including substantial new funding from the Max Planck Foundation. Other notable achievements by Fitz team members this year include post-doctoral fellow Dr Shannon Conradie's award of the prestigious Jennifer Ward Oppenheimer Research Grant ($150,000 USD), and Prof. Claire Spottiswoode's award of the Friedrich Wilhelm Bessel Research Award by the Humboldt Foundation, Germany. Together with our publication of more than 100 research papers, many in top journals internationally, these are indicators of the calibre of the Fitz team. I am proud of the continued excellence of the work done by all the Fitz's staff, students, and extended family of HRAs and RAs. Equally, I am proud of the team's commitment to collegiality and inclusiveness, which makes the Fitz (in Nqubeko's words) "the warmest and loveliest environment I've had at UCT".

Congratulations to everyone on another successful, happy and productive year at the Fitz!

Susan Cunningham, March 2025

FitzPatrick Institute Advisory Board 2024

Mark Anderson (BirdLife South Africa)
A/Prof. Colin Attwood (HoD, Biological Sciences) Apr-Dec
Michael Buckham (co-opted)
A/Prof. Susan Cunningham (Director, FIAO)
Vernon Head (co-opted)
Marina Niven (FitzPatrick Memorial Trust)
François van der Merwe (co-opted)
A/Prof. Pippin Anderson (EGS, UCT)
Dr Graham Avery (WESSA)
Dawie Chamberlain (co-opted)
Dean Ferreira (co-opted) Jan-Mar
Prof. Jeff Murugan (Acting DVC Research, UCT)
Prof. Hussein Suleman (Dean of Science, UCT) Chair
A/Prof. Tony Verboom (HoD, Biological Sciences) Jan-Mar

Staff, Students and Associates

UCT GRADUATES

PhD
Christie Craig (PeterRyan)
Nicolas Pattinson (Susie Cunningham)

MSc
Temitope Adelola (Robert Thomson/Arjun Amar)
Abigail Ramudzuli (Peter Ryan)
Kyle Walker (Arjun Amar)

Conservation Biology MSc
Tevin Adams
Zoe Allouchery
Abigail Campbell
Xolani Mabaso
Casper Morch

NEW UCT STUDENTS

MSc
Leslie Bayanza (Susie Cunningham)
Lailat Jose Guta (Claire Spottiswoode)
Daniella Mhangwana (Claire Spottiswoode)
Yusra Samsodien (Robert Thomson/Arjun Amar)
Martiné van den Berg (Susie Cunningham)

Upgrade from MSc to PhD
Koi Pillay (Arjun Amar)

Conservation Biology MSc
Thirteen students began the CB MSc in January 2024.

BSc Hons
Hannah Glanville
Carolina Policarpo
Muano Ramavhoya

Academic Staff

Director:
Assoc. Prof. Susan Cunningham, PhD (Massey)

Academic and Research Staff:
Assoc. Prof. Arjun Amar, PhD (Aberdeen)
Dr Sally Hofmeyr, PhD (Cape Town)
Dr Gabriel Jamie, PhD (Cambridge) (Oct-Dec)
Dr Chima Nwaogu, PhD (Groningen & St Andrews)
Emer. Prof. Peter Ryan PhD (Cape Town)
Prof. Claire Spottiswoode, PhD (Cambridge)
Assoc. Prof. Robert Thomson, PhD (Oulu)

Honorary Professor:
Prof. David Cumming, PhD (Rhodes)

Honorary Research Associates/Affiliates
Dr Phoebe Barnard, PhD (Uppsala)
Dr Rita Covas, PhD (Cape Town)
Prof. Graeme Cumming, PhD (Oxford)
Prof. Wendy Foden, PhD (Wits)
Dr David Grémillet, PhD (Kiel)
Dr Azwianewi Makhado, PhD (Cape Town)
Dr Megan Murgatroyd, PhD (Cape Town)
Assoc. Prof. Mandy Ridley, PhD (Cambridge)
Dr Andrea Santangeli, PhD (Helsinki)
Dr Colleen Seymour, PhD (Cape Town)
Dr Rob Simmons, PhD (Wits)

Research Associates
David Allan, MSc (Cape Town)
Dr Ben Ashton, PhD (Western Australia)
Dr Steve Boyes, PhD (KwaZulu-Natal)
Dr Christiaan Brink, PhD (Cape Town)
Dr Ursula Bryson, PhD (Ludwigs-Maximilians)
Dr Elsa Bussière, PhD (Cape Town)
Dr Callan Cohen, PhD (Cape Town
Dr Maëlle Connan, PhD (Pierre & Marie Curie)
Dr Timotheé Cook, PhD (La Rochelle)
Dr Christie Craig, PhD (Cape Town)
Dr Tanmay Dixit, PhD (Cape Town)
Dr Robert Flood, PhD (City University, London)
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)
Dr Anthony Lowney, PhD (Cape Town)
Dr Kristi Maciejewski, PhD (NMU)
Dr Rowan Martin, PhD (Sheffield)
Dr Martim Melo, PhD (Edinburgh)
Dr Antoni Milewski, PhD (Murdoch)
Prof. Sue Milton, PhD (Cape Town)
Dr René Navarro, PhD (Cape Town)
Dr Samuel Osinubi PhD (Christchurch)
Adj. Prof. Lorien Pichegru, PhD (Strasbourg)
Dr Dominic Rollinson, PhD (Cape Town)
Dr Antje Steinfurth, PhD (Kiel)
Dr Petra Sumasgutner, PhD (Vienna)
Dr Gareth Tate, PhD (Cape Town)
Jessie Walton
Dr Ross Wanless, PhD (Cape Town)

Post-doctoral fellows
Dr Shannon Conradie, PhD (Pretoria) Jul-Aug
Dr Kyle-Mark Middleton, PhD (Cape Town)
Dr Jessica van der Wal, PhD (St Andrews)
Dr Santiago Zuluaga Castañeda, PhD (Universidad Nacional del Comahue, Argentina)

Support Staff

Scientific Co-ordinator, Max Planck Centre
Dr Susan Miller, DTech (TUT)

Principal Technical Officer
Michael Brooks

Administrative Assistants
Hilary Buchanan, BA, HDipLib (Cape Town) (Jan-Mar)
Nqubeko Hlekwayo, BA, BA Hons (Cape Town) (Apr-Dec)
Anthea Links

Niven Librarian
Janine Dunlop, M.IT (Lib Sci) (Pretoria)

Project Assistants
SABAP2: Tania Anderson, MSc (Free State)
SAFRING: Kim-Kelly Hunt, MSc (Cape Town) (Jan-Jun)
SANAP: Vanessa Stephen, MSc (Cape Town)

Ad hoc Research Assistants
Cameron Blair, Rion Cuthill, Ryan Forbes, Carrie Hickman, Sally Hofmeyr, Amy Hunter, Jess Lund, Ryan Forbes

Students

Doctoral
Robin Colyn, MTech (CPUT)
Christie Craig, MSc (Cape Town) – *graduated Sept*
Carrie Hickman, BSc (Hons) (Open University)
Eliupendo Laltaika, MSc (Cape Town)
David Lloyd-Jones, BSc (Hons) (Canterbury)
Kyle Maclean, BSc (Hons) (Cape Town)
Rebecca Muller, MSc (Cape Town)
Benjamin Murphy. MSc (Exeter)
Merlyn Nkomo, MSc (Cape Town)
Olufemi Olubodun, MSc (Ibadan)
Kailen Padayachee, BTech (TUT)
Nicholas Pattinson, MSc (NMU) – *graduated Sept*
Vonica Perold, MSc (Pretoria)
Koi Pillay, BSc (Hons) (Cape Town)
Kim Stevens, BSc (Hons) (Cape Town)
Marc Travers, MSc (Simon Fraser)

MSc by dissertation
Yinka Abayomi, BSc (Abeokuta)
Temitope Adelola, BSc (Hons) (Akure) - *graduated Sept*
Abiodun Ademola, BSc (Hons) (Abeokuta)
Leslie Bayanza, BA (Hons) (African Leadership University)
Cameron Blair, BSc (Hons) (Cape Town)
Lailat Jose Guta, BSc (Hons) (EARTH, Costa Rica)
Sthabile Khumalo (BSc (Hons) (Wits)
Chukwudi Nwaigwe, BSc (Hons) (Futo)
Daniella Mhangwana, BSc (Hons) (Cape Town)
Yusra Samsodien BSc (Hons) (UWC)
Martiné van den Berg, BSc (Hons) (Cape Town)
Kyle Walker, BSc (Hons) (Cape Town) - *graduated Sept*

Masters in Conservation Biology 2024/25
Catarina Caspers, BSc (Amsterdam)
David Chapoloko, BSc (Copperbelt, Zambia)
Lara Howard, BSc (Glasgow)
Atalante Itzicsohn, MSc (Ecole Polytechnique, Paris)
Dembo Jatta, BA (Hons) (African Leadership University)
Clara Marincowitz, MSc (Stellenbosch)
Miranda Mix, BSc (Cornell)
Lesedi Moagi, BTech (TUT)
Keyura Pather, BSc (Hons) (Wits)
Natalie Psillos, MPhil (Cambridge)
Claude Schippers, BSc (Hons) (NMU)
Jade Simoen, BSc (Hons) (Cape Town)
Tanki Thubela, BSc (Fort Hare)

Masters in Conservation Biology 2023/24
Tevin Adams, BSc (Hons) (Western Cape) - *graduated Sept*
Zoe Allouchery, BSc (Hons) (Cape Town) - *graduated Sept*
Abigail Campbell, BSc (U.Mass Amherst) - *graduated Sept*
Alexandro Faria, BSc Agric (Hons) (Pretoria)
Mpho Havhi, BSc (Hons) (Venda)
Wiro-Bless Kamboe, BSc (U. Dev. Studies)
Casper Morch, BSc (Leiden Univ. College) - *graduated Sept*
Choolwe Mulenga, BSc (Copperbelt, Zambia)
Maggie Mwale, BSc (Copperbelt, Zambia)
Obakeng Pule, BSc (Hons) (North West)
Lawrence Steyn, BCom (Pretoria)
Wambui Waibochi, BSc (Hons) (East Anglia)
Robi Watkinson, BSc (Leeds)

BSc Hons
Hannah Glanville, Carolina Policarpo, Muano Ramavhova

Externally registered students

Doctoral:
Cambridge – Marienn Attwood, Jess Lund
Helsinki – Teresa Abaurrea
Leeds – Rebecca Dobson
Montpellier –Nicolas Silva
NMU – Danielle Keys
Porto –Babette Fourie, Marta Marmelo,
Pretoria – Bianca Coulson, Wesley Gush, Ryno Kemp
UCT – Jessleena Suri (Stats)

MSc/MPhil by dissertation:
Cambridge – Rion Cuthill
Pretoria –Nazli Liddle, Makgoshi Mogotsi, James Short, Lara Strydom, Jochen Voges

BSc Hons
Pretoria – Caitlin Read

Max Planck-UCT Centre for Behaviour and Coevolution

For the first time in Africa, and only the second time in the Global South, a new and prestigious Max Planck Society "virtual centre of excellence" has been established, in a partnership between the Fitz and the Max Planck Institute for Biological Intelligence (MPIBI). Known as the Max Planck–University of Cape Town Centre for Behaviour and Coevolution, it will run initially for five years, with funding from the Max Planck Foundation and a matching contribution from UCT.

The Centre is co-directed by Professor Claire Spottiswoode of the Fitz and Professor Bart Kempenaers of the MPIBI's Department of Ornithology. Dr Gabriel Jamie has recently been appointed as a Lecturer at the Fitz and is the Deputy Co-director of the Centre, and Dr Susan Miller joins as the Scientific Coordinator for the Centre.

The Centre will investigate the relationship between species interactions and biodiversity in the context of a changing world. This research falls into three broad themes: (i) Species interactions and the evolution of mimicry and signatures of identity; (ii) Species interactions and cultural co-evolution; and (iii) species interactions and adaptations to a changing climate. These projects aim to understand, for example, the role of learning in co-evolutionary arms races between brood-parasitic birds and their hosts; cultural variation in interactions between people across Africa and the Greater Honeyguides which guide them to bees' nests; the effects of fire on bird movements; how bird eggs avoid overheating in a warming world; and how African birds adjust their breeding seasons in response to a changing climate. Projects directly supported by the Centre include "Coevolutionary arms races in brood-parasites and their hosts" (page 8), "The evolution, ecology and conservation of honeyguide-human mutualism" (page 12), and "Why do Afrotropical birds breed when they do?" (page 22), with collaborations across many of the other core projects of the Fitz.

Claire Spottiswoode from the Fitz and Bart Kempenaers from the Max Planck Institute for Biological Intelligence are Co-Directors of the Max Planck–UCT Centre for Behaviour and Coevolution, the first Max Planck Centre in Africa (Photo: Sabine Spehn).

The logo of the new Max Planck–UCT Centre for Behaviour and Coevolution representing some of our research themes, designed by David Lloyd-Jones and Jess Lund.

The Centre was officially launched with a ceremony and scientific workshop at the MPIBI in Seewiesen in mid-June 2024. A group of Fitz staff and students travelled to Germany for the occasion, marking the first opportunity for us as a team to meet our MPIBI colleagues and further discuss collaborations. The opening ceremony was attended by the President of the Max Planck Society, a delegation from the South African Consulate in Germany, and donors from the Max Planck Foundation which funded the Max Planck Society's contribution to the Centre. The opening

Colleagues from the Fitz and Max Planck Institute for Ornithology on a birding outing at the Murnauer Moos in the Bavarian foothills of the Alps, June 2024 (Photo: Claire Spottiswoode).

ceremony was followed by a week of engaging scientific talks, discussions and local outings, in a wonderful week of science, birds, food and camaraderie.

The Centre will foster collaboration and discovery by combining the complementary skills and scientific knowledge of the Fitz and the MPIBI, as well as facilitating the exchange of early career researchers and scientists. For instance, the MPIBI in Seewiesen offers state-of-the-art aviaries where FitzPatrick Institute scientists and students will conduct experiments. Likewise, MPIBI researchers are collaborating with Fitz teams at our unique field sites in South Africa, Zambia and Mozambique. The new Centre will support numerous graduate students and several post-doctoral fellows and junior research team leaders at the Fitz, including an annual scholarship for a student from Africa to join the MSc Conservation Biology course, and provide internships for students from Zambia and Mozambique, in addition to supporting the appointment of Gabriel Jamie as Lecturer and convener (from 2025) of the CB course and of Susan Miller as Scientific Coordinator.

We are excited to see how these projects evolve in the coming years and look forward to sharing the discoveries that result from this collaboration.

Dr Gabriel Jamie, Dr Moses Chibesa (Copperbelt University, Zambia), Joel Radue, Maggie Mwale, Tanmay Dixit, Daniella Mhangwana and Prof. Claire Spottiswoode watching whinchats at the Murnauer Moos, June 2024 (Photo: Wolfgang Forstmeier).

Coevolutionary arms races in brood-parasites and their hosts

Coevolution is the process by which two or more species influence each other's evolution. Brood-parasitic birds, the cheats of the bird world, give us an ideal opportunity to study coevolution in the wild. Coevolutionary "arms races" arise when 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. Three long-term projects in Zambia, the Western Cape of South Africa and Finland, address different aspects of this fascinating model system for coevolution.

Claire Spottiswoode and Gabriel Jamie's team works on a variety of brood-parasitic systems in Zambia, focusing mainly on three broad 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 maintained? The genetic basis of signature-forgery arms races is almost entirely unknown. In collaboration with Prof. Michael Sorenson (Boston University), we are using genomic approaches to ask how specialised adaptations to different host species (mimicry of host eggs) are maintained within a single parasitic species (e.g. Cuckoo Finches *Anomalospiza imberbis* and Greater Honeyguides *Indicator indicator*) in the absence of parasite speciation. We are also interested in the genetic basis of host defences, and whether convergent genetic mechanisms have evolved in their parasitic mimics. Third, what is the role of phenotypic plasticity (such as developmental differences and learning) in coevolution, and how might such plasticity facilitate exploitation of new host species in the absence of appropriate genetic adaptations? We are addressing this question for indigobirds, whydahs and honeyguides.

Gabriel Jamie photographing a Huambo Cisticola *Cisticola bailunduensis* on the slopes of Mt Moco in Angola (Photo: Ryan Truscott).

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

Robert Thomson's team works in Finland, where their research focuses on how host pairs of Common Redstarts *Phoenicurus phoenicurus* can decrease the chance of a Common Cuckoo *Cuculus canorus* parasitising their nest. Hosts that are able to avoid parasites decrease the fitness costs of parasitism; the earlier that avoidance occurs during the breeding cycle, the lower the cost. Therefore, host adaptations before egg laying should be especially beneficial. The Finnish project investigates the redstart's frontline defences (nest site choice, habitat selection, nest building decisions) and the cuckoo's counter-adaptations, including prospecting and laying

Gabriel Jamie (right) and Michael Mills setting up mist nets to catch cisticolas at Mt Moco, Angola (Photo: Ryan Truscott).

strategies, which have received little attention to date. Redstarts are the only regular cuckoo host that breed in cavities, which makes it difficult for female cuckoos to lay eggs and for their newly-hatched chicks to evict host eggs/chicks. This project also studies whether cuckoo females use behaviour and physiology to enhance the manipulative signals that cuckoo nestlings use to extract as much care as possible from their foster parents.

Activities in 2024

- We carried out two seasons of fieldwork in Zambia: rainy season fieldwork in January–March on cuckoo finches and their hosts (Tanmay Dixit), and dry season fieldwork in September–November (Jess Lund and Mairenn Attwood) on Greater *Indicator indicator* and Lesser *I. minor* Honeyguides and African cuckoos *Cuculus gularis* and their hosts, together with our local field team led by Collins Moya, Silky Hamama and Onest Siakwasia.
- Gabriel Jamie conducted fieldwork in Angola (Jan–Feb) with Michael Mills on several poorly known cisticola taxa. Gabriel also conducted whole-genome sequencing on a wide range of cisticolid species collected during fieldwork in Nigeria, DRC, Angola, Zambia and South Africa over the past several years, to track the inheritance and diversification of anti-parasitic egg signatures across the cisticola family.
- Maggie Mwale began the process of curating the remarkable ornithological collection of Zambian birds made by John Colebrook-Robjent, now housed at Livingstone Museum, and supported by the new Max Planck–UCT Centre for Behaviour and Coevolution. Maggie is Curator of Ornithology at the Livingstone Museum as well as a recent CB MSc graduate at the Fitz.
- Joel Radue started his MSc studies on the ecology and evolution of fire-dependence in birds, with a special focus on Bronze-winged Coursers *Rhinoptilus chalcopterus* studied at our long-term study site in Zambia, where, as well as brood parasites, we study the thermal ecology of ground-nesting birds. Joel is supervised by Claire Spottiswoode, Eunbi Kwon and Sally Archibald.

Highlights

- Project co-leader, Gabriel Jamie, was appointed as a Lecturer at the Fitz, supported by the Max Planck-UCT Centre for Behaviour and Coevolution. Gabriel moved to UCT from his

research fellowship at the University of Cambridge in September.

- Gabriel gave a talk for the "Network on the Integration of Speciation" seminar series entitled "Imprinting, speciation and host-specific adaptation in Africa's brood-parasitic finches".
- PhD graduate Angela Moreras was awarded the 2023 Purcell Prize for best thesis with a zoological subject in the Department of Biological Sciences, UCT. Her thesis was entitled "Frontline strategies in the arms-race between hosts and their brood parasites: the case of the common redstart and the common cuckoo."
- Mairenn Attwood, Cameron Blair, Tanmay Dixit and Jess Lund all gave talks on their brood parasite research at the International Society for Behavioural Ecology conference in Melbourne, Australia. Additionally, Tanmay gave a seminar entitled "Cryptography in the bird world" at the University of Oxford.
- Teresa Abaurrea represented the redstart-cuckoo project by giving two talks: to the Animal Behaviour Live Conference entitled "No transmission of mites from host to brood parasite: Do carotenoids protect nestlings from nest mites?" and an invited seminar to the Experimental Station for Arid Zones, National Council for Scientific Research in Spain entitled "Parent-offspring coadaptation without parental care: Common cuckoos vs Common redstarts."
- Several members of the brood parasite research team presented research talks at the opening workshop of the Max Planck–UCT Centre for Behaviour and Coevolution in Seewiesen, Germany, in June: Mairenn Attwood, Tanmay Dixit, Gabriel Jamie, Jess Lund, Maggie Mwale and Chima Nwaogu, as well as our long-standing collaborators Moses Chibesa from Copperbelt University; Michael Sorenson from Boston University, and Shannon Conradie, now at Wits University.
- Cameron Blair's MSc thesis entitled "Begging call mimicry and host manipulation by brood-parasitic honeyguides" was awarded with Distinction. The degree will be conferred at the graduation ceremony in April 2025. Cameron was supervised by Claire Spottiswoode and Jess Lund.
- Maggie Mwale received a distinction for her MSc thesis (and for the degree overall) for her thesis

Maggie Mwale gives a presentation on the curation and research potential of the Colebrook-Robjent ornithological collection at the Livingstone Museum, Zambia, at the opening workshop of the Max Planck–UCT Centre for Behaviour and Coevolution in Seewiesen, Germany, in June 2024. (Photo: Claire Spottiswoode).

entitled "Have birds' eggs become paler as the climate warms?", involving research conducted at our long-term study site in Zambia. Maggie was supervised by Claire Spottiswoode, Shannon Conradie and Nick Horrocks.

- Tanmay Dixit was awarded a Certificate of Commendation by the Zoological Society of London's Scientific Awards Committee for his PhD thesis 'Signatures and Forgeries: optimality in a coevolutionary arms race' (at the University of Cambridge, supervised by Claire Spottiswoode).
- Jess Lund, Tanmay Dixit, Silky Hamama, Luke McClean and Claire Spottiswoode co-authored a paper with colleagues from the University of London entitled "Virulent brood parasites show elevated embryonic metabolic rates at specific incubation stages compared to less virulent and non-parasitic species", published in *Biology Letters*.
- Angela Moreras, Jere Tolvanen, Robert Thomson and their collaborators from various institutions in Czechia authored a paper entitled "Can nest design hinder brood parasitism success?", published in *Journal of Avian Biology.*
- The Zambia brood parasite team continued their diverse outreach and collaborative activities internationally, including presenting talks to schools in both Zambia and the UK.
- Two members of the team, Gabriel Jamie and Maggie Mwale, were married in a joyful ceremony in Cape Town in August.

An "egg spoon" is used by Collins Moya to gently extract a drongo egg from its nest at our long-term study site in Choma, Zambia. (Photo: Mairenn Attwood).

Key co-supporters

Max Planck–UCT Centre for Behaviour and Coevolution; The Leverhulme Trust; Natural Environment Research Council; Jesus College, Cambridge; Societas pro Fauna et Flora Fennica; Finnish Cultural Foundation; LUOVA Doctoral Programme in Wildlife Biology at the University of Helsinki.

Research team 2024

Team leaders and collaborators:

Prof. Claire Spottiswoode (FIAO, UCT / U. Cambridge)
Dr Gabriel Jamie (U. Cambridge/FIAO, UCT)
Prof. L. Mahadevan (Harvard University)
Dr Nicholas Horrocks (University of Cambridge)
A/Prof. Rose Thorogood (U. Helsinki, Finland)
Dr Jere Tolvanen (U. Oulu, Finland)
A/Prof. Robert Thomson (FIAO, UCT)
Prof. Michael Sorenson (Boston University)
Dr Tanmay Dixit (U. Cambridge/FIAO, UCT)
Dr Christopher Town (University of Cambridge)
Dr Angela Moreras (Université Laval, Canada)
Jessie Walton (FIAO, UCT)

Students: Teresa Abaurrea (PhD, U. Helsinki); Mairenn Attwood (PhD, Cambridge); Jess Lund (PhD, Cambridge); Cameron Blair (MSc, UCT); Joel Radue (MSc, UCT); Maggie Mwale (CB MSc, UCT).

Research assistants: Silky Hamama, Collins Moya, Onest Siakwasia, Sylvester Munkonko, Sanigo Mwanza, Oscar Siakwasia, Iness Liteta, Milton Simanunki, Aron Muntanga and many others.

The evolution, ecology and conservation of honeyguide-human mutualism

This project focuses on a unique mutualism: the foraging partnership between Greater Honeyguides *Indicator indicator* and human honey-hunters whom they guide 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, and provides a wonderful opportunity to study the ecology and evolution of mutualisms in nature, because human and honeyguide populations vary strikingly in how they interact, and we can readily manipulate these interactions.

Claire Spottiswoode and her team at the Fitz and the University of Cambridge have been studying human-honeyguide interactions in the Niassa National Reserve of northern Mozambique since 2013, collaborating with the honey-hunting community of Mbamba village, and receiving crucial support from the Mariri Environmental Centre led by Dr Colleen Begg, Keith Begg and Agostinho Jorge of the Niassa Carnivore Project. One key focus has been investigating reciprocal communication between the two parties: not only do honeyguides 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. The Yao honey-hunters of northern Mozambique give a loud trill followed by a grunt. A 2016 experiment showed that honeyguides were twice as likely to initiate a cooperative interaction with humans who made this sound compared to humans giving control sounds, and three times as likely to lead such humans to honey.

Supported by a Consolidator Grant from the European Research Council and now the Max Planck–UCT Centre for Behaviour and Coevolution (as well as other grants, including the Cultural Evolution Society Transformation Fund), we now ask whether learning is involved in maintaining a geographical mosaic of honeyguide adaptation to local human cultures; how such reciprocal communication between humans and honeyguides mediates their interactions; what the effects of cultural co-extinctions may be on each partner and their ecosystems; and ultimately, how quickly such cultures can be re-ignited following their loss. In so doing we hope to test whether 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 project, known as 'Projecto Sego' ('sego' is Greater Honeyguide in the Yao language), has the support of the community and traditional chiefs of the Mbamba and Nkuti villages. We cooperate closely with the local community to collect data and assist with our field sampling, experiments and documentation of Indigenous knowledge. We also regularly carry out honeyguide fieldwork in several parts of Tanzania, again in collaboration with local honey-hunting communities, and at field sites in Zambia and South Africa. Since 2022, we have been documenting honey-hunting cultures in over ten countries as part of a Pan-African collaborative effort led by post-doctoral fellow Jessica van der Wal, primarily funded by a Cultural Evolution Society Transformation Grant.

Activities in 2024

- Lailat Guta started her MSc on the ecosystem role of honey-hunting with honeyguides, especially in relation to bees and pollination. She made a successful field trip to the Niassa Special Reserve in Mozambique during the rainy season, carrying out pollination experiments on crops to test whether honey-hunting has any effect on pollination ecosystem services. Lailat is supervised by Claire Spottiswoode, Colleen Seymour and Jessica van der Wal.
- After the rains, Lailat Guta, Jess Lund and Claire Spottiswoode carried out a successful further

Lailat Guta in the field in the Niassa Special Reserve, Mozambique, laying out her experimental plots together with Mbamba village farmer Mzee Mustafa Aly at the start of the rainy season (Photo: Claire Spottiswoode).

field trip to Niassa in May, capturing and tracking our long-term study population of honeyguides together with our honey-hunter colleagues Carvalho Issa Nanguar, Seliano Rucunua and Fatima Balasani.

- At the Niassa Special Reserve in Mozambique, a team of five honey-hunters continued to collect bee samples from the bee colonies they naturally harvest, resulting in a bee genetic dataset which allows us to tackle questions on the ecology of wild honeybees and how this may be affected by honeyguide-human mutualism.
- Eliupendo Alaitetei Laltaika continued his PhD fieldwork in Tanzania.
- Daniella Mhangwana began her MSc research project investigating why and how several other bird species besides honeyguides also eat wax. Daniella is supervised by Claire Spottiswoode, Celiwe Ngcamphalala and Susan Miller.
- Our citizen science project, Honeyguiding.me, continues to receive records of Greater Honeyguides, which will enable us to map the extent of changes in guiding behaviour and help to shed light on how honeyguides acquire their ability to engage with humans (see website: AfricanHoneyguides.com).
- Jessica van der Wal came to the end of her five years as a postdoc at UCT and continues as a Research Fellow at both the Fitz and the Max Planck Institute for Biological Intelligence, funded by the newly established Max Planck-UCT Centre for Behaviour and Coevolution.
- Amana Kilawi, a member of the African Honey-Hunting Research Network and a former CB student, spearheaded a successful outreach initiative at a school in northern Tanzania. She organised the creation of a mural by a local artist, depicting a honey-hunting scene featuring a honeyguide bird, highlighting a declining tradition in this region. Collaborator Colleen Begg helped a similar outreach initiative at Mariri Environmental Centre in Niassa, where a mural also depicting a honey-hunting scene was made by a local artist.
- The Honey-hunter Researchers Network (coordinated by Jessica van der Wal) met in Cape Town in February, including Wiro-Bless Kamboe, Rochelle Mphetlhe, George M'manga, Sanele Nhlabatsi, Daniella Mhangwana, Celiwe Ngcamphalala, Claire Spottiswoode and Jessica van der Wal. We discussed research findings, shared skills, and planned manuscripts.
- We concluded our European Research Council Consolidator Grant project, which supported the honeyguide team's research from 2017 to 2024. Since mid-2024, the project is supported by the new Max Planck–UCT Centre for Behaviour and Coevolution.

Highlights

- Claire Spottiswoode, Lailat Guta, David Lloyd-Jones and Sally Archibald (Witwatersrand University) held a productive meeting with the Niassa Special Reserve management to share our data on the ecological role of honey-hunting with honeyguides, such that it could contribute to the reserve's management plan. Sally and Claire also reported back on the honeyguide team's research specifically on the role of honey-hunting in fire ecology (studied by Rion Cuthill during his MPhil) at a Niassa fire management workshop in Maputo.

- David Lloyd-Jones submitted his PhD, entitled "Cooperation, ecology and behaviour in the honeyguide-human mutualism".
- Rion Cuthill graduated with his MPhil from the University of Cambridge. His thesis was entitled "The ecological impacts of honey-hunting on fire regimes in the Niassa Special Reserve, Mozambique", from work together with Claire Spottiswoode, Sally Archibald, David Lloyd-Jones and a large team of honey-hunter collaborators in Mozambique.
- Wiro-Bless Kamboe graduated with his CB MSc, His thesis was entitled "Partners, companions, or enemies: how and why people differ in their relationship with honeyguides in northern Ghana", supervised by Jessica van der Wal, Claire Spottiswoode, and Fitz alumnus Timothy Khan Aikins. His fieldwork was supported by the Cultural Evolution Society Transformation grant.
- Claire Spottiswoode shared overviews of the research team's findings in a plenary talk at the International Society for Behavioural Ecology (ISBE) conference in Melbourne, Australia, and seminars at the University of Saint-Etienne in France, Harvard University in the USA, Durham University in the UK, the Nyika-Vwaza Trust in the UK, and at UCT.
- Daniella Mhangwana and Sanele Nhlabatsi gave talks on their honeyguide research at the International Society for Behavioural Ecology conference in Melbourne, Australia.
- Jessica van der Wal and Wiro-Bless Kamboe gave a talk and poster at the Cultural Evolution Society conference in Durham, UK, on the work of the Honey-hunting Research Network which is funded by the Cultural Evolution Society Transformation Fund. Jessica also gave a seminar at the University of Stirling in Scotland, and a lecture at the University of Amsterdam in the Netherlands.
- Several members of the honeyguide research team presented research talks at the opening workshop of the Max Planck–UCT Centre for Behaviour and Coevolution in Seewiesen, Germany, in June: Lailat Guta, Eliupendo Laltaika, David Lloyd-Jones, Jess Lund, Daniella Mhangwana, Susan Miller and Jessica van der Wal, as well as our collaborators Brian Wood from UCLA and Celiwe Ngcamphalala from UCT.
- A paper led by Jessica van der Wal, Dominic Cram and Claire Spottiswoode investigating the possible cooperation between honey badgers and greater honeyguides, won the 2023 *Journal of Zoology* 'Paper of the Year' award. The journal's editors commended its innovative approach, blending literature, observations, and interviews, as well as its diverse authorship and valuable contributions to both science and communities. Among the co-authors were several past and present members of the Fitz and UCT: Gabriel Jamie, Wiro-Bless Kamboe, Amana Kilawi, Eliupendo Laltaika, David Lloyd-Jones and Celiwe Ngcamphalala.

Jess Lund in the field near Lipumbulu mountain in the Niassa Special Reserve Mozambique, putting up a base station to collect data from GPS-tagged Greater Honeyguides (Photo: Claire Spottiswoode).

- A 2022 paper led by a Jessica van der Wal and a similar team, "Safeguarding human-wildlife cooperation", was highlighted by Wiley as one of their most influential research publications from South African authors, with over 9,000 downloads since its publication in *Conservation Letters.*
- The honeyguide team's recent work on honeyguide-human communication was covered in *National Geographic.*
- In a side project while carrying out honeyguide fieldwork in Mozambique, David-Lloyd Jones, in collaboration with Tomas Buruwate of Mariri Environmental Centre, Mozambique, published a landmark paper, comprehensively describing the Niassa Special Reserve's reptiles and amphibians, in the *Journal of East African Natural History*.

Honey-hunting research network

- Jessica van der Wal continued coordinating efforts by the Honey-hunting Research Network, supported by a grant from the Cultural Evolution

Society Transformation Fund. Entitled 'Together', the Network is documenting Africa's remaining diversity of endangered honey-hunting cultures with honeyguide birds.

- All network researchers (Anap Afan, George Malembo, Sanele Nhlabatsi, Wiro-Bless Kamboe, Faroukou Wabi, David Garakva, Rochelle Mphetlhe, Ali Langa and Samson Zelleke) have now finalised their data collection and entry, and the data are currently being merged.
- Wiro-Bless Kamboe and Sanele Nhlabatsi and co-authors have submitted manuscripts from their findings for publication.

Impact of the project

This project closely involves rural communities and simultaneously relies on and showcases their knowledge and expertise. Data from the project on the ecological role of honey-hunting are currently contributing to conservation planning in the Niassa Special Reserve, Mozambique. More broadly, we hope to further our understanding of how mutualisms evolve, and specifically how learnt traits mediating mutualisms may coevolve. Understanding the evolution of mutualisms 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 disappeared 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.

Our long-standing honey-hunter collaborator Mama Fatima Balasani carrying a GPS hub to collect data from tagged Greater Honeyguides (Photo: Claire Spottiswoode).

Key co-supporters

European Research Council; Max Planck–UCT Centre for Behaviour and Coevolution, Cultural Evolution Society; National Geographic Society; Max Planck Institute for Evolutionary Anthropology; British Ecological Society; Association for the Study of Animal Behaviour; American Ornithological Society.

Research team 2024

Team leaders and collaborators:

Prof. Claire Spottiswoode (FIAO, UCT/U. Cambridge)
Dr Susan Miller (FIAO, UCT)
Dr Dominic Cram (U. Cambridge)
Prof. Sally Archibald (Wits University)
Dr Colleen Begg (Niassa Carnivore Project)
Celestino Dauda (Niassa Carnivore Project)
Prof. Robin Crewe (U. Pretoria)
Prof. Robert Fleischer (Smithsonian Institution)
Dr Laurel Fogarty (Max Planck Institute for Anthropology, Leipzig, Germany)
Dr Celiwe Ngcamphalala (Biological Sciences, UCT)
Dr Rodrigue Idohou (Université Nationale d'Agriculture, Benin)
Dr Jessica van der Wal (FIAO, UCT)
Farisayi Dakwa (FIAO, UCT)
Assoc. Prof. Brian Wood (U. California, Los Angeles)
Prof. Timm Hoffman (Biological Sciences, UCT)
Keith Begg (Niassa Carnivore Project)
Dr Yusuf Abdullahi Ahmed (U. Pretoria)
Prof. Christian Pirk (U. Pretoria)
Dr Anne Kandler (Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany)
Dr Mazi Sanda (U. Ngaoundéré, Cameroon)
Dr Timothy Aikins Khan (University for Development Studies, Ghana)
Agostinho Jorge (Niassa Carnivore Project)

Honey-hunting research network 2024: Anap Afan (APLORI, Nigeria); George Malembo (Mzuzu University, Malawi); Sanele Nhlabatsi (Eswatini); Wiro-Bless Kamboe (UCT); Faroukou Wabi (Benin); David Garakva (U. Ngaoundéré, Cameroon); Rochelle Mphetlhe (UCT); Ali Langa (Chad); Samson Zelleke (Ethiopia).

Students: Eliupendo Alaitetei Laltaika (PhD, UCT); David Lloyd-Jones (PhD, UCT); Jess Lund (PhD, U. Cambridge); Rion Cuthill (MPhil, U. Cambridge); Wiro-Bless Kamboe (CB MSc, UCT); Daniella Mhangwana (MSc, UCT); Lailat Guta (MSc, UCT).

Projecto Sego data collection team: Fatima Balasani, Carvalho Issa Nanguar, Kambunga Jaime, Seliano Alberto Rucunua and Rui Francisco Ndala, with data collection by many others.

Cooperation and population dynamics in the Sociable Weaver

Our long-term project at Benfontein Reserve uses the fascinating Sociable Weavers *Philetairus socius* to study questions about the ecology and evolution of social behaviour. We investigate whether sociality contributes to buffer against the extremes of the Kalahari climate and focus on whether individuals that are more cooperative are preferred as partners. The extreme weather experienced in recent years and destructive fires provided an unsolicited but interesting opportunity for research.

The Sociable Weaver population at Benfontein seems to be getting some respite after a series of adverse events – two fires, weather extremes and what seems to have been an outbreak of avian pox at one of the colonies – decreased the population to its lowest in 31 years of records. These adversities however demonstrate the importance of long-term studies. The long-term data that have been collected by Rita Covas and Claire Doutrelant, allowed us to describe some of the key demographic, genetic and social changes associated with natural catastrophes. For example, we found that the most destructive fire led to a rearrangement of the colonies' social structure, with the levels of genetic relatedness decreasing within colonies and, strikingly, the species' characteristic family-based breeding groups giving way to groups composed of immigrants and family members. Post-doctoral fellow Sophie Dupont is investigating how the stress arising from the fire influenced telomere attrition and survival. In an impressive effort, Sophie extracted over 900 DNA samples, which will be used to understand how catastrophic events affect physiology and their long-term consequences.

It's not only the weavers that show resilience in the face of disaster. PhD student Babette Fourie spent several weeks rebuilding the sophisticated automatic feeders that were destroyed by the 2023 fire. This ambitious experiment aimed to manipulate familiarity at the feeders and foster new social associations among the birds. The experiment was finally conducted at the end of 2024 and the preliminary results show that sociable weavers can form new 'friendships' when forced to interact with birds outside of their usual social group. Forming friendships is important, Post-doctoral fellow Gabriel Munar's results showed that birds with a higher number of strong social associations have higher survival. Gabriel's work is part of a European Research Commission (ERC) funded study looking at the bases of partner choice in animal societies. To achieve these goals, Liliana Silva is developing AI-based models for behavioural identification.

PhD student Marta Marmelo continued her study of whether cooperation is a repetitive trait, and whether some individuals are consistently more cooperative than others. Marta started by studying mobbing in Sociable Weavers by presenting models of snakes and Pygmy Falcons *Polihierax semitorquatus*. Work on another cooperative behaviour, nest building, was conducted by PhD student Nicolas Silva. Nicolas found that male sociable weavers, and especially older males, build slightly more than females, and prefer to build with larger straws. Nicolas also studied social dominance and associated signalling and sexual selection in this species. He found that, in spite of sociable weavers' dull plumage and lack of sexual dimorphism, there is evidence for sexual selection in this species, in both sexes, which is an original finding. New post-doctoral fellow Jorge Garcia Campa, will investigate whether females prefer to mate with more cooperative males.

Activities in 2024

- Two new post-doctoral fellows joined the project – Gabriel Munar will investigate fitness benefits of social bonds and Jorge Campa will investigate whether more cooperative individuals are preferred as sexual partners.
- Sophie Dupont extracted >900 DNA samples in the lab.
- Babette Fourie ran a fascinating experiment to manipulate feeding behaviour and social associations. The experimental apparatus is a sophisticated system based on RFID technology which was entirely built by Babette.
- Marta Marmelo is investigating the reliability of

After setting up several video cameras, PhD student Marta Marmelo hides a fake snake which she will use to study mobbing behaviour in sociable weavers. Marta is hoping to determine whether some individuals have a higher propensity to mob predators than others. She is also hoping to uncover whether sociable weaver emit different alarm calls when threatened by ground or aerial nest predators (snakes or pygmy falcons in this study) (Photo: Jorge Campa).

helping behaviour and initiated a study of mobbing behaviour in Sociable Weavers.

- Liliana Silva set up an AI-assisted pipeline for video analyses that can automatically describe the behaviours taking place at the nest. A manuscript on this was submitted to a special issue of *Methods in Ecology and Evolution* on Deep Learning.

Highlights:

- New funding from the Marie Curie Staff Exchange, EU, was granted to a consortium of researchers from CIBIO-Univ Porto, the French National Centre for Scientific Research (CNRS), the University of Zurich and the Fitz to continue our work on developing AI-based methods for the automatic identification of individual and behavioural features.
- Nicolas Silva successfully defended his PhD at the University of Montpellier in December.
- Pietro D'Amelio and colleagues published two papers, one in the *American Naturalist* on the benefits of monogamy, and the other in a special issue of *Ostrich*, in memory of Richard Dean, describing the highly original and flexible breeding phenology of sociable weavers.
- Rita Fortuna published the last chapter of her PhD thesis in *Behavioural Ecology,* detailing how a perceived predation threat might influence maternal investment.
- Rita Covas and others published a paper in *Evolution* showing that family-living and cooperative breeding in birds are associated with the number of avian predators.

Impact of the project

The long-term nature of this project allows unique insights into the evolution of cooperation and the mechanisms that allow it to persist. The demographic data allow for examination of the factors affecting population dynamics, provide a baseline against which to study environmental change and natural disasters, which are increasing in frequency under climate change, and provide insight into whether and how sociality mediates the response to a changing environment.

Key co-supporters

European Research Council (ERC); Marie Curie – Staff Exchange (EU); French Research Agency (ANR); Portuguese Foundation for Science and Technology.

Research team 2024

Team leaders and collaborators:
Dr Rita Covas (FIAO, UCT and CIBIO, U. Porto)
Dr Claire Doutrelant (FIAO, UCT and CNRS, France)
Dr Fanny Rybak (U. Paris-Sud, France)
Liliana Silva (CIBIO, U. Porto)
Dr André Ferreira (U. Zurich, Switzerland)
Dr Sophie Dupont (U. Montpellier, CNRS, France)
Dr Jorge Campa (CIBIO, U. Porto)
Dr Gabriel Munar (CIBIO, U. Porto)
Franck Théron (CIBIO, U. Porto)

Students: Babette Fourie (PhD, U. Porto); Marta Marmelo (PhD, U. Porto); Nicolas Silva (PhD, U. Montpellier)

Research Assistants: Lesedi Moagi, Justin Jacobs, Owami Mashaba, Yoann Depalle, Natacha Ampe, Paulo Ditzel, Marine Hoareau, Hippolyte Dupas.

Pied Babblers

Since 2003, Prof Amanda Ridley has maintained a long-term study of habituated Southern Pied Babblers *Turdoides bicolor*, on the Kuruman River Reserve in the southern Kalahari Desert. Together with her collaborators, Amanda's work explores the behavioural ecology of Pied Babblers, providing unique insight into conflict versus cooperation in group-living societies, vocal communication, behavioural responses to climate extremes, and the relationship between sociality and cognition.

The Pied Babbler Research Project investigates the costs and benefits of cooperation, and the relationship between cooperation, cognition and climate change. Long-term life history data, along with short-term observations and experiments, have helped us understand the causes and consequences of cooperative breeding behaviour, and to determine influences on individual cognition. The study population size varies according to weather conditions, with the population decreasing when breeding seasons are hot and dry, and during very cold winters.

The range of questions that can be asked increases as the duration of the study grows, and we can now assess the factors influencing life-time fitness. The Babbler team have been investigating the impact of heat on cognitive ability. This research theme came about because cognition is vital to an individual's ability to behaviourally respond to changes in their environment. Postdoctoral fellow Camilla Soravia has found that heat stress impairs some, but not all cognitive abilities in babblers. The decline in associative learning ability during very high temperatures is of concern, because identifying the relationship between a cue and a threat is often how animals recognise competitors and predators. Camilla also found that cognitive ability declines with age in females, but not males – presumably due to the higher costs of reproduction in females. She also found that heat stress experienced during the early developmental period can have lifelong impacts, affecting reproductive success and cognition in adults.

We conducted a number of physiological studies recently, looking at dehydration during incubation, and using thermal imaging to determine the level of heat stress individuals were under. Postdoctoral fellow Dr Shannon Conradie collated a huge dataset on behaviour during different points of the day for Pied Babblers, as well as Southern Yellow-billed Hornbills and Fiscal Shrikes, collected by members of the Pied Babbler and Hot Birds research teams over the last 15 years. Shannon used these behavioural data to better inform existing biophysical models, and used different climate change projections to determine how this would impact these species in the future. Sadly for the pied babblers, she found that under a warming climate, they are the most vulnerable of the three species, with a >50% increase in the number of days that they are a risk of lethal dehydration. This points to limited population viability for Kalahari endemics like pied babblers as climate change continues to impact the area.

Activities in 2024

- Camilla Soravia completed her time as a postdoctoral fellow on the project and started a new position at the University of Chester.

An adult southern pied babbler displaying vigilance behaviour in response to a potential predator threat. Our current research investigates how air temperature and individual associative learning performance influence antipredator behaviours, including vigilance, alarm calling, and fleeing (Photo: Camilla Soravia).

An adult southern pied babbler interacting with a cognitive task designed to quantify associative learning performance. One of the two coloured lids hides a food reward and the task measures how many trials an individual needs to learn the association between the colour of the lid and the food reward. Our research has shown that individuals require more trials to learn the association when the maximum air temperature during cognitive testing is higher (Photo: Camilla Soravia).

- Sabrina Engesser completed her final paper on vocal communication in pied babblers.
- Predator exposure experiments (taxidermied predator presentations) were completed and analysis (led by Dr Soravia) is underway.
- Two new field assistants joined the research project.

Highlights:

- Our research on evidence for complex vocal behaviour, headed by Dr Sabrina Engesser, was published in *Proceedings of the Royal Society B.* This research builds on previous evidence of call combinations (believed to represent the precursors of language in humans), in pied babblers. To test that the combining of calls needed to occur in a specific way to encode information (similar to what we know as syntax in language), the call combinations pied babblers make were reversed and played back to them, to see if their response differed. This paper is titled 'Seeds of language-like generativity in bird call combinations'.
- Our research was presented at the International Society for Behavioural Ecology (ISBE) conference in Melbourne in 2024 – this is one of the largest behavioural ecology conferences in the world.
- Our research that used biophysical models to inform about potential future impacts on pied babblers under a changing climate was published in *Ecography*. This research was headed by Dr Shannon Conradie and titled 'Integrating fine-scale behaviour and microclimate data into biophysical models highlights the lethal risk of hyperthermia and dehydration'.
- Camilla Soravia presented our pied babbler research at the 30th National Congress of the Italian Ethological Society.
- Amanda Ridley and Camilla Soravia co-authored a review that summarizes our current and future research interests, on the importance of accounting for the effects of multiple anthropogenic stressors that may be simultaneously impacting a population. This review was published in *Journal of Avian Biology.*
- Amanda and her (non-Pied babbler project affiliated) colleague published an opinion piece in *Nature Climate Change* that reflects the lab's current vocal communication research interests, entitled 'Climate-induced divergence of song'.

For more details on the collaborative work between the Pied Babbler Project and the Hot Birds Research Project, see page 40.

Key co-supporter
Australian Research Council.

Research team 2024
Team leaders and collaborators:
Prof. Amanda Ridley (FIAO, UCT / UWA)
Dr Camilla Soravia (UWA)
Dr Amanda Bourne (AWC)
A/Prof. Susie Cunningham (FIAO, UCT)
Dr Ben Ashton (UWA/Maquarie)
Dr Alex Thornton (U. Exeter)
Dr Shannon Conradie (FIAO, UCT / Wits)

Sociable weaver nests as a resource

This project examines the importance of Sociable Weaver *Philetairus socius* and other weaver nests to Kalahari animal and plant communities. The objectives are to investigate the diversity of animals associated with weaver 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, challenging the traditional emphasis on negative species 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 due to global change. Ecological engineers – species that modify habitats and ameliorate abiotic stress for other species – 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 due to global climate change.

Pygmy Falcons *Polihierax semitorquatus* are the most "*controversial*" user of Sociable Weaver colonies. They never construct their own nests and depend entirely on weaver colonies, which is a unique obligate nesting association. Pygmy Falcons also prey on weaver nestlings and even adults, suggesting a semi-parasitic relationship between the species. We explore the interactions between weaver hosts and falcons, to determine whether the falcons provide benefits or costs to the weavers. Furthermore, we study the natural history and ecology of the Pygmy Falcon, and the long-term population demographic responses of the falcon to weather and environmental change.

Lesedi Moagi and Inês Gonçalves collecting fallen White-browed Sparrow-Weaver nests to create experimental weaver colonies (Photo: Azraa Ebrahim).

As colonial breeders, Sociable Weavers bring material back to their nest trees in the form of faeces, feathers, and carcasses. This nutrient input results in weaver nests being islands of fertility in the landscape. We study how this alters the soil chemistry, as well as soil nematode and plant communities. We further investigate the effect of this fertile island on host tree seedlings, host tree productivity and the potential costs of supporting such a huge nest.

Activities in 2024

- PhD student Olufemi Olubodun started the year off in January hosting a film crew from NHK (Japanese national television) on Tswalu Kalahari. The crew shot a program for their Darwin's Amazing Animals series that explores the ecosystem engineering role of the Sociable Weaver and activity of other animals at their nest colonies. The documentary aired in May 2024.
- CB MSc student Lesedi Moagi worked on weaver nests as a resource on Tswalu Kalahari using White-browed Sparrow-Weaver nests as her study system as they are more amenable to conducting field experiments. Lesedi explored the role of old weaver nests in the Kalahari as an important part of habitat, investigating effects on the local resident bird community.
- MSc student Sthabile Khumalo returned to the field to collect samples for her study exploring the physiological stress responses of Sociable Weavers when hosting Pygmy Falcons in their colonies.
- The 14th season of detailed monitoring of Sociable Weaver colonies and the individually

Sthabile Khumalo checking Sociable Weaver colonies to use in her pygmy falcon presentation experiments (Photo: Robert Thomson).

marked Pygmy Falcon population at Tswalu Kalahari was completed. After the near-complete breeding failure of Pygmy Falcons in 2023, the 2024 breeding season featured at least 28 active nests. In total, 14 new Pygmy Falcon adults were colour-ringed, and 20 fledging chicks (many nests remain active in January 2025). At least 25 other colour ringed adult falcons were retrapped or resighted.

Highlights:

- The project hosted the Conservation Biology MSc field camp again in 2024. The class were able to witness the magnitude of the Sociable Weaver nest and think about their role in the Kalahari ecosystem. They also contributed to the capture of an unringed pair of pygmy falcons for colour-ringing.
- The project inspired artist Karen Stander who made several art pieces representing the weaver nests and their role and representation of resilience in the harsh Kalahari. The exhibition was entitled "Hotel Kalahari".

Impact of the project

This project provides unique insights into the community ecology and between-species interactions in the Kalahari. It highlights fascinating natural history stories and brings attention to this unique system. We quantify the ecological engineering role of the Sociable Weaver and determine the potential role of Sociable Weaver nests in a warming and increasingly arid Kalahari. The outputs of this project also contribute to eco-tourism information to enhance the experience of visitors to landscapes within the distribution of the Sociable Weaver.

Key co-supporters

Tswalu Foundation, DECRA -Australian Research Centre.

Research team 2024

Team leaders and collaborators:

A/Prof. Robert Thomson (FIAO, UCT)
Dr Celiwe Ngcamphalala (Biological Sciences, UCT)
Dr Anthony Lowney (U. Hartpury / FIAO, UCT)
Prof. Michael Cramer (Biological Sciences, UCT)
Dr Ben Ashton (U Flinders / FIAO, UCT)
Dr Inês Gonçalves (U. Bristol)

Students: Olufemi Olubodun (PhD, UCT); Sthabile Khumalo (MSc, UCT), Lesedi Moagi (CB MSc, UCT).

An early morning Pygmy Falcon catch with Prof Mike Cramer, Inaê Guion and part of the CB class, (L to R) Lara Howard, Lesedi Moagi, Dembo Jatta and Claude Schippers (Photo: Robert Thomson).

Why do Afrotropical birds breed when they do?

Breeding seasons are considered the most important period of the annual cycle of birds, but we still lack a full understanding of why birds breed when they do. Answering this long-standing question in life history research is crucial to understanding how climate change will impact bird populations, and how those effects can be mitigated.

Our current understanding of life-history evolution and phenology is heavily biased towards the north-temperate zone, where breeding seasonality is tightly correlated with temperature and photoperiod. This has led to the notion that breeding is prioritized over other annual cycle events and that food availability for nestlings is the main determinant of breeding seasonality in birds. However, in the tropical and south-temperate zones, the link between breeding phenology and food abundance is less clear-cut. Moreover, the determinants of environmental productivity cycles may differ among tropical environments. Here, we might expect other patterns of environmental variability to be more important for the timing of birds' annual cycles. This is because where annual reproductive output is low or unpredictable, birds should prioritise investing in processes promoting self-maintenance and survival (such as moult and immunity) rather than necessarily timing breeding to coincide with periods of peak food abundance for nestlings and juveniles. This alternative hypothesis remains untested to explain both the adaptive fine-tuning of timing of breeding according to environmental conditions within species, and the striking and unexplained differences among species.

Furthermore, rainfall is considered the key determinant of food availability in seasonally arid tropical environments, but it remains unclear how a single wet season influences food availability across the year for different breeding communities.

In 2021 we started a research project to address these knowledge gaps in Choma, Zambia. Choma is a seasonally arid environment with distinct wet and dry seasons and a species-rich bird community including species breeding within and across seasons. By combining year-round field sampling of invertebrates and grass seeds with analyses of long-term bird breeding data from the work of Major John Colebrook-Robjent from 1970–2008, we have identified peak periods of specific food availability and peak breeding periods of different species. Two clear breeding peaks occur in Choma – shortly before, and after the onset of the rains, creating three breeding clusters within the bird community assemblage. We are conducting a trait-based analyses to identify the specific traits that link each species to a cluster and determine whether this pattern is generalisable across bird communities. Thanks to Matt Lobenhofer (MSc CB 2022/3) and our resident colleagues in Choma who maintained our year-round invertebrate sampling, we now know that invertebrate abundance peaks before the onset of the rains rather than after. Although, multiple smaller peaks occur after the rains.

In 2024, MSc student Yinka Abayomi combined these long-term bird breeding datasets with more recent data collected by colleagues in the Fitz (See AfricanHoneyguides.com) for a select group of species identified from our previous multispecies analyses to test how environmental conditions before the rains such as leaf flush, and after the rains, such as increased grass seed availability, influence the timing of breeding in different breeding communities. In 2024, we conducted additional field work in Choma to understand the determinants of pre-rain leaf flush which coincides with large bird breeding and invertebrate abundance peaks. We now know that vegetation green-up before the rain is associated with a fourfold increase in invertebrate abundance compared to vegetation green-up after the rains.

In collaboration with Dr Felicity Newell at Louisiana State University working in the cloud forest of northern Peru, we are pooling year-round invertebrate sampling data from different tropical environments to identify the key determinants of invertebrate abundance cycles among tropical environments. Insights from these analyses will allow us to understand whether the timing of breeding in birds is determined by the main environmental driver of seasonal invertebrate abundance rather thanvrainfall seasonality.

We are also writing up results from analyses of data from immune assays from samples collected in Choma, Zambia and Jos, Nigeria to test how the immune function of birds varies across seasonal

transitions from wet to dry season and vice versa. This will allow us to unravel the environmental components of rain-driven seasonal transitions that influence immune function and how factors other than the onset of the wet season or food availability influence breeding decisions.

These projects provide an exciting opportunity to disentangle components of seasonal environmental conditions that drive timing of bird breeding in Afrotropical ecosystems. Achieving this fundamental objective will help us detect and predict impacts of rapidly changing environmental conditions in Africa and other understudied biodiverse environments.

Activities in 2024

- Chima Nwaogu completed work with Prof. Barbara Helm and Dr Crinan Jarrett on a tri-trophic phenology project, investigating differences in the timing of breeding, moult, insect abundance and plant fruiting along a latitudinal gradient.
- Chima Nwaogu spent a month with Prof. Irene Tieleman at the University of Groningen. He completed analysis of immune function data from Choma, Zambia and Jos, Nigeria to test how the immune function of nestling and adult birds vary across seasonal transitions from wet to dry season and vice versa.
- UCT and Groningen Nuffic-NRF joint PhD student, Rebecca Muller continued to work on over 100,000 nest record cards held in the Niven Library assessing the impact of climate change on breeding seasonality in Afrotropical birds. Rebecca spent three months working with Prof. Irene Tieleman in Groningen.
- MSc student Yinka Abayomi is investigating determinants of pre-rain green-up and its association with insect abundance and bird breeding seasonality in the Afrotropics. He conducted fieldwork in Choma in August and September 2024.
- Matthew Lobenhofer is writing up results from his MSc CB thesis, assessing the association between invertebrate abundance and bird breeding seasonality using our year-round invertebrate sampling data and long-term bird breeding data from Major John Colebrook-Robjent's egg collection records.

Highlights

- Chima attended the launching workshop of the Max Planck-UCT Centre for Behaviour and Co-evolution in Seewiesen, Germany in June 2024.
- Chima continues to receive funding for his Junior Research Fellowship which was extended for two years until October 2025; we are grateful to the Carnegie Developing Emerging Academic Leaders Programme for their support.
- The Max Planck UCT Centre for Behaviour and Co-evolution will provide research funding and an additional two years of support for Chima beyond the Carnegie Developing Emerging Academic Leaders Programme Junior Research Fellowship.
- Chima gave a presentation at the Trends in Tropical Ecology and Evolution Conference in Vila Do Conde Porto, Portugal.
- A paper was published in *Ecology and Evolution* from collaborative work on the timing of breeding, moult, insect abundance and plant fruiting along a latitudinal gradient, with Prof. Barbara Helm and Dr Crinan Jarrett.

Yinka Abayomi measures tree height for tree volume estimates during field work in Choma, southern Zambia. Yinka seeks to understand whether tree sizes influences the timing of leave flush before the onset of the rains (Photo: Claire Spottiswoode).

Key co-supporters

Carnegie Developing Emerging Academic Leaders Programme; Max Planck UCT Centre for Behaviour and Coevolution; British Ecological Society; British Ornithological Union.

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Dr Susan Cunningham (FIAO, UCT)
A/Prof. Arjun Amar (FIAO, UCT)
Prof. Irene Tieleman (U. Groningen)
Prof. Barbara Helm (Swiss Ornithological Institute)
Dr Felicity Newell (Louisiana State University)

Students: Rebecca Muller (PhD, UCT), Yinka Abayomi (MSc, UCT).

Moult and migration

Together with breeding, moult and migration are the greatest challenges in a bird's annual cycle. Moulting birds suffer increased metabolic costs as well as impaired flight ability, insulation and camouflage/signalling. Birds vary greatly in how they manage these costs through changing the timing and intensity of moult, both within and between species. Globally, migrant birds are at greater risk of extinction than resident species due to the risks they face travelling across an increasingly transformed planet, and the need to have secure breeding and non-breeding areas. Understanding the strategies birds use to moult and migrate is crucial for their conservation.

Once formed, feathers are dead structures that start to degrade through mechanical abrasion, damage by UV light, and attack by ectoparasites, fungi and bacteria. Most feathers need to be replaced every year or so through a regular process of moult. The costs of moult are significant, so most birds schedule their moult to periods when they are not breeding or migrating (although there are numerous exceptions). New feathers grow from a ring of cells in the feather follicle, which limits their rate of growth to around 4-6 mm per day. Feathers that grow faster tend to be of poorer quality, providing less insulation and wearing faster than feathers grown more slowly. This largely invariant growth rate means that large birds take longer to replace a given feather than small birds, and so typically have more complex moult strategies than small birds, either greatly increasing the intensity of moult (e.g. replacing all flight feathers at once and becoming flightless for a few weeks while they grow new feathers) or staggering their moult over several years. The timing, intensity and symmetry of moult likely reflect individual health. And unlike breeding, moult is something that all birds must undergo. Thus monitoring how different birds moult, and how this changes over time, might be a way to track population health.

Migration is better studied than moult, but there is still much to learn regarding movement patterns among African birds. And given the less marked seasonality in the Southern Hemisphere, more species move in response to rainfall rather than temperature, especially in more arid areas. Our understanding of these nomadic movements is still in its infancy. Finally, we also contribute to an understanding of global shorebird movements and conservation through coastal bird surveys.

Activities in 2024

- PhD student Rachel Dobson (Leeds) handed in her thesis at the end of 2024. She completed a draft paper describing Ludwig's Bustard *Neotis ludwigii* movements based on Jessica Shaw's tracking data, which has up to 11 years of data for some individuals. Some bustards undertake more or less regular migrations between the Nama and Succulent Karoo each year, following seasonal rains, whereas others are more sedentary. A second manuscript exploring the environmental triggers for their movements is nearing completion.
- A paper on the moult of Tristan Albatrosses *Diomedea dabbenena* is almost complete, relating the extent of wing moult to age, sex and past breeding history. Peter Ryan obtained additional images of known-age Wandering Albatrosses *D. exulans* on Marion Island in April-May 2024, which will be compared with those of Tristan Albatrosses to improve our understanding of the complex plumage maturation sequences in these birds.

A White-chinned Petrel in heavy wing moult struggles to take off (Photo: Peter Ryan).

A small section of the massive wader roost discovered in the southwestern edge of Vilanculos Bay, Mozambique (Photo Peter Ryan).

- Following the synoptic survey of coastal birds in the Greater Bazaruto IBA/KBA in November 2023, in collaboration with African Parks (Evan Trotzuk) and the Vilanculos Coastal Wildlife Sanctuary (Christine Read and Dave Gilroy), a follow-up survey in August 2024 was conducted to assess winter shorebird numbers and explore for migrant Damara *Sternula balaenarum* and Saunders's Terns *S. saundersi* in the Bazaruto National Park. No new tern populations were found, highlighting the importance of the sanctuary for these species in Mozambique, but a new major shorebird roost was discovered in the southwest of Vilanculos Bay.

Highlights

- The final paper from Oluwadunsin Adekola's PhD was published. It described the moult of White-chinned Petrels based on the large numbers of birds killed on long-lines off South Africa. It also reported the absence of a clear impact of moult on time spent on the water by this species, contrary to the pattern found in most other albatrosses and petrels examined to date.
- The discovery of a major shorebird roost site in the southwest of Vilanculos Bay indicates that counts made in November 2023 for the Greater Bazaruto IBA/KBA underestimate the importance of this region for shorebirds. Notable populations present in the roost include over 2 500 Bar-tailed Godwits *Limosa lapponica*, 1 000 Curlew Sandpipers *Calidris ferruginea*, 950 Tibetan Sandplovers *Charadrius atrifrons* and 40 Eurasian Curlews *Numenius arquata,* but the most surprising finding was over 1 100 Chestnut-banded Plovers *Charadrius pallida*, representing some 10% of the global population. Although nearly 500 Chestnut-banded Plovers were recorded during the synoptic survey of the IBA in 2023, they were almost all in the mangrove-lined bays south of the Save River. The breeding sites of these plovers is unknown.

Key co-supporters

BirdLife International; Mohamed bin Zayed Species Conservation Fund; African Parks.

Research team 2024

Team leaders and collaborators:
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Dr Alan Lee (BLSA / FIAO, UCT)
Dr Birgit Erni (SEEC, UCT)
Dr Samuel Temidayo Osinubi (FIAO, UCT)
Dr Jessica Shaw (NatureScot)
Prof. Les Underhill (BioSci, UCT)

Student: Rachel Dobson (visiting PhD student, Leeds).

Threats, demography and mating systems of resident plovers

Disturbances related to changing environmental conditions, presence of predators and human activities are negatively impacting the reproduction of resident shorebirds globally. Evaluating the mechanisms by which these disturbances influence breeding shorebird populations will result in informed decisions to better conserve these species and their habitats. Plovers also serve as model systems to understand avian demography, behaviour, and mating systems. In South Africa, resident shorebirds have been understudied, which is surprising given the wealth of research groups working on this group in other parts of the world. This project joins global projects focusing on shorebirds to collect breeding and demography data for individually-marked populations of these species.

The project studies a common species, the Kittlitz's Plover *Charadrius pecuarius,* and a species considered 'near threatened', the Chestnut-banded Plover *C. pallidus.* Data collection is focused on finding all breeding attempts at the study site annually and maintaining a marked population to track aspects of breeding biology, nest success and demography. When nests are successful, parental care and brood behaviour is documented with the goal of building a detailed understanding of the mating systems of these species, and how local conditions may shape strategies in comparison to populations elsewhere.

The study site is at the Berg River estuary and the commercial salt pans near the town of Velddrif in the Western Cape. It is recognised as an Important Bird and Biodiversity Area (IBA) with its high number of breeding and wintering waterbird species. The project was piloted in 2019, with the first field season initiated in 2020 and the fifth breeding season monitored in 2024.

Activities in 2024

- MSc student Claude Schippers led the 2024 field season between September and November. A new record season total of 128 nesting events were documented, including 51 Kittlitz's (KiP)

Claude Schippers working at a Chestnut-banded plover nest in between the heaps of commercial salt (Photo: Robert Thomson).

Potential disturbances from salt workers and recreational birdwatchers in the salt works (Photos: Claude Schippers).

and 68 Chestnut-banded plover (CbP) nests, with an additional 3 KiP and 6 CbP nesting events found as broods. Nest survival during the season was exceptionally high with about 55% of KiP nests and about 60% of CbP nests of known fate hatching (excluding those found as broods). Nest predation was a main cause of failure, along with weather events and human related trampling.

- The focus research question of the breeding season was evaluating the impacts of disturbance on the breeding success of both plover species. Claude scored all human visits to the salt pans to quantify disturbance in space. He also conducted flight initiation trials on the incubating birds to explore how various factors impact flight initiation distance.

Highlights:

- Dr Carina Nebel evaluated both Kittlitz's and Chestnut-banded Plovers for the South African red data list.

Impact of the project

This study informs conservation efforts as it occurs at a designated IBA, which primarily holds important populations of waders and other waterbirds. It aids understanding of the threats to these species, helping to protect them from current and future threats. In terms of evolutionary ecology, this project provides information on the breeding and demography of these shorebird populations and will evaluate the mating system variation in the population at this site to determine whether it is linked to sex ratios, demography or other environmental/life history factors.

Key co-supporters

University of Bath; Élvonal Shorebird Science network at University of Debrecen, Kuifkopvisvanger accommodation

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Dr Anthony Lowney (U. Hartpury / FIAO, UCT)
Melisa Bal (KAB Ecology)
Anaïs Paturle (U. Groningen)
Dr Carina Nebel (U. Turku)

Student: Claude Schippers (CB MSc, UCT)

Evolution in island birds and the 'insularity syndrome'

Islands are important centres of endemism and key natural laboratories for the study of ecology and evolution, but also are hotspots of human-driven extinctions. This programme investigates how island communities are assembled (island biogeography), how new species arise (speciation), how populations adapt to island environments, and assesses threats to their persistence. Our research focuses on birds from the Gulf of Guinea, Cape Verde and Tristan islands.

Organisms on islands often exhibit convergent evolution on a wide suite of traits, which are together termed the "island syndrome". These common evolutionary outcomes are linked to the isolation, small size and stable climate associated with oceanic islands. Isolation reduces species richness relative to mainland areas, limiting inter-specific competition and allowing for ecological release. Low species richness also results in fewer predators and parasites. During the last decade, we have investigated several island syndrome traits (e.g. size, color, song, life-history) and their explanatory factors (e.g. competition, parasites, immune system). Currently we are exploring how reduced interspecific competition and low resource availability (due to small island areas) combine to cause island species to evolve more generalist dietary niches.

The São Tomé storm-petrel mystery

After the discovery of a new species of scops-owl on Príncipe, one might think that São Tomé and Príncipe had no more secrets regarding birds. However, Martim Melo has been trying to unravel the mystery of the São Tomé Storm-Petrel since his first visit to the islands in 1996. Robert Flood recently led a team that has solved this mystery. A combination of observations in the southern forests of São Tomé and from boats offshore, together with genetic sequences from six birds attracted to the lights of a palm oil factory, has resolved whether these storm petrels are a population of *Hydrobates castro*, a population of the Cape Verde Storm-Petrel *H. jabejabe*, or a new species. The results are reported in a paper currently under review.

Cape Verde sparrows

The Iago Sparrow *Passer iagoensis*, endemic to Cape Verde, is an excellent model to study climate adaptation as it occupies a wide aridity gradient on 13 islands. It is also exhibits a range of commensalism, as humans only colonised the archipelago 500 years ago, and some islands remain uninhabited. Martim Melo and Rauri Bowie are collaborating with Ângela Ribeiro, Mark Ravinet and José Cerca on a project that combines fieldwork and genomics to understand the sparrow's evolutionary history. The species succeeds by being a 'super-generalist' in a harsh

The origins of the storm-petrel population that breeds within the rainforests of São Tomé Island have long remained unsolved. A concerted effort launched in 2023 by Dr Robert Flood, led to data collection from six new birds (attracted by lights) which were combined with available museum specimens, allowing for an integrative taxonomic study, the results of which will reveal all in early 2025 (Photo: Michael Mills).

environment characterised by scarce, unpredictable food resources. Surprisingly, sparrows from the Rombos, two small islets, differ phenotypically and genetically from all other populations. The genes determining bill size and shape are the same as those causing bill diversification in Darwin's finches, but the mutations likely evolved after the islands were colonised.

Tristan's landbirds

The Tristan archipelago of three islands in the central South Atlantic is home to the most remote human community. The presence of people and their commensal animals on the main island of Tristan since the early 19th Century has seen the extinction of the endemic moorhen and finch, leaving the Tristan Thrush *Turdus eremita* as the only surviving native species. Fortunately, the other two islands lack introduced predators, and still support several endemic landbirds. Peter Ryan works with the Tristan Conservation Department and the RSPB to conserve these vulnerable species.

Activities in 2024

- The identity of the storm-petrel population breeding on São Tomé was resolved.
- The arts and sciences project 'Obô' (the São Tomé name for primary forest) is growing steadily. An exhibition, including art, live music and poetry readings, took place in Montpellier, France.
- A paper on the evolutionary history of the Iago Sparrow was submitted.
- During two trips to Tristan in 2024, Peter Ryan and Coleen Moloney re-assessed the population of Wilkins's Finch *Nesospiza wilkinsi* on Nightingale Island after extensive storm damage to island trees. They also studied the introduced population of Gough Moorhens *Nesiotis comeri* on Tristan. Finally, they collected blood samples from Tristan Thrushes from all three islands to determine the degree of genetic differentiation among populations, and attempted to estimate the numbers of thrushes surviving on the main island of Tristan.

Highlights

- Two reviews on evolution on islands were published, and two papers on the conservation status of Tristan landbirds were accepted for publication.

The scarce nominate race of Tristan Thrush, confined to the main island of Tristan, is smaller and paler than the birds on Inaccessible and Nightingale Islands (Photo: Peter Ryan).

- Intriguing observations of Oceanites storm petrels off São Tomé were described in a paper in *Marine Ornithology*.
- Martim Melo wrote an article on the importance of the Gulf of Guinea islands for birds in BirdLife International's publication *Birdlife: The Magazine*.

Key co-supporters

FCT - Portuguese Science and Technology Foundation; CNRS-France (PEPS); Marie Sklodowska-Curie Grants; Royal Society for the Protection of Birds; Tristan Conservation.

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Dr. Claire Loiseau (University of Montpellier)
Dr Ângela Ribeiro (IPVC, Portugal)
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Dr Luis Valente (Naturalis Biodiversity Center, Leiden)
Dr Ricardo Lima (cE3c, U. Lisbon)
Prof. Bengt Hansson (Lund U.)
Emer. Prof. Peter Ryan (FIAO, UCT)
Dr Raquel Ponti (CIBIO, U. Porto)
Dr Ana Leitão (CIBIO, U. Porto)
Prof. Rauri Bowie (U. California Berkeley)

Impacts of power infrastructure

This project mitigates the impacts of power generation and transmission infrastructure on birds and other biota. The focus is on both collision impacts associated with powerlines, which mainly affect large, open-country birds such as bustards and cranes and 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 electricity, 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 collaboration with BirdLife South Africa's Birds and Renewable Energy programme, the Endangered Wildlife Trust (EWT) and HawkWatch International (HWI).

Activities in 2024

- PhD student Christie Craig, based at the EWT, submitted her PhD on the viability of Blue Crane *Anthropoides paradisea* populations in the Western Cape and Karoo for examination in February 2024. Powerline collisions are one of the main threats to Blue Cranes, and assessing the severity of this threat formed the basis of one of the chapters of her thesis. She found that proximity to seasonal wetlands was a useful predictor of collision risk in the Western Cape, which will be useful for planning the routing of new power lines as well as mitigating collision risk by retrospective marking of existing high-risk lines.
- Robin Colyn completed drafts of most of the chapters for his PhD on the factors determining the distributions of range-restricted larks across an aridity gradient in 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, and the high mortality rate of larks that undertake aerial displays at windfarms.
- PhD student Merlyn Nkomo continued her PhD research into the potential impacts of wind farms on Jackal Buzzards. Merlyn spent some time in the USA working with collaborators at Hawk Mountain Sanctuary analysing her GPS tracking data.
- Megan Murgatroyd and Arjun Amar continued their research on Black Harriers, with the aim of providing tools to reduce the impact of wind energy developments on this vulnerable species. A further three adult Harriers were fitted with trackers in 2024, bringing the total to 20 individuals. In 2024, we also signed a Memorandum of Understanding (MOU) with another research group (Overberg Renosterveld Trust & Birds and Bats Unlimited) to collectively share our tracking data, which will improve our ability to provide useful recommendations to the wind energy sector to minimise the impact of wind energy developments.
- Arjun Amar and Megan Murgatroyd were also involved in several projects where wind farms will undertake patterning of wind turbine blades to test whether this mitigation method

Christie Craig's PhD showed that numbers of Blue Cranes in the Overberg, their main stronghold in the Western Cape, have decreased over the last decade. (Photo: Peter Ryan).

A Black Harrier fitted with a GPS transmitter which will provide information on its movements. These data will be used to provide tools to minimise the impacts of wind energy developments (Photo: Megan Murgatroyd).

can reduce the number of birds killed by wind turbines. The team has been trapping and tracking Verreaux's Eagles at a wind farm in the Karoo, where blade patterning on existing turbines will occur in 2025, to explore how the species avoids areas near to wind turbines once a blade is patterned. The team has also been working with developers at another site that will be built in 2025, in which a third of the turbines will be patterned and the remaining being left as controls to explore differences in fatality rates at the two types of turbines.

Highlights:

- Christie Craig was awarded her PhD in 2024. She was the first Fitz PhD student to elect to undergo an online defence of her thesis, an experience which she enjoyed!
- Merlyn Nkomo published the first chapter of her PhD which explored the co-production of a research agenda for Jackal Buzzards and wind farms involving different stakeholders. This paper was published in *Ostrich* in 2024.
- Megan Murgatroyd attended the Bird and Renewable Energy Forum, where she presented an update on the range of projects that the team is working on.
- Megan Murgatroyd and Arjun Amar submitted a paper to *Ecology & Evolution*, which refined the output of our VERA model to reduce uncertainty about its application by developers.

Key co-supporters

Endangered Wildlife Trust – Eskom Strategic Partnership; The Bateleurs; BirdLife South Africa; BTE Renewables; Hans Hoheisen Charitable Trust; Leiden Conservation Fund; Dave Myers; The ABAX Foundation; The Shannon Elizabeth Foundation; Oppenheimer Memorial Trust (OMT)

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A/Prof. Robert Thomson (FIAO, UCT)
A/Prof. Susie Cunningham (FIAO, UCT)
Dr Chris Vennum (USGS)
Dr Rob Simmons (Birds & Bats Unlimited)
Dr Odette Curtis (Overberg Renosterveld Conservation Trust)
Dr Alan Lee (FIAO, UCT / BLSA)
Dr Andrew Jenkins (Avisense)

Students: Robin Colyn (PhD, UCT); Christie Craig (PhD, UCT); Merlyn Nkomo (PhD, UCT), Yusra Samsodien (MSc, UCT).

Conserving Martial Eagles

This project is aimed at better understanding the ecology and conservation of Martial Eagles *Polemaetus bellicosus*, with a particular focus on the declines observed within the country's largest protected area, the Kruger National Park. This research aids our understanding of the role of protected areas for conserving wide-ranging species and the specific threats and habitat requirements of Martial Eagles.

This project was initiated in response to the decrease in reporting rates of Martial Eagles between the Southern African Bird Atlas Project, SABAP1 (1987-1992) and SABAP2 (2007-ongoing), which suggests a population decrease of up to 65% across South Africa. Declines were also observed inside large protected areas, such as the Kruger National Park (KNP), which experienced a 54% decrease in reporting rate. Similar decreases have been reported elsewhere in Africa resulting in the species being uplisted to 'Endangered' on the IUCN Red List. However, a new study, combining population trends from multiple African countries, suggests that declines across the entire African continent may warrant the species to be further uplisted to 'Critically Endangered' in the near future.

We aim to improve our understanding of the threats faced by Martial Eagles and how these threats may drive population decreases even within protected areas. 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 widely. Contrary to this hypothesis, we found little evidence for low survival during these early life stages, despite immature eagles ranging far beyond protected area boundaries. However, results from GPS tracking of adult birds and nest monitoring suggested two potential factors that may contribute to the observed population decreases: 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 population decreases.

Although our initial nest monitoring suggested low productivity rates, this may have been due to difficulties in detecting all nests of a pair. Indeed, using GPS tracking we have recently found that breeding performance may be better than initially thought and this shows the value of using tracking units to monitoring breeding performance in wide ranging species. For several years we have been placing cameras at nests to better understand the factors that influence prey provisioning rates and diet. These data have been used to understand how temperature can influence diet and nestling provisioning rates.

Although we are no longer actively monitoring nests on the ground in KNP, we are continuing to follow our tracked eagles to determine the frequency and causes of mortality, as well as the breeding status of our tracked birds to gain a more comprehensive understanding of the environmental drivers of breeding performance. Additionally, we have collaborated with the Endangered Wildlife Trust (EWT) on their project monitoring the Martial Eagles nesting on power pylons in the Karoo. This population may be the largest in South Africa, yet little is known about their productivity rates or survival, and whether this population may be acting as a source

Kyle Walker posing proudly outside the Fitz after being awarded his MSc with Distinction at the September 2024 graduation ceremony (Photo: Arjun Amar).

We used camera traps at the nests of Martial Eagles to document the frequency of food provisioning to the nestling (visible here between the legs of its parent).

population for the rest of the region. Lastly, we have also been working on a movement model using tracking data from both the Kruger and Karoo populations to help inform wind farm development.

Activities in 2024

- Kyle Walker submitted his MSc dissertation in Feb 2024. Kyle's research explored how this species may respond as temperatures warm due to climate change. He investigated how provisioning rates of adults to their nestling change in hotter conditions, and whether diet flexibility may allow this species to adapt to rising temperatures. This analysis uses data from 12 camera traps that were placed at nests during the nestling period, and found dietary shifts in hotter conditions.
- Building on the key findings from Kyle's thesis, Dr Santiago Zuluaga (ABAX Foundation post-doctoral fellow) has been using data from our GPS tracked birds to explore whether dietary shift may be explained by changes in the movement patterns in hotter conditions.

Highlights

- Kyle Walker graduated with Distinction for his MSc thesis on Martial Eagle food provisioning and diet in relation to temperature.
- Arjun Amar was co-author on a paper published in *Nature Ecology and Evolution* which explored changes in raptors across African Savannas. This included the Martial Eagle which declined by over 90% over 3 generation lengths. These findings suggest that the IUCN status of this species may need to be reconsidered for uplisting to Critically Endangered.

Impact of the project

Our research provides a better foundation for protecting this Endangered species, within the most important areas for this species in South Africa.

Key co-supporters

ABAX Foundation; Endangered Wildlife Trust (EWT); SANParks; Eskom.

Research team 2024

Team leaders and collaborators:

A/Prof. Arjun Amar (FIAO, UCT)
Dr Megan Murgatroyd (HawkWatch International / EWT / FIAO, UCT)
Dr Santiago Zuluaga (ABAX Foundation post-doctoral fellow, FIAO, UCT)
Dr Chris Vennum (USGS)
Dr Gareth Tate (EWT)

Student: Kyle Walker (MSc, UCT)

Vulture conservation

Several vulture populations in Africa have declined by up to 95% over the last few decades. The critical nature of this rapid decrease was highlighted when parties to the Convention on Migratory Species (CMS) adopted the Multi-species Action Plan to Conserve African-Eurasian Vultures (Vulture MsAP). Unlike the Asian Vulture Crisis, where the veterinary drug diclofenac was responsible for the collapse, there appear to be multiple drivers of the African Vulture Crisis, with the importance of each varying between species and region.

Vultures provide important ecosystem services, and their rapid declines will have a dramatic effect on people and wildlife in Africa. The FitzPatrick Institute is committed to help conserve vultures by engaging in collaborative research projects throughout the continent.

Working with the conservation NGO Raptors Botswana, we have been involved in long term research on Botswana's significant populations of vultures. All five species in the country are globally threatened. Central to this research is an attempt to quantify changes in vulture populations in Botswana over the last 30 years by repeating road transects undertaken in the early 1990s, as well as repeating aerial surveys of key colonies. This work has also involved GPS tracking of Lappet-faced Vultures.

We are also a key partner in the conservation of the Bearded Vulture *Gypaetus barbatus* in southern Africa. We have a long-standing collaboration with the team from Ezemvelo KZN Wildlife, where several students have worked on this important conservation project.

Building on our successful predictive space use model for the Bearded Vulture, we have now also completed a space use model for the Cape Vulture *Gyps coprotheres* across its entire global range. This was a large collaborative project using data from almost every organisation that has put GPS tags on this species. These predictive maps are now being used by the Department of Forestry, Fisheries and the Environment (DFFE) to help guide wind farm placements to protect this important and threatened species. Additionally, we have been involved in analysing tracking data from an isolated population of Cape Vultures at the Potberg colony, Western Cape to help better understand their food requirements and habitat use.

Tevin Adams explored movements and food use by Cape Vultures at the isolated Potberg Colony in the Western Cape. He found they were highly reliant on fallen stock within the surrounding farmland (Photo: Gareth Tate).

Activities in 2024

- Our published space use model for Cape Vultures continued to be incorporated into the DFFE protocol to guide wind farm placement for vultures. This protocol was made available for consultation in 2024 and will hopefully be gazetted by government in the near future.
- In collaboration with researchers at the Leibniz Institute for Zoo and Wildlife Research, Andrea Santangeli used data from 20 GPS tracked Lappet-faced Vultures from Botswana, to better understand and map the exposure of these birds to intentional and unintentional poisoning risk across Southern Africa. This work is a collaboration between Raptors Botswana, Arjun Amar and Robert Thomson.
- CB MSc student Tevin Adams explored the movement and diet of GPS tracked Cape Vultures from the Potberg Colony, and ground truthed over 40 potential feeding sites based on the GPS 'signatures'. Tevin was supervised by Arjun Amar, Robert Thomson and Gareth Tate (EWT). Tevin also conducted a series of questionnaire interviews with farmers in the region to better understand their perspectives on vulture conservation in the areas around the Potberg colony.

Our space use model for Cape Vultures was a collaborative project using almost all of the GPS tracking data available for this species across its Southern African range. The model is now eing used by DFFE to guide proposed wind farm placements.(Photo: Gareth Tate).

Highlights

- A simplified version of our predictive space use model for Cape Vultures, developed by Dr Francisco Cervantes, was incorporated by the DFFE into their Cape Vulture Protocol for use in EIAs for onshore wind farms in South Africa. In 2024 this protocol was issued for public consultation prior to being gazetted by government.
- Tevin Adams graduated in September 2024. He is currently writing up his thesis for publication.
- Arjun Amar, Glyn Maude, previous PhD student Beckie Garbett and colleagues published a paper in *Nature Ecology & Evolution.*
- Andrea Santangeli, Arjun Amar, Robert Thomson and colleagues, led by Teja Curk, published a paper in *Animal Conservation* exploring the overlap between space use, food abundance and poisoning risk for Lappet-faced Vultures tagged in Botswana.
- Andrea Santangeli presented the results of a pan-European vulture survival project named SURVIVALIST at the European Conservation Biology Congress held in Bologna in 2024. The results he presented highlight high survival rates across three of the four European vulture species, which align with the good status of their populations across the continent.
- Andrea Santangeli, and colleagues from Africa and beyond, published a global study on the contribution of vultures towards ecosystem services and sustainability based on expert elicited scores worldwide. The paper is published in the journal *iScience*.

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, poison use, blood lead levels and hunting, and more recently 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 co-supporters

NRF Innovation Scholarship; ABAX Foundation; BTE Renewables; JW Jagger Grant; Denver Zoo; Raptors Botswana; Rufford Grant; Wilderness Wildlife Trust; Colombus Zoo; Leslie Brown Memorial Grant; Peregrine Fund; IDEA Wild; Ezemvelo KZN Wildlife; Endangered Wildlife Trust; N3TC through Wildlands; Vultures Namibia; VulPro; HawkWatch International; University of Marburg; Academy of Finland; WildBird Trust.

Research team 2024

Team leaders and collaborators:

A/Prof. Arjun Amar (FIAO, UCT)
A/Prof. Robert Thomson (FIAO, UCT)
Dr Andrea Santangeli (IMEDEA / FIAO, UCT)
Dr Francisco Cervantes (FIAO, UCT)
Dr Megan Murgatroyd (HawkWatch International)
Dr Sonja Krüger (EKZN Wildlife)
Dr Glyn Maude (Raptors Botswana)
Dr Richard Reading (Raptors Botswana)
Dr Moses Selebatso (Raptors Botswana)
Dr Gareth Tate (Endangered Wildlife Trust)
Dr Beckie Garbett (BirdLife International)

Student: Tevin Adams (CB MSc, UCT).

Southern Ground-Hornbill conservation

Southern Ground-Hornbills *Bucorvus leadbeateri* are large, group-living birds that require extensive territories with large trees for breeding and roosting. Habitat loss has led to a two-thirds reduction in their range in South Africa during the past century. A long-term study has investigated their habitat use, breeding success, and dispersal. Now we are studying how high temperatures influence breeding success and nestling growth rates. We are also investigating how high temperatures influence micro-habitat use, behaviour, and body condition year-round.

The long-term project has provided nest boxes to 28 ground-hornbill groups in the Associated Private Nature Reserves (APNR), adjacent to Kruger Park. Together, these groups make 12-15 breeding attempts each year. This area is now a national population stronghold for the species and this successful population is now dispersing outside of the APNR and is re-populating the surrounding area. The project also provides second-hatched chicks (which invariably die of starvation in the wild) to the Mabula Ground-Hornbill Project (MGHP) for captive-rearing and later release. Post-doctoral research fellow Dr Kyle-Mark Middleton has started investigating how temperature influences habitat use and trade-offs between thermoregulation and other vital behaviours (foraging and vigilance) year-round, and how these trade-offs will in turn affect body condition and reproduction. Newly developed leg ring tracking devices will be implemented to track the movements of birds within their territories. Additionally, perch scales (being developed by UCT's engineering department) and camera traps will be implemented at nesting sites to automatically monitor the body conditions of different individuals.

PhD student Carrie Hickman, supervised by Rita Covas and Susan Cunningham, continued her work investigating whether high air and nest temperatures impact hornbill nestlings by measuring nestling growth, fledging size and telomere length (a measure of physiological condition). She is also recording the hornbill's behavioural responses to high temperatures. iButtons (devices used for data logging) have been installed inside nests to obtain hourly temperature recordings and camera traps are used to record provisioning. The results from these analyses will assist in designing better nest boxes for the species and provide information on locations where the birds will have the best chance to persist, where microsites are more favourable and temperature increases are slower.

Activities in 2024

- PhD student Carrie Hickman successfully carried out another field season, where nine ground-hornbill nestlings fledged in February and March 2024. Carrie weighed and measured nestlings at specific ages to obtain growth rates, adding to her dataset on nestling growth and physiology.
- Kyle repaired and replaced artificial nest boxes to ensure that ground-hornbills continue to thrive in the study area, which has only 5 natural nests out of a total 36.
- Leg-ring tracking devices, specifically designed for ground-hornbills, were designed and tested on a captive bird. This test was successful and the trackers will be implemented in 2025.
- New artificial nests were designed and installed. The wooden design ensures that external temperatures are buffered, and also have provisions for future research, including hidden compartments to install equipment for internal nest cameras and scales.
- A new website for the project was created to help provide information on the research and conservation activities carried out by the project participants.
- The project hired a field assistant, Ryan Forbes, at the end of 2024 for the breeding season. Ryan will be assisting with fieldwork duties as well as data capturing and analyses..

Highlights:

- The 2023/24 breeding season saw nine chicks fledge out of 14 breeding attempts and the 2024/25 breeding season started well with 11 breeding attempts.
- A ringed individual was resighted outside of the study site. This individual was photographed

and its ring number identified. The individual fledged from a nest in 2011 within the study site and dispersed approximately 40km where it has now joined a new breeding group.

- Six new nests were placed outside the study site to encourage natural dispersal.
- Nine nests were installed to replace nests that had either been destroyed or fallen down.
- New colour rings were implemented to help identify individual birds within the study site.
- New tracking device rings were developed specifically for ground-hornbills.
- Continued research on ground-hornbill vocalisations indicated that the provisioning vocalisations differ based on whether males bring vertebrate or invertebrate prey to the nest.
- An adult breeding female was seen with what appeared to be a broken leg. This resulted in the nestling within the nest being in poor condition and covered in ectoparasites. With the assistance of local vets, this nestling was given antibiotics and fluids which subsequently led to its successful fledging.
- A sick bird was found within the reserves next to a landowner's home. It is suspected that the bird ate window putty laced with parafin. This bird was collected, treated at Onderstepoort veterinary hospital, and then released back into the study site several weeks later.
- The population size in the study site was estimated to have roughly tripled in the past 25 years.
- Kyle-Mark Middleton rejoined the project as a Post-doctoral Research Fellow.

Impact of the project

This project continues to generate fundamental knowledge about the species, the factors affecting reproduction, their social structure and their physiology. It also contributes to the population growth of Southern Ground-Hornbills in the APNR and has demonstrated the efficacy of artificial nests as a conservation tool in areas where natural cavities are scarce. The surrounding areas are now beginning to benefit from the project, with new groups occurring in areas previously lacking ground-hornbills. The project contributes to the national Southern Ground-Hornbill Species Action Plan and the Southern Ground-Hornbill Reintroduction Plan.

PhD student Carrie Hickman weighing and measuring a newly-hatched chick to monitor growth rates (Photos: Kayla Zoon).

Key co-supporters

The Foundation for Science and Technology (FCT), Portugal; Associated Private Nature Reserves; National Geographic Society; The Rufford Foundation; Mary Oppenheimer & Daughters Foundation; John Solomon; Timothy Hancock Charitable Trust; Wild Wonderful World; Bateleurs.

Research team 2024

Team leaders and collaborators:
Dr Rita Covas (FIAO, UCT / CIBIO, U. Porto)
A/Prof. Susie Cunningham (FIAO, UCT)
Prof. Claire Spottiswoode (FIAO, UCT / U. Cambridge)
Dr Fanny Rybak (U. Paris-Sud, France)
Dr Kyle-Mark Middleton (FIAO, UCT / Mabula Ground- Hornbill Project)

Student: Carrie Hickman (PhD, UCT)

Research Assistant: Ryan Forbes

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, and by invasive species on land. Monitoring seabirds provides a window into the health of the Southern Ocean.

Most fieldwork takes place through the South African National Antarctic Programme (SANAP) at the Prince Edward Islands, Tristan da Cunha, Gough Islands and Antarctica. Fitztitute seabird research on Marion Island, the larger of the two Prince Edward Islands, commenced in the 1970s. John Cooper initiated a series of seabird study colonies in the early 1980s, but servicing these studies through a succession of three-year research projects has become increasingly challenging. Fortunately, the long-term monitoring of albatrosses and petrels at Marion Island was taken over in 2024 by SAPRI, the South African Polar Research Infrastructure. Peter Ryan and Maëlle Connan (NMU) assisted with the transition. Monitoring at Gough Island was taken over by the RSPB some years ago, but it seems likely that the RSPB will not send a team to Gough in 2025, so we are exploring other options to continue the long-term studies in this island.

Susie Cunningham and Peter Ryan were awarded a three-year research grant through the South African National Antarctic Programme for 2024-2026 to assess the impacts of climate change on surface-nesting seabirds at Marion Island.

Activities in 2024

- The SANAP project on avian scavengers at Marion Island led by Maëlle Connan and Peter Ryan ended field work in May 2024. Immediately prior to the annual relief voyage, the two field workers, Michelle Risi and Chris Jones, initiated a survey of mouse attacks on breeding Wandering Albatrosses *Diomedea exulans* on Marion Island, which continued into the takeover period. Overall, 1% of adults had mouse-inflicted wounds, providing yet more impetus to the need to eradicate introduced House Mice *Mus musculus* from the island. A note reporting these findings has been submitted for publication. A complete survey of mouse attacks on mollymawk chicks also was conducted for the first time in several years.
- In April, Vanessa Stephen started the first year of observations for the new SANAP project assessing the impacts of climate change on surface-nesting seabirds at Marion Island. She deployed numerous temperature loggers around the island and used cameras and direct observations to record behavioural responses to extreme temperature events. Paired ambient and environmental temperature loggers also were deployed at different elevations on Gough and Inaccessible Islands to provide comparative data from the northernmost breeding sites for several key seabird genera.
- Plans to assess water turnover in giant petrel chicks on Marion Island had to be shelved when a suspected outbreak of highly pathogenic avian influenza (HPAI) occurred in October 2024. Vanessa worked tirelessly with the SAPRI field assistant, Rhiannon Gill, to document the impact of this event on seabird populations.
- PhD student Kim Stevens made steady progress towards her PhD on Grey-headed Albatrosses *Thalassarche chrysostoma*. She published her first paper, reporting the steady growth of the Marion Island population, in *Antarctic Science*.
- PhD student Danielle Keys (NMU), supervised by Pierre Pistorius, Chris Oosthuizen and Peter Ryan, completed her research on the interaction between foraging behaviour and demographic responses in Wandering Albatrosses *Diomedea exulans* at Marion Island. Her thesis was submitted in January 2025.
- Theresa Burg's MSc student, Dilini Abeyrama, published a paper on the phylogeography of Sooty Albatrosses *Phoebetria fusca* in *Conservation Genetics*.
- Peter Ryan led visits to two Emperor Penguin

Aptenodytes forsteri colonies in central Dronning Maud Land, including the Lazarev colony, which was first detected in 1959 from a Russian plane, but had not been visited directly. He discovered an unusual mortality event among Emperor Penguins at the Astrid colony, but subsequent sampling confirmed that this was not due to HPAI. A paper summarising the status of Emperor Penguins in the region is being prepared.

- Peter's paper on the seabirds of the Schirmacher Oasis was published in *Marine Ornithology*. However, in November 2024 he discovered a colony of some 60 pairs of Adelie Penguins *Pygoscelis adeliae* at the Oasis, more than 100 km from the ice shelf edge. They laid eggs and even hatched some chicks, but subsequent observations by researchers from the Novolazarevskaya Station confirmed that no chicks were raised.

Highlights:

- Susie Cunningham and Peter Ryan obtained funding from SANAP for a three-year project on the impact of climate change on seabirds breeding at Marion Island, which commenced in 2024. Susie made her first visit to Marion in April-May 2024, and despite some boot challenges, completed two round-island walks!
- Six papers on Southern Ocean seabirds and their conservation were published in 2024, and four more were in press. Two other papers on seabirds also were published: one in *Ibis* on the diet of Kelp Gulls *Larus dominicanus* in South Africa led by Katherina Reusch and one in *Bird Conservation International* on thermoregulation in African Penguins *Spheniscus demersus*.
- Newi Makhado remains a member of the Southern Ocean Observing System (SOOS) steering committee and the Southern Indian Ocean Sector (SOIS) Regional Working Group. He is the scientific advisor and South Africa's scientific representative in CCAMLR and ACAP, and continues to serve on the CCAMLR General Capacity Building Fund committee. Newi is also on the steering committee of the Pelagic High Seas Ocean Ecoregionalisation of the Indian Subantarctic (PHOCIS) project, which examines pelagic eco-regionalisation in subantarctic Indian oceans. He presented at the CCAMLR Working Group on Ecosystem Monitoring and Management (WG-EMM) in the Netherlands.

A Southern Giant Petrel chick investigating a black globe thermometer placed by the nest to record operative temperature (Photo: Vanessa Stephen).

- Newi has submitted two papers to *CCAMLR Science*, one on seabird assemblages and dispersion in the African region of the southern ocean and the other on higher predator ecoregionalisation of the pelagic zone in the subantarctic and subtropical Indian Ocean. Another paper has been submitted to *Royal Society Open Science* on the juvenile dispersal of Emperor Penguins.

Key co-supporters

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

Research team 2024

Team leaders and collaborators:
Emer. Prof. Peter Ryan (FIAO, UCT)
Dr Maëlle Connan (NMU)
A/Prof. Susie Cunningham (FIAO, UCT)
Dr Azwianewi Makhado (Oceans & Coasts, DFFE)
Prof. Pierre Pistorius (NMU)
Prof. Res Altwegg (SEEC, UCT)
Dr Theresa Burg (U. Lethbridge, Canada)
Dr Sarah Converse (Oregon)
Dr Steffen Oppel (RSPB)
Dr Richard Phillips (British Antarctic Survey)
Janine Schoombie (U. Pretoria)
Dr Stefan Schoombie (SEEC, UCT)
Dr Henri Wiemerskirch (CNRS, Chizé)
Prof. Rory Wilson (Swansea U.)

Students: Danielle Keys (PhD, NMU); Kim Stevens (PhD, UCT).

Field assistants: Chris Jones, Michelle Risi (Marion 2023/24); Vanessa Stephen (Marion 2024/25).

Hot Birds – birds and climate change

The 'Hot Birds Research Project' (HBRP) is a large international research programme led from the Fitz, which integrates behavioural and physiological approaches to understand the impact of climate change on birds. The HBRP's research has historically focused on birds in arid habitats in southern Africa, North America and Australia, but increasingly involves birds in mesic and humid environments – and in the subantarctic.

In last year's annual report, we shared the news that 2023 had been declared the hottest year since records began, and that temperatures were close to 1.5°C above pre-industrial averages. In 2024, the records were smashed again. On 10th January 2025, experts from the World Meteorological Association confirmed that global temperatures in 2024 exceeded the 1.5°C warming threshold for the first time. Extreme weather and climate-related impacts on lives and livelihoods are now a daily feature of the news cycle. Climate change is no longer a threat looming in the future: the impacts are here and now. In response, the HBRP is increasingly working on red-listed species that already face other threats in addition to climate change, including a new project on the iconic seabirds of the Southern Ocean, in collaboration with the "Conserving Southern Ocean Seabirds" project (page 38). In addition, we continue to step up research on mitigation interventions and mechanistic modelling, and data collection on how behaviour and physiology inform climate change vulnerability and resilience of birds.

Temperature effects on behaviour – habitat, hydration and humidity

During 2024, the team continued long-running research building information across taxa on how birds respond behaviourally to the heat and the likely consequences for fitness. To date, HBRP work on this theme has encompassed 11 study species in arid, mesic, montane and urban environments of southern Africa and Australia. In 2024, Dr Shannon Conradie wrapped up her post-doctoral fieldwork on White-browed Sparrow-weavers *Plocepasser mahali* at Murray Guest Farm in the Kalahari. Shannon's work focused on the relationships between air temperature and sparrow-weaver behaviour, body mass maintenance and hydration status. Shannon will use these data to validate state-dependent and biophysical models for this species, and to add to the growing comparative dataset.

Several other projects under this theme were also completed in 2024. Susie Cunningham and collaborator David Diez-Mendez from the Museo Nacional de Ciencias Naturales in Spain finally published work they carried out together in 2018 on incubation behaviour of Southern Fiscals *Lanius collaris* at Tswalu Kalahari, showing that the birds engage in egg shading behaviour during the heat of the day, buffering nest temperature from hot extremes. They also showed that nest temperature loggers are not an appropriate method for monitoring patterns of incubation in subtropical birds, because in hot environments nest temperature does not predictably drop during parental absences. The paper is published in the *Journal of Arid Environments*. James Short submitted his MSc thesis on behavioural responses of Karoo Chats *Emarginata schlegelii* to extremes of heat and cold in the Tankwa Karoo. James' second chapter compared physiological heat tolerances of Large-billed Larks *Galerida magnirostris* from the Tankwa Karoo to those of other bird species in arid environments. James was awarded his degree with Distinction.

Finally, Ben Murphy wrapped up his PhD on how Fork-tailed Drongos *Dicrurus adsimilis* buffer costs of breeding in hot and arid environments, and will submit in February 2025. Ben's PhD includes six field seasons' worth of data, and was conducted through a time of drought, flood, pandemic and personal health crisis. Unlike any other species studied by the HBRP team to date, nestling growth and fledging size in Kalahari Fork-tailed Drongos is resilient to negative effects of hot weather. Ben discovered that drongo parents facilitate this remarkable feat by making multiple behavioural adjustments as temperatures rise, which collectively buffer their offspring against costs of high heatloads. For example, they increase provisioning rates in the mornings of hot days to buffer declines later in the day; and carry larger load sizes of prey to the nest per trip at times when temperature constrains the number of trips they

can make. Furthermore, drongos shade their nestlings during hot weather, buffering nests from harmful temperature extremes. Drongo parents manage all this without measurable costs to their own body condition, perhaps because adjustments in provisioning behaviour also reduce heat loads experienced by adults. This suggesting that behavioural compensation to overcome costs of hot weather for nestlings can also alleviate parent-offspring conflicts. Experimental work by Ben also uncovered that drongos will continue to forage to obtain water (from prey) under hot temperature conditions, but cease to forage if sufficiently hydrated, suggesting water rather than energy may be the more limiting resource during hot weather. Drongos' ability to buffer their own and offsprings' body condition in the heat appears related to their considerable behavioural flexibility. However, drongos also have the advantage of very low wing-loading and a flycatching lifestyle, meaning flight costs are lower and their foraging microhabitat (the air column) significantly cooler than those of other species which forage on the ground. Congratulations to Ben on finally completing this mammoth piece of work.

In 2024, we welcomed a new MSc student to this branch of the HBRP: Leslie Bayanza. Leslie is working in collaboration with the UCT Red-winged Starling Project to investigate whether high human presence buffers or exacerbates the impacts of hot weather on body condition and breeding success of the Upper Campus population of Red-winged Starlings *Onychognathus morio* at UCT. Further details of Leslie's work are available in the Urban Birds section (page 45).

Carry-over effects and cognition

Impacts of hot weather on nestling growth are almost ubiquitous among the species we have studied (except for drongos)! However, adverse conditions in early life can also have more subtle, long term consequences via impacts on less-visible components of development, such as cognition. In 2024, new MSc student Makgoshi began work to understand impacts of hot weather during development on problem-solving abilities of drongos. Her initial fieldwork in winter highlighted that juvenile drongos are much faster than adults to solve novel tasks including lifting lids on pots to extract mealworms. At the time of writing, Makgoshi is in the field assessing how

MSc student Makgoshi Makgotsi conducting cognition experiments with a habituated fork-tailed drongo at Kuruman River Reserve. Makgoshi is investigating the impacts of temperature on cognition development and performance in these birds (Photo: Susie Cunningham).

capacity of birds to solve problems is affected by current and historic (i.e. experienced as a nestling) temperature exposure.

Heat-associated vocalisations in incubating estrildids

Post-doctoral fellow Dr Lisa Nupen joined the HBRP in 2024 to investigate heat-associated calls in estrildid finches as part of a collaboration between Andrew McKechnie and Dr Mylene Mariette of the Donaña Biological Station at Seville, Spain. In a 2016 paper in *Science*, Dr Mariette demonstrated how incubating female zebra finches *Taeniopygia guttata* communicate acoustically with their offspring prior to hatching via specific calls associated with hot weather. Lisa's project seeks to determine whether similar heat-related vocalisations occur in southern African estrildid finches, including waxbills. During 2024, ethics and land-owner permissions were secured and Lisa conducted spatial analyses using SABAP data to prioritize study sites. After expert consultations and site visits, two locations on the Springbok Flats were selected. As of early 2025, Lisa has installed microphones at a number of blue waxbill nests and preliminary analyses suggest that heat-associated vocalisations may occur in this species, although further verification is needed.

Red-list species and mitigation interventions

In 2024, we continued research to understand how climate warming is affecting already-threatened species, and develop of conservation mitigation tools.

CB MSc student Obakeng Pule completed work on the Southern Yellow-billed Hornbill *Tockus leucomelas* population at Kuruman River Reserve, experimentally assessing whether the impact of hot weather on nestling growth and nest success can be mitigated by provision of thermally-buffered nest boxes. Obakeng's results suggest that nests in insulated boxes are more likely to succeed than those in uninsulated boxes. Nestlings in insulated boxes also weigh more than those in uninsulated boxes, throughout the entire growth curve. This suggests that nestbox insulation might be a cheap and effective way to improve breeding success under rising temperatures in nestbox-dependent species. Obakeng received a Distinction for his thesis and will graduate in 2025. We are continuing his experiment in the 2024/25 breeding season to understand how seasonal differences in environmental conditions may impact these results.

Another red-listed species that continues to be a focus for the HBRP is the Red Lark *Calendulauda burra*, a desert specialist restricted to sand dunes and gravel plains in South Africa's arid west. A paper by Ryno Kemp and co-authors published during 2024 provided an up-to-date estimate of the population at one of the species' strongholds, the Black Mountain Mine Conservation Area (BMMCA) near Aggeneys in the Northern Cape. Using a combination of habitat modelling, survey data and home range estimates based on telemetric tracking of Red Larks equipped with transmitters, the Red Lark population of the BMMCA was estimated at 232–382 individuals, considerably fewer than were thought to occur there three decades ago. Towards the end of 2024, University of Pretoria student Anton Schultz, spent three months at another site near Aggeneys investigating whether the Red Larks will make use of artificial shade if it is provided in their territories. The objective of Anton's project is to evaluate whether artificial shade provision may be worth considering as a conservation intervention in light of rapidly advancing climate change and associated increases in air temperature.

Carrie Hickman has added a final breeding season of data collection for her PhD on Southern Ground-hornbills *Bucorvus leadbeateri* in summer 2024/25, to bring her sample size of nestlings close to 50. She has begun her writeup and has one chapter completed and three in advanced drafts. Her results show, among other things, that landscape temperatures experienced by hornbills are hotter in winter than summer on matched air temperature days due to low shade availability in winter, and that cooler riverine areas will become increasingly important thermal refuges in the lowveld landscape as the climate continues to warm. Carrie's preliminary analyses also suggest impacts of hot weather on nestling growth especially during early development. Kyle-Mark Middleton rejoined the Southern Gound-hornbill team as a post-doctoral fellow in 2024, to further investigate the impacts of changing landscapes of heat on the birds' behaviour, body condition, and interactions with other species. See page 36 for more details.

Wesley Gush's PhD project on the implications of warming temperatures for Secretarybirds *Saggitarius serpentarius* continued in 2024, with a second field season of data collection on parental behaviour, nestling morphometrics and nest temperatures. Wesley worked hard with Marc Freeman and Bianca Coulson to develop a respirometry chamber large enough for Secretarybirds and will deploy this to measure thermal physiology of captive birds at Dullstroom in 2025.

Finally, research assistant Vanessa Stephen spent almost all of 2024 on subantarctic Marion Island, collecting data on thermoregulatory behaviours and landscape and microsite temperatures for surface-nesting seabirds including Northern and Southern Giant Petrels *Macronectes halli* and *M. giganteus* and Wandering Albatrosses *Diomedea exulans*. See page 38 for more information on this Hot Birds – Southern Ocean seabirds collaboration.

Green twinspots were among the forest birds for which the HBRP team collected thermal physiology data during 2024 (Photo: Marc Freeman).

Thermal physiology

The HBRP's research on thermal physiology during 2024 focused on species inhabiting the Afromontane forests of the Magoebaskloof region in Limpopo province. PhD student Bianca Coulson and post-doctoral fellow Marc Freeman were based at a study site near Haenertsburg from October 2024 until early 2025, where they were joined for two months by visiting PhD student Ryan Leys from the University of Waterloo in Canada. One of the hypotheses Bianca is testing as part of her PhD is that birds inhabiting these forests show adaptive variation in evaporative cooling and heat tolerance correlated with vertical thermal gradients between the forest floor and the upper canopy. Bianca and Marc completed a tree climbing course in the run-up to the field season, which provided the training required for them to place temperature and humidity loggers at various heights in the forest to quantify temperature and humidity differences between the canopy, mid-stratum and the forest floor.

The team also caught birds inhabiting these different strata and measured their evaporative cooling capacity and heat tolerance, before releasing them. By the end of the season, they had collected data for around 20 species, providing the basis for comparing the thermal physiology of species occupying these different microclimates. The study species included inhabitants of the forest floor like Lemon Dove *Aplopelia larvata*, Orange Ground Thrush *Geokichla gurneyi* and Green Twinspot *Mandingoa nitidula*, mid-stratum species including Cape Batis *Batis capensis*, White-starred Robin *Pogonocichla stellata* and Blue-mantled Crested-flycatcher *Trochocercus cyanomelas*, as well as canopy-dwellers like Olive Woodpecker *Dendropicos griseocephalus*, Olive Bushshrike *Chlorophoneus olivaceus* and Southern Double-collared Sunbird *Cinnyris chalybeus*. One study species that proved particularly fascinating was the Narina Trogon *Apaloderma narina*. Not only did the trogons show extremely efficient evaporative cooling when experiencing humid heat, but they also appear to possess evaporative cooling behaviours not previously described among birds. In addition to the data needed to examine differences in thermal physiology correlated with microclimate, the team also began quantifying wet bulb temperature tolerance limits for a handful of species.

Bianca Coulson descending after deploying a temperature and humidity logger in the forest canopy (Photo: Marc Freeman).

Thermal physiology publication highlights for 2024 included a 1) paper by Marc Freeman and co-authors in *Ecology* showing how humidity has shaped the evolution of evaporative cooling and heat tolerance in forest birds, 2) a paper on non-evaporative heat loss across the beaks of large forest hornbills by Bianca Coulson and co-authors, and 3) Jochen Voges' meta-analysis of the functional role of metabolic suppression during avian thermoregulation in the heat. In addition, a paper led by Andrew McKechnie, in collaboration with colleagues at VulPro and the University of Pretoria's Faculty of Veterinary Science, reported the results of a study exploring whether lead poisoning affects the ability of Pied Crows *Corvus albus* to thermoregulate during heat exposure. Published in *Environmental Toxicology and Pharmacology*, this is one of the first studies to explore interactions between environmental pollutants and the capacity of birds to keep cool during hot weather.

Modelling climate change impacts

Predicting the impacts of rising temperatures and more frequent extreme weather events on birds and other animals requires a detailed understanding of how heat transfer between birds and their environment varies across landscapes, and the constraints that this places on birds' ability to survive and reproduce. In 2024 Shannon Conradie continued work developing methods to

validate and improve biophysical models of thermoregulation, energy and water balance of passerine birds under complex field conditions, using Southern Pied Babblers *Turdoides bicolor* and White-browed Sparrow-weavers *Plocepasser mahali* as study species. Shannon was also successful in attracting a prestigious Jennifer Ward Oppenheimer award for her research and joined Wits university as a lecturer in September!

Martiné van den Berg registered as an MSc student on a project validating biophysical models for thermal physiology and microclimates of Fynbos birds, with a view to predicting future physiological costs under changing temperatures and fire regimes in the Cape Floristic Region.

Hannah Glanville completed her Honours comparing biophysical model, black bulb, and taxidermic mount estimates of operative temperatures in arid savanna and urban environments, finding that the NicheMapR microclimate model produces more accurate predictions for natural than built-up environments. Hannah received a Distinction for her work.

Highlights:

- The HBRP published 18 papers in international peer-reviewed journals in 2024.
- Nicholas Pattinson graduated in September with his PhD on how temperature and resource availability shape thermoregulation and breeding outcomes in Southern Yellow-billed Hornbills.
- Susie Cunningham published a chapter on behavioural responses of animals to climate change in new Oxford University Press book "Behaviour in a Changing World", edited by Bob Wong and Ulrika Candolin.
- Susie also presented two invited seminars at Monash University in Melbourne (as part of their Distinguished Women in Science seminar series) and at the Max Planck Institute for Animal Behaviour in Konstanz.
- PhD students Linda van den Heever and Ryno Kemp graduated at the University of Pretoria's autumn and spring ceremonies, respectively.
- MSc students Bianca Coulson, Nazley Liddle, Obakeng Pule and James Short all received Distinction grades for their MSc theses.
- Shannon Conradie was successful in her application for a permanent Lectureship at the University of the Witwatersrand, and was awarded the prestigious Jennifer Ward Oppenheimer Research Grant to kickstart her independent lab group.

Key co-supporters

SARChi Chair in Conservation Physiology; UCT URC; U. Pretoria; NRF Thuthuka Grant; Francois van der Merwe; John Solomon; WWF USA; Rufford Foundation; VC Future Leaders Programme, UCT; Associated Private Nature Reserves.

Research team 2024

Team leaders and collaborators:

Prof. Andrew McKechnie (U. Pretoria / SANBI)
Dr Janet Gardner (Australian National University)
Dr Rowan Martin (FIAO, UCT)
Prof. Vinny Naidoo (U. Pretoria)
Dr Christiaan Brink (FIAO, UCT)
Dr Blair Wolf (U. New Mexico)
Dr Tom Flower (FIAO, UCT / Capilano University)
Dr Rita Covas (U. Porto / FIAO, UCT)
Dr Celiwe Ngcamphalala (BioSci, UCT)
Dr Mia Momberg (U. Pretoria)
Dr Lisa Nupen (U. Pretoria)
Dr Kyle-Mark Middleton (FIAO, UCT)
A/Prof. Susie Cunningham (FIAO, UCT)
Dr Alan Lee (BLSA / FIAO, UCT)
Dr Ben Smit (Rhodes)
Dr Melissa Whitecross (Conservation Alpha, Wits)
Dr Danielle Levesque (U. Maine)
A/Prof. Amanda Ridley (U. Western Australia)
Dr Izak Smit (SANParks)
Dr Shannon Conradie (FIAO, UCT / Wits)
Dr Chima Nwaogu (FIAO, UCT)
Dr Marc Freeman (U. Pretoria)
Dr Amanda Bourne (Australian Wildlife Conservancy)

Students: Carrie Hickman (PhD, UCT); Benjamin Murphy (PhD, UCT); Nicholas Pattinson (PhD, UCT); Bianca Coulson (PhD, Pretoria); Wesley Gush (PhD, Pretoria); Ryno Kemp (PhD, Pretoria); Leslie Bayanza (MSc, UCT); Martiné van den Berg (MSc, UCT); Nazley Liddle (MSc, Pretoria); Makgoshi Mogotsi (MSc, Pretoria); James Short (MSc, Pretoria); Jochen Voges (MSc, Pretoria); Jaimie Whyte (MSc, Pretoria); Lara Strydom (M. Environ. Mgmt., Pretoria); Obakeng Pule (CB MSc, UCT); Hannah Glanville (BSc Hons, UCT); Caitlin Read (BSc Hons, Pretoria), Ryan Leys (visiting PhD student, U. Waterloo).

Research Assistants: Amy Hunter, Justin Jacobs, Bianca Koste, Lesedi Moagi, Samantha Murphy, Vanessa Stephen, Kiley van Meer.

Global change and urban birds

Urban environments create novel challenges and opportunities for birds. Understanding why and how some birds are able to adapt to urban landscapes, and others are not, is important for predicting how ongoing urbanisation is likely to impact birds. This project aims to understand how birds in human-altered landscapes cope with the opportunities and pressures of urban life.

The Red-winged Starling project

Since 2017 we have studied how Red-winged Starlings *Onychognathus morio* on UCT's highly urbanised Upper Campus cope with highly variable food quality and quantity in urban environments, the stresses of sharing their space with large numbers of people, and of high summer temperatures as Cape Town's climate warms. Early correlative work showed that adult starlings benefit from high availability of anthropogenic food, gaining more weight on weekdays than on weekends, but that chicks seem to suffer, with those experiencing many high-human-presence days while in the nest showing reduced growth compared to those raised during lower-human-presence days (i.e. those whose nestling period overlaps with public holidays and vacations). We also found that more built-up areas on campus were occupied by larger birds, suggesting that starlings perceive these areas to be higher quality. Indeed, faecal glucocorticoid metabolite concentrations in starling droppings are negatively correlated with human foot traffic levels outside of the breeding season, suggesting that starlings experience less stress in the presence of high human numbers, perhaps because of the ready availability of anthropogenic food or because humans deter natural starling predators.

However, even though adults benefit from high human presence on campus, nestlings appear to be negatively affected, and experimental work (e.g. by Miqkayla Stofberg over the last several years) has not clarified whether food quality or other correlated urban stressors are to blame. In 2024, MSc student Abiodun Ademola finalised her data collection; she is investigating whether the negative impacts of high human presence on nestling growth may be related to stress effects associated with adult nest defence behaviours (breeding adults frequently divebomb passersby) and how adult starlings respond to human presence in terms of stress hormone expression while breeding versus not.

The starlings again played an important role in undergraduate and post-graduate teaching in 2024. Susie Cunningham led a 3rd-year project on the BIO3013F Global Change Ecology course looking at starling responses to hot weather on campus. This project teaches 3rd-year students how to collect and analyse behaviour data from free-living animals. This was the 9th year this project has run (2015–24, with a 1-year COVID-19-related hiatus) and it is becoming apparent that starlings adjust the onset of heat-dissipation behaviours annually in relation to the prevailing weather conditions that year, suggesting a great deal of behavioural plasticity in heat-load management. Dr Celiwe Ngcamphalala again used our annual starling 'catch week' in mid-winter to expose Biological Sciences Honours students to methods used to study avian stress physiology, inviting the students to take part in catching efforts and observe and record data on blood-sampling, measurement and ringing, to aid their understanding of invasive versus non-invasive methods of studying wild animals.

Red-winged Starling field technician Dr Sally Hofmeyr examines the growth of the eponymous red flight feathers in a 17-day old red-winged starling chick (Photo: Mila Truter).

Interactions between urbanisation and climate change

Climate change and urbanisation are two of the most pervasive current drivers of global change. Impacts of climate change on wildlife could be exacerbated or buffered in urban areas. This is because major changes in habitat structure, food and water availability, disease exposure, species interactions, and pollution (light, sound and chemical) may all affect how wildlife can respond to rising temperatures and changing weather patterns. Additionally, urban environments tend to be hotter than surrounding natural landscapes (the 'urban heat island' effect), except in arid areas where they may be cooler. In 2023, we published a major perspectives paper in the journal *Global Change Biology* highlighting how we might expect the forces of urbanisation and climate change to interact in their effects on wildlife. In 2024, we began research to investigate interactions between weather conditions and a correlate of urbanisation: human presence. For this we are using the long-term database on the behaviour, body mass and breeding success of Red-winged Starlings on Upper Campus. This study is led by new MSc student Leslie Bayanza, who builds on Miqkayla Stofberg's preliminary pre-pandemic work on this topic. Leslie's preliminary analyses suggest an interaction between heat and human presence on the body mass of starlings recorded between 2017 and the present, such that starlings lose mass on hot low-human-presence days but are able to maintain body mass regardless of temperature on high-human presence days.

Energy expenditure in urban landscapes

Although urban areas pose novel challenges for wildlife, they also provide opportunities. Some species, such as the Red-winged Starlings, manage to take advantage of these opportunities and become very abundant in urban centres. Another such African urban 'success story' is that of the Crowned Eagle *Stephanoaetus coronatus*, which has reached higher densities in the Durban metropolitan area than anywhere else documented within its range. In 2024, we collaborated with researchers from the University of Vienna and University of KwaZulu-Natal (UKZN) on a project looking at how urban Crowned Eagles use the different habitat types available within the Durban Metropolitan Open Space System (DMOSS) and assessing the energetic costs associated with use of these habitat types. This project was taken up by CB MSc student Lara Howard, who is working with a dataset comprising movement data from five Durban Crowned Eagles wearing GPS tags fitted with accelerometers. Using location data, Lara was able to show that the forested areas of the DMOSS are instrumental in anchoring the eagles in this environment, although the birds do make hunting forays into suburban areas. In general, they avoid the highly built-up areas of the city, and this may be associated with a higher energy expenditure in these areas (as suggested by the accelerometer data), perhaps due to human disturbance.

Activities in 2024

- Abiodun Ademola finished data collection and lab work for her MSc project, which focuses on understanding the effect of fluctuations in human foot traffic on stress levels in adult and nestling Red-winged Starlings, using faecal glucocorticoid metabolites as a proxy for stress. She is now working on her write-up, for submission in 2025. Abiodun is supervised by Susie Cunningham and Celiwe Ngcamphalala.
- Leslie Bayanza began data collection for her project on the interaction between weather and human presence on starling body mass maintenance and breeding success. Leslie is using the long-term datasets amassed by the project since 2017 and collecting novel data of her own. Leslie is supervised by Susie Cunningham and Celiwe Ngcamphalala.
- Muano Ramavhoya studied relationships between built-up surfaces around nest sites and chick growth in the Red-winged Starlings for her BSc Hons, discovering no clear correlation between the two. Next steps will include assessing interactions between nest location and day status.
- Lara Howard joined Crowned Eagle researchers from UKZN and the University of Vienna in Durban to learn about the birds first-hand and witness transmitter fittings.
- A highly successful trapping effort in mid-2024 saw 39 new colour-ringed starlings added to the study population, bringing the total number of adult starlings ringed during the course of the project to 351. An additional 43 nestlings were ringed in 2024.
- Body mass maintenance and breeding monitoring of the starlings continued throughout 2024: these data will be used to

Crowned Eagles thrive in the Durban metropolitan area, but spend most of their time in the forested areas of the DMOSS. CB MSc student Lara Howard showed forays into built up areas are energetically costly for the eagles, perhaps due to increased disturbances by humans (Photo: Marc Graf and Christine Sonvilla).

investigate the effects of societal recovery from the COVID-19 pandemic on the productivity of urban wildlife, and, in the long term, to assess how climate change and urbanisation together impact the fitness of urban wildlife.

Highlights

- MSc student Leslie Bayanza joined the team from the DRC on a Mandela Rhodes scholarship.
- CB MSc student Lara Howard joined the team, facilitating collaboration with the Durban Crowned Eagle Project.
- The team had an exceptional catch week in June, capturing 47 starlings, illustrating the success of Celiwe's trap training methods. Of these, 39 were new captures and 8 were re-traps (mostly of birds ringed as nestlings in previous years).

Impact of the project

Studying the starlings 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. In addition, the starling project supports teaching at undergraduate (3rd year) and post-graduate (honours) levels, exposing students to the skills needed for field ornithology.

Key co-supporters

Vice-Chancellors' Future Leaders programme, Mandela Rhodes Scholarship programme, Mastercard scholarship programme, Ralph Buij, Jesus Bautista.

Research team 2024

Team leaders and collaborators:
A/Prof. Arjun Amar (FIAO, UCT)
A/Prof. Res Altwegg (SEEC, UCT)
A/Prof Susan Cunningham (FIAO, UCT)
Dr Celiwe Ngcamphalala (BioSci, UCT)
Dr Sally Hofmeyr (FIAO, UCT)
Dr Petra Sumasgutner (KLF, University of Vienna)
Dr Shane Sumasgutner (KLF, University of Vienna / UKZN)
A/Prof. Robert Thomson (FIAO, UCT)
Varalika Jain (KLF, University of Vienna)

Students: Jessleena Suri (PhD, UCT Stats); Abiodun Ademola (MSc, UCT), Leslie Bayanza (MSc, UCT), Lara Howard (CB MSc, UCT), Muano Ramavhoya (BSc Hons, UCT)

Volunteers: Mila Truter, Joel Radue, Daniella Mhangwana, Josua Wenzel, Suzanne Hofmeyr, Ilana Engelbrecht, Ben Wittenberg, Anthony Boetcher, Edith Binnema and many others.

Plastics in the environment

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 aquatic fauna, killing them directly, or reducing their appetite. Concerns about microplastics introducing persistent organic pollutants (POPs) into aquatic foodwebs, combined with the discovery of 'garbage patches' in all the main ocean gyres, has sparked renewed interest in the subject. This project aims to understand and monitor plastic pollution with a view to reducing the amount entering 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 serious environmental and economic threat. The most significant threat arises from plastic ingestion, so it is important to understand why organisms ingest plastic. During 2024, Vonica Perold completed her PhD, which compared plastics ingested by seabirds with those found in the environment, and assessed changes in ingested plastic over the last 40 years. In a similar vein, CB student Abigail Campbell was awarded her MSc for a study of the long-term changes in plastic loads in White-chinned Petrels *Procellaria aequinoctialis*.

Although much remains to be learned about the impacts of plastics on aquatic ecosystems, we know enough to act to limit waste plastic entering the environment. Reducing plastic pollution depends on changing human behaviour through education, policy interventions, incentives, etc. Knowing where marine plastic comes from, and how it disperses through the environment, is crucial to target mitigation measures. Fitz researchers have developed indicators for the levels of environmental plastics that assess the efficacy of measures introduced to reduce plastic leakage. We monitor plastic in the environment – through interactions with biota as well as sampling on beaches. Studies of 'general' marine litter, such as bottles and their lids, which could come from a variety of sources, have shown that most foreign drink bottles washing ashore are dumped illegally from ships, whereas most loose lids have drifted from distant land-based sources.

However, most litter close to urban centres in South Africa comes from local sources. A more applied project, funded through the South African Waste Research Development and Innovation Roadmap, has assessed the efficacy of devices designed to trap litter in rivers and storm drains, and used spatially explicit models to identify key sites for the installation of litter traps. This project also has a social component, trying to better understand why people litter in different communities across the Cape Flats.

Activities in 2024

- Vonica Perold completed her PhD on seabird plastic ingestion, garnering many plaudits from her examiners. Her paper on the use of Brown Skua *Catharacta antarctica* pellets as a way to monitor ingested plastic in South Atlantic seabirds was published in *Marine Pollution Bulletin*, and a second paper reporting long-term trends in four frequently-ingested species appeared in *Science of the Total Environment*.
- Abigail Campbell was awarded an MSc for her study of long-term changes in plastic ingestion among White-chinned Petrels since the 1980s. Towards the end of 2024, she added more data from birds killed recently on fishing gear to her data set, and has a paper ready for submission to *Marine Pollution Bulletin*.
- PhD student Kyle Maclean expanded his original focus from the amounts of litter intercepted in rivers and storm drains to include surveys of the amounts of street litter generated in four areas in Cape Town, across the socio-economic spectrum. During 2024 he conducted workshops to assess attitudes to litter and littering in these four communities in collaboration with Prof. Rinie Schenck, SARChi Chair in Waste and Society at UWC. Kyle's research is funded through an NRF bursary from Prof. Cristina Trois, SARChi Chair for Climate Change and Waste Management at UKZN.
- MSc student Chukwudi Nwaigwe made steady progress in writing up his study of the amount

and composition of litter contributed to beach litter loads by beach-goers. He also assessed the factors influencing surf zone litter in False Bay to assess whether there is significant export of beach litter into the sea. He will submit his dissertation in March 2025.

- Peter Ryan and Coleen Moloney spent two weeks on Inaccessible Island in September 2024, where they collected data on stranded bottles and added another year of data to the long-term study using skua pellets. The bottle findings, updating the 2018 data published in *PNAS* in 2019, were published in *Marine Pollution Bulletin*. Vonica Perold processed all the plastics found in skua pellets and added them to the final chapter of her PhD that determined long-term changes in the characteristics of plastics ingested by South Atlantic seabirds, and compared these data with samples collected from selected remote South African beaches since the 1980s. The paper describing her findings has been submitted to *Environmental Pollution*.
- The final year of intensive sampling of bottles washing ashore on Marion Island was completed in April 2024. Maëlle Connan is lead author on a paper describing their origins, which will be submitted in 2025.

Highlights:

- CB MSc student Abigail Campbell has updated her project to include the birds killed in 2024. A manuscript describing her findings will be submitted in early 2025.
- Vonica Perold was awarded her PhD and will graduate in 2025. She published two papers from her thesis in 2024 and will submit her final chapter for publication in January 2025. Perhaps surprisingly, she found little change in the amounts of plastic ingested by four petrels breeding on Inaccessible Island since the 1980s. However, there has been a decrease in the proportion of industrial pellets relative to fragments of manufactured items, reflecting improved pellet handling by plastics manufacturers and converters. Among plastic fragments, there has been an increase in the proportion of polypropylene relative to polyethylene. We lack a clear explanation for this change, but it was also detected in beached plastics.
- Peter Ryan led on a paper showing how the origins of drink bottle washing ashore on Inaccessible Island in the Tristan archipelago have changed over the last 6 years, with an increase in Chinese bottles more than offsetting a decrease in those from South America. He also assisted a Spanish team that reported the origins of bottles stranded in the Galapagos Islands, published in *Environmental Pollution*.
- Peter co-authored a paper in *Marine Pollution Bulletin* with Maëlle Connan and Lorien Pichegru showing how foreign drink bottle lids indicate a different litter source than foreign drink bottles on South African beaches; whereas most bottles are made in China and are dumped illegally from ships, almost all loose lids come from Indonesia, having drifted across the Indian Ocean.
- Peter also contributed to a paper led by Sarah Key from the University of Leicester, published in *Environmental Pollution* showing how colorants greatly affect the rate of degradation of plastic bottles in the environment.

Peter Ryan checking the origin and age of bottles washed ashore on Inaccessible Island (Photo: Coleen Moloney).

Key co-supporters

South African Department of Science and Innovation, through the Waste RDI Roadmap, managed by the Council for Scientific and Industrial Research (CSIR); Commonwealth Litter Programme (CLiP); United Nations Environment Programme.

Research team 2024

Team leaders and collaborators:
Emer. Prof. Peter Ryan (FIAO, UCT)
Emer. Prof. Coleen Moloney (BioSci, UCT)
Dr Maëlle Connan (NMU)
Dr Lorien Pichegru (NMU)
Dr Patrick O'Farrell (UWC)
Dr Giuseppe Suaria (CNR-ISMAR, Italy)

Students: Vonica Perold (PhD, UCT); Kyle Maclean (PhD, UCT); Chukwudi Nwaigwe (MSc, UCT); Abigail Campbell (CB MSc, UCT).

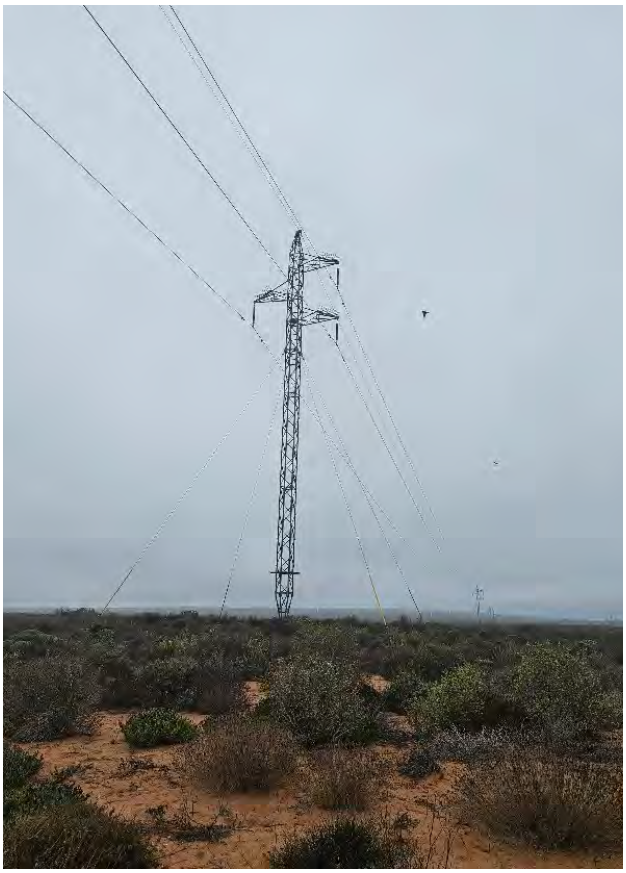
Understanding the ecological impacts of Pied Crows

Pied Crow *Corvus albus* numbers are increasing in many parts of South Africa. Recent work at the Fitz suggests that the increase is attributable to 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', and aims to understand what impacts these changes might have for biodiversity. Previous Fitz research has focused on quantifying predation on tortoises and avian nest predation. Our current project builds on that research, which suggested that crows may benefit from scavenging on the carcasses of road kills. We also work to gain a broad understanding of public perceptions on Pied Crows and their potential management.

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. Because they may prey on species that are important for processes like seed dispersal, increases in crow numbers may influence ecosystems, generally. Researchers and conservation organisations have begun drawing attention to the knowledge gap with regards to the ecological impacts of Pied Crows, emphasising 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. Our work contributes to filling these knowledge gaps.

Activities in 2024

- MSc student Yusra Samsodien, funded by the Joan Wrench Kirstenbosch Scholarship (SANBI), joined the project. She is investigating Pied Crow range expansion in South Africa using SABAP2 data, and exploring how anthropogenic factors influence the changes observed, with a special focus on the Western Cape fynbos. Yusra will also examine the biodiversity impacts associated with increasing Pied Crow abundance on tortoise populations.
- Yusra began her field work along the Eskom powerline at Sere Windfarm near Lutzville in the Western Cape to investigate the impacts of linear infrastructure on pied crow and tortoise numbers. Yusra undertook four 10-day field trips to count tortoises and crows at different distances from the powerline.



Field site near the Sere Windfarm and the monitored powerline (Photo: Yusra Samsodien).

Yusra Samsodien giving her award-winning talk at the Arid Zone Ecology Forum 2024 meeting (Photo: AZEF).

Highlights

- Temitope Adelola submitted her MSc thesis entitled "Pied Crow in South Africa: integrating ecological and social dimensions for effective management" and graduated in September. Her study gave key new perspectives on the effect of roadkill on Pied Crow abundance and breeding success, including understanding the public's perceptions of Pied Crows.
- Yusra attended the Arid Zone Ecology Forum conference held in Calvinia in October. She won the award for the best student presentation for her talk titled 'Pied Crow population changes in South Africa'.

Impact of the project

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

Key co-supporters

Joan Wrench Kirstenbosch Scholarship (SANBI), Mastercard Foundation, BirdLife South Africa.

Research team 2024

Team leaders and collaborators:
A/Prof. Robert Thomson (FIAO, UCT)
A/Prof. Arjun Amar (FIAO, UCT)
Dr Colleen Seymour (SANBI / FIAO, UCT)
Lizel Tolken (EWT)

Students: Temitope Adelola (MSc, UCT), Yusra Samsodien (MSc, UCT)

Conservation Biology Masters programme 2024

The 2024 intake of CB students comprised 13 students from seven countries: South Africa, Zambia, The Gambia, France, Germany, the UK, and the USA. All students completed the coursework successfully, and three students (23% of the class) achieved distinction grades in the coursework. Congratulations all!

Course structure and teachers

The course continues to be taught by a wide range of module leaders from within and outside UCT. In 2024, the module leaders were: Colin Attwood (Population Modelling); Jacqui Bishop (Conservation Genetics); William Bond (Big Picture Conservation in Context); Murray Christian (Statistics and Project Planning); Mike Cramer (Community Ecology); Susie Cunningham (Biodiversity Basics); Wendy Foden (Conservation Leadership); William Froneman (Marine Conservation); Dalton Gibbs (Urban Conservation); Lindsey Gillson (Climate Change); Mlungele Nsikani (Restoration Ecology); Justin O'Riain (Conservation Conflicts); Sebataolo Rahlao (Biological Invasions); Jeremy Shelton (Freshwater Conservation); Jasper Slingsby (Landscape Ecology and GIS); Claire Spottiswoode (Project Planning); Robert Thomson (Community Ecology); Gladman Thondhlana (Conservation and Society); and Jane Turpie (Resource Economics). Many others contributed through guest lectures, field trips and discussions. This diversity of perspectives adds greatly to the course.

Challenges and opportunities

Sally Hofmeyr continued in the role of Course Convenor for the year of 2024, but by the end of the year had handed over the reins to Dr Gabriel Jamie, who joined the Fitz in September as a lecturer in the Max Planck Centre. Gabriel has made a strong start as convenor and we are confident the course is in good hands in terms of both academics and course culture. Hilary Buchanan's retirement at the end of March and the onboarding process of her replacement, Nqubeko Hlekwayo, presented a challenge for the Course Convenor and the Director, who had to help Nqubeko to get up to speed as tight Science Faculty finances meant there was no allowance for a handover period with Hilary. The Admin Assistant is essential to the smooth running of the CB programme, so this could have been a very difficult period, but fortunately Nqubeko is a quick learner, and she hit the ground running. Sadly, at the end of the year, she moved on to another position, so this process will be repeated in 2025.

The 2024–25 CB class in the Niven Library. L-R (back): David Chapoloko, Catharina Caspers, Clara Marincowitz, Lara Howard, Dembo Jatta, Lesedi Moagi, Natalie Psillos, Tanki Thubela; (front): Atalante Itzicsohn, Jade Simoen, Claude Schippers, Miranda Mix, Keyura Pather (Photo: Wendy Foden).

Highlights

- Research done by CB MSc students for the dissertation component of their degree continues to produce publication-quality results. In 2024, three papers were published by CB MSc students on their research in international journals (*Conservation Science and Practice*, *AQUA—Water Infrastructure, Ecosystems and Society,* and *Ecohydrology*). At least six further papers were published by CB alumni on research they conducted after graduating. As ever, we are proud of the work our students are producing and the impact they have in the field of conservation biology globally.
- All 13 of the 2024 cohort of students successfully completed the coursework component of the degree. Three students achieved distinctions for their coursework.

MSc Conservation Biology projects 2024

Catharina Caspers: Conflict and coexistence: Assessing welfare outcomes in urban chacma baboon (*Papio ursinus*) management on the Cape Peninsula (Supervisors: Justin O'Riain, Joselyn Mormile, Esme Beamish, Ben Allen).

David Chapoloko: Evaluating fire management practices in Miombo Woodlands: Policy appropriateness, seasonal burning, and ecological consequences in Katanino Reserve, Zambia (Supervisors: Michael Cramer, Michael Cherry).

Lara Howard: Resource selection and energy expenditure of Crowned Eagles in an urban–forest mosaic landscape (Supervisors: Susan Cunningham, Petra Sumasgutner, Shane McPherson, Veera Jain).

Atalante Itzicsohn: Creating sustainable ecotourism investments for communal rangeland restoration in Kenya: Unlocking the potential of private sector involvement (Supervisors: Justin O'Riain, Jane Turpie).

Dembo Jatta: Estimating survival probability of critically endangered Hooded Vultures (*Necrosyrtes monachus*) in The Gambia (Supervisors: Robert Thomson, Gareth Tate, Lindy Thompson, Andrea Santangeli).

Clara Marincowitz: Molecular detection of Apicomplexan pathogens in the blood of endangered Cape cormorants (*Phalacrocorax capensis*) and Cape gannets (*Morus capensis*) (Supervisors: Jacqueline Bishop, Kathryn Morrissey).

Miranda Mix: Effectiveness of a mechanical removal of invasive spotted bass to conserve endemic fish in a Western Cape headwater stream (Supervisors: Jeremy Shelton, Colin Attwood).

Lesedi Moagi: White-browed Sparrow-weaver structures as a resource to avian communities in the Kalahari (Supervisors: Robert Thomson, Ben Ashton, Inês Gonçalves).

Keyura Pather: Putting the 'hot' in biodiversity hotspot: An assessment of the climate change vulnerability of Richtersveld plants (Supervisors: Wendy Foden, Domitilla Raimondo, Susan Cunningham).

Natalie Psillos: An updated analysis of abalone poaching in South Africa (Supervisors: William Froneman, Markus Burgener).

Claude Schippers: Assessing the impact of disturbance on breeding plovers: Implication for conservation in an important bird area (Supervisors: Robert Thomson, Carina Nebel, Anthony Lowney, Narhulan Halimbekh).

Jade Simoen: Satellites or sightings? The effectiveness of citizen science for modelling caracal (*Caracal caracal*) habitat use in a rapidly urbanising area (Supervisors: Jacqueline Bishop, Gabriella Leighton, Zoë Woodgate).

Tanki Thubela: The current and future distribution of *Pteronia incana* and its impact on biodiversity in the Eastern Cape (Supervisors: Muthama Muasya, Samson Chimphango).

Niven Library

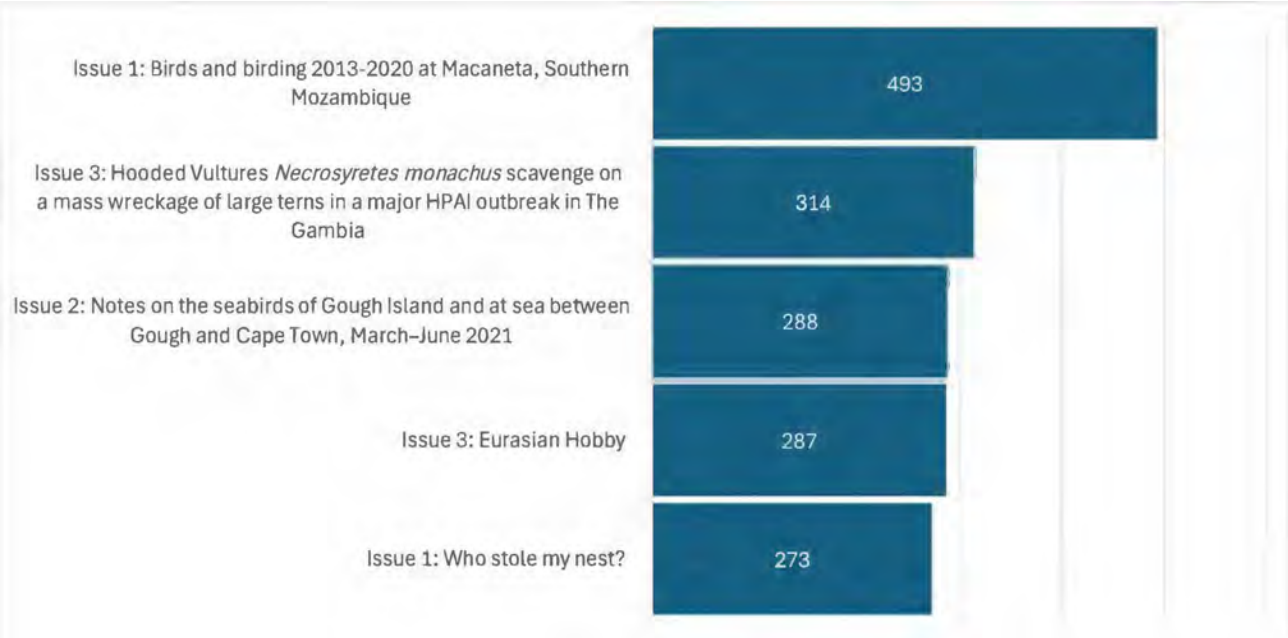
The Niven Library is often touted as the largest ornithological library in the Southern Hemisphere. Named after Dr Cecily Niven, the main architect of the FitzPatrick Institute of African Ornithology, it houses the joint collection of the Fitz and BirdLife South Africa. The main reading room also serves as a meeting place for staff, students, and visitors as it hosts Fitz social functions, meetings, seminars, the annual general meeting, and occasional classes.

If activity in the Niven Library in 2024 were an indicator for Fitz culture and productivity, then this was a year of community and industry. The year got off to a strong start, when in January, a guest speaker from the University of Guelph in Canada addressed staff and students from the Fitz and the Biological Sciences Department in the library. As usual, the library was the venue for regular staff, student group, Bird Club, and Red-winged Starling project meetings, as well as Fitz student presentations and the twice-monthly social gathering, "Thirsty Thursday".

This year, the library added selection committee and candidate interview meetings to its list, and it was also where those involved in the newly-established Max Planck-UCT collaboration gathered and met online with their overseas colleagues. This year, we received requests from three Grade 11 learners to use the library resources for school projects, which the librarian accommodated. In August, the Biological Sciences Department held a Women in Bio panel discussion in the library, which was very well attended. The year finished well with staff and student volunteers spending hours in the library counting and re-housing the nest record card collection. When the library was not being used as an event venue, Fitz students used it as a quiet writing space and a place to find and chat to peers about their studies.

Attendees at the Women in Bio panel discussion (Photo: Hana Peterson).

Students volunteered to help count and re-house the nest record card collection (Photo: Janine Dunlop).



The five most downloaded papers from the Fitz initiated journal, *Afrotropical Bird Biology.*

Issue no. 4 of ABB:

The Fitz-initiated journal, *Afrotropical Bird Biology: Journal of the natural history of African birds* (ABB), is managed by the librarian, who facilitates the publishing process from author submission to publication on the web. The journal published its fourth issue this year, containing five papers.

Since its inception in 2021, the journal's abstracts have received 8001 views, and its papers have been downloaded 5315 times. Gary Allport's *Birds and birding 2013-2020 at Macaneta, Southern Mozambique*, published in issue no. 1, has had an impressive 493 downloads. The download figures for the rest of the papers in the "five most downloaded" list are close, ranging from 317 to 273.

Sharing Fitz data

Being the moderator for Biological Sciences Department submissions to ZivaHub, the university's data repository, the librarian assisted staff and students to upload their datasets, add relevant metadata to describe them, choose appropriate file formats, and make informed decisions about intellectual property, and embargo periods and whether the data should be public or private.

This year, Fitz datasets received 17868 views and 6281 downloads.

Contributing to ornithological research

The Niven Library receives regular offers of donations of books and journals and for this, we are immensely grateful. Every accepted item added to the library collection contributes towards ornithological research, both now and in the future.

This year, we are thankful for a large and meticulously organised collection of papers, mainly on waterbirds, but also covering a vast range of other topics, from Tony Williams. This collection will be available as a database to Fitz staff and students.

We also appreciate donations of books from Colin Atwood, Peter Ryan, and Karl-Heinz Loske.

Preserving the Niven Library collections

As vital as it is to make the library's resources available to researchers, we have an equally important responsibility to preserve them for future generations of researchers. To this end, the library continued its ongoing task of ensuring that hard copy journals are bound, protecting their structure and ensuring they will be read for decades to come. This year, five titles, amounting to 23 volumes (and 156 issues) were preserved by means of hard cover binding.

Niven Library Staff 2024

Janine Dunlop (Niven Librarian)

SAFRING report

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

SAFRING received primary ringing data from 123 bird ringers during 2024, but ringers continue to submit data for 2024, so this number is likely to increase slightly. A total of 7 new SAFRING ringers were registered in the calendar year. Thus far for 2024, primary ringing data were received from 8 African countries, with resighting or recapture data of ringed birds from another 5 countries, mostly in Europe, North Africa and the Middle East.

Social media

Membership numbers of our SAFRING Registered Ringers Facebook group grew from 72 to 84. A variety of topics were discussed this year, including selling and donating rings and ringing equipment, tips for obtaining regional permits, trapping methods for particular species, and website and data uploading issues. We also used this group to obtain responses to a survey created to improve website functionality.

Our public Facebook group continues to be both a valuable source of information and an effective platform from which to share information about resightings of live and recoveries of dead ringed birds. During 2024, membership of this group grew from 1455 to 1566. We had 76 posts published to the group by ringers, members of the public, and group administrators, and these posts garnered 271 comments and 695 reactions. The value of this group is visible in the multiple reports of ringed birds from members of the public. A member of the public in Belarus, for example, who reported a sighting of a Common Tern, was excited to hear from us that the bird had been ringed by a SAFRING ringer just two months before in Senegal, which is 5672 km away.

A resighting of a Lesser Spotted Eagle was reported on 29 December near Shingwedzi, Kruger National Park. The bird was ringed as a nestling in Valga county, southern Estonia on 19 July 2023.

Common Tern 4H91546

At the end of June 2024, Kim-Kelly Hunt unfortunately left SAFRING to pursue teaching. Kim was an integral part of SAFRING for 4 years, and the main link between SAFRING and the SAFRING ringers. Kim started at SAFRING in 2019 as an NRF-funded intern and transitioned into the SAFRING data manager role in 2022. We thank her for all her years of service at SAFRING.

SAFRING team 2024

A/Prof. Robert Thomson (Co-ordinator, FIAO, UCT)
Janine Dunlop (Niven Librarian, FIAO, UCT)
Kim Kelly Hunt (Research & Data Manager) (Jan-Jun)
Michael Brooks (FIAO, UCT, SAFRING website maintenance)

SAFRING Steering Committee members:

Zephne Bernitz; Mark Brown (UKZN); Ursula Bryson (FIAO RA); Tammy Caine (FreeMe Wildlife); Brent Coverdale (KZN Wildlife); Johan de Jager (BirdLife North Gauteng); Chris du Plooy (BirdLife North Gauteng); Peter Hamming (Southern African Wildlife College); Alan Lee (BirdLife SA); Katta Ludynia (SANCCOB); Craig Nattrass (Vulpro; Wits Bird Club); Gareth Tate (EWT).

Southern African Bird Atlas Project (SABAP2)

The Southern African Bird Atlas Project (SABAP2) is a citizen science initiative that provides open-access data on bird distributions and reporting rates, supporting bird conservation and research across southern Africa. Covering South Africa, Lesotho, eSwatini, Namibia, Botswana, Zimbabwe, Zambia, Malawi, and Mozambique, the project serves as a valuable resource for students, researchers, and consultants. It plays a crucial role in training new scientists, guiding conservation efforts, conducting environmental impact assessments, and advancing research on bird biology and population health.

During 2024, a total of 1,103 citizen scientists actively contributed to the SABAP2, surveying 10,872 pentads and recording an impressive 950 species within the monitored region. Their efforts resulted in 1.6 million individual sightings, submitted across more than 65,000 cards under the project's two survey protocols. This significant contribution brought the overall dataset to over 25 million records across all protocols, reinforcing SABAP2's value as a critical long-term biodiversity monitoring initiative.

The continued success of SABAP2 is largely attributable to the dedication and commitment of its citizen scientists, whose collective efforts amounted to 120,000 hours of field surveys in 2024. Whether expanding geographic coverage into previously unrecorded or underrepresented areas or refining our understanding of local avian populations, their contributions provide essential data for assessing the impact of environmental changes on bird populations across the region.

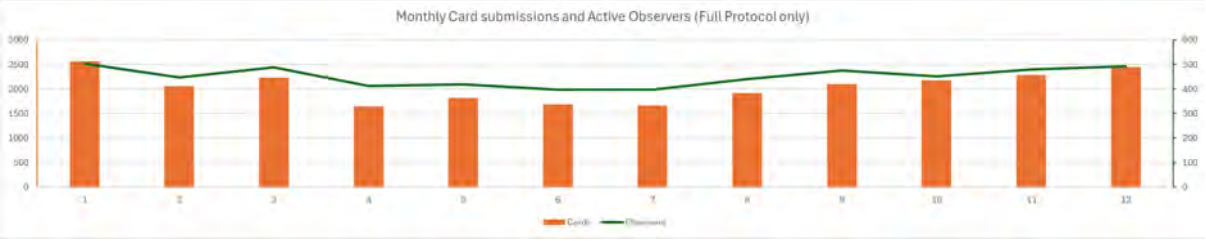
There were notable changes within the SABAP2 Steering Committee in 2024: Ernst Retief moved to a new role at BirdLife South Africa, and Dr. David Ehlers Smith, an avid atlaser, now supports SABAP2 in his capacity as the Science and Spatial Planning Project Manager at BirdLife South Africa.

In parallel, the African Bird Atlas Project (ABAP) also experienced substantial growth during this period. In 2024, data collection expanded to 24 African countries, culminating in 117,712 records from 3,025 pentads. These contributions were made possible through the dedicated efforts of 282 citizen scientists, further demonstrating the increasing reach and impact of bird monitoring initiatives across the continent. ABAP now has collected data from 52 of Africa's 54 countries!

Despite these successes, SABAP2 continues to face significant challenges, particularly in securing sustainable funding. Given the project's long-term commitment to continuous data collection, maintaining core operational systems remains a priority. We extend our sincere gratitude to the patrons and supporters whose generosity has sustained the project thus far. Their contributions have been instrumental in ensuring SABAP2's ongoing growth and success, and continued support will be vital for the project's future. The growing list of publications using SABAP2 data can be found at http://sabap2.birdmap.africa/media/bibliography.

SABAP2 team (Admin)

Dr. David Ehlers Smith (Project Coordinator, BirdLife SA)
Tania Anderson (Project Coordinator SABAP2, CWAC, CAR, FIAO)
Michael Brooks (Chief Technical Officer, FIAO)



Top 5 contributors (Full protocol only)

Name	Cards	Pentads	Species	Records	Name	Cards	Pentads	Species	Records
1. Mr R Hawkins	299	107	564	22355	4. Mr C Venter	219	97	499	16034
2. Mr D.R. McKenzie	296	163	542	20621	5. Mr J van Rensburg	216	91	466	9880
3. Mr M Benadie	225	176	630	14442					

Scientific publications 2024

Bold authors: Fitz staff and Research Associates
Bold and underlined authors: Fitz post-doctoral fellows and students (current and graduated)

IF = Thomson Scientific Impact Factor score (2019, 2-year impact factor)

Online Journal Published Papers

Abeyrama, D.K., **Risi, M.M.**, Connan, M., **Ryan, P.G.**, **Jones, C.W.**, Glass, T., **Osborne, A.M.**, Steinfurth, A., Schofield, A., Pistorius, P. and Keys, D. 2024. Cryptic variation in the sooty albatross *Phoebetria fusca*: genetic and morphological differences between Atlantic and Indian Ocean birds. *Conservation Genetics.* **IF: 2.0**
https://doi.org/10.1007/s10592-024-01656-0

Basu, P., Ngo, H.T., Aizen, M.A., Garibaldi, L.A., Gemmill-Herren, B., Imperatriz-Fonseca, V., Klein, A.M., Potts, S.G., **Seymour, C.L.** and Vanbergen, A.J. 2024. Pesticide impacts on insect pollinators: Current knowledge and future research challenges. *Science of The Total Environment* 954. **IF: 8.2**
https://doi.org/10.1016/j.scitotenv.2024.176656

Beaman, J.E., White, C.R., Clairbaux, M., Perret, S., Fort, J. and **Grémillet, D.** 2024. Cold adaptation does not handicap warm tolerance in the most abundant Arctic seabird. *Proceedings of the Royal Society B* 291. **IF: 4.7**
https://doi.org/10.1098/rspb.2023.1887

Benito-Kaesbach, A., Suárez-Moncada, J., Velastegui, A., Moreno-Mendoza, J., Vera-Zambrano, M., Avendaño, U., **Ryan, P.G.** and Sanz-Lázaro, C. 2024. Understanding the sources of marine litter in remote islands: The Galapagos islands as a case study. *Environmental Pollution*. **IF: 8.9**
https://doi.org/10.1016/j.envpol.2024.123772

Bentley, L.K., Phillips, R.A., Carpenter-Kling, T., Crawford, R.J., Cuthbert, R.J., Delord, K., **Dilley, B.J.**, **Makhado, A.B.**, Miller, P.I., Oppel, S., Pistorius, P.A., **Ryan, P.G.**, **Schoombie, S.**, Weimerskirch, H. and Manica, A. 2024. Habitat preferences of *Phoebetria* albatrosses in sympatry and allopatry. *Journal of Biogeography*. **IF: 3.4**
https://doi.org/10.1111/jbi.14966

Bliard, L., Dufour, P., Griesser, M. and **Covas, R.** 2024. Family living and cooperative breeding in birds are associated with the number of avian predators. *Evolution*. **IF: 3.1.**
https://doi.org/10.1093/evolut/qpae058

Brink, C.W., **Lee, A.T.K.**, Priyadarshani, D., Hwang, W.H., Retief, E., Chetty, K. and Whitecross, M.A. 2024. Recent distribution and population trends for Secretarybirds *Sagittarius serpentarius* in South Africa, Lesotho, and Eswatini from citizen science data. *Bird Conservation International* 34. **IF: 1.5**
https://doi.org/10.1017/S0959270924000157

Burawate, T.C. and **Lloyd-Jones, D.J.** 2024. Amphibian and reptile diversity of Niassa Special Reserve, Northern Mozambique. *Journal of East African Natural History* 113: 1-18. **NO IF**
https://doi.org/10.2982/028.113.0101

Carneiro, A.P., Dias, M.P., Clark, B.L., Pearmain, E.J., Handley, J., Hodgson, A.R., Croxall, J.P., Phillips, R.A., Oppel, S., Morten, J.M., Lascelles, B., Cunningham, C., Taylor, F.E., Miller, M.G.R., Taylor, P.R., Bernard, A., **Gremillet, D**. and Davies, T.E. 2024. The BirdLife Seabird Tracking Database: 20 years of collaboration for marine conservation. *Biological Conservation* 299. **IF: 4.9**
https://doi.org/10.1016/j.biocon.2024.110813

Clements, H.S., … **Cohen, C.**, … **Rollinson, D.** et al. 2024. The bii4africa dataset of faunal and floral population intactness estimates across Africa's major land uses. *Scientific Data* 11. **IF: 9.8**
https://doi.org/10.1038/s41597-023-02832-6

Colyn, R.B., Anderson, T.A., Anderson, M.D., Retief, E.F., Van der Westhuizen-Coetzer, E.J. and Smit-Robinson, H. 2024. The use of image classification to estimate flamingo abundance from aerial, drone and satellite imagery. *Ostrich*. **IF: 1.3**.
https://doi.org/10.2989/00306525.2024.2325674

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https://doi.org/10.1111/ecog.07432

Courbin, N., Besnard, A. and **Grémillet, D.** 2024. Transnational mortality from Spanish longline fisheries bycatch is shaping the decline of a vulnerable French seabird. *Biological Conservation* 293. **IF: 4.9**
https://doi.org/10.1016/j.biocon.2024.110597

Cruz-Flores, M., Lemaire, J., Brault-Favrou, M., Christensen-Dalsgaard, S., Churlaud, C., Descamps, S., Elliott, K., Erikstad, K.E., Ezhov, A., Gavrilo, M., **Grémillet, D.**, Guillou, G., Hatch, S., Huffeldt, N.P., Kitaysky, A.S., Kolbeinsson, Y., Krasnov, Y., Langset, M., Leclaire, S., Linnebjerg, J.F., Lorentzen, E., Mallory, M.L., Merkel, F.R., Montevecchi, W., Mosbech, A., Patterson, A., Perret, S., Provencher, J.F., Reiertsen, T.K., Renner, H., Strøm, H., Takahashi, A., Thiebot, J.-F.,

Thorarinsson, T.L., Will, A., Bustamante, P. and Fort, J. 2024. Spatial distribution of selenium-mercury in Arctic seabirds. *Environmental Pollution* 343. **IF: 8.9** https://doi.org/10.1016/j.envpol.2023.123110

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D'Amelio, P.B., Silva, N.J., Silva, L.R., Ferreira, A.C., Theron, F., **Doutrelant, C.** and **Covas, R.** 2024. Highly variable breeding phenology in an arid region colonial cooperative breeder, the Sociable Weaver *Philetairus socius*. *Ostrich*. **IF: 1.3** https://doi.org/10.2989/00306525.2024.2328654

Denner, C., Clements, H.S., Child, M.F. and De Vos, A. 2024. The diverse socioeconomic contributions of wildlife ranching. *Conservation Science and Practice*. **IF: 2.8**. https://doi.org/10.1111/csp2.13166

Diez-Méndez, D. and **Cunningham, S.J.** 2024. Open-cup nesters in the Kalahari: Incubation and egg-shading behaviour in passerines cannot be detected with temperature dataloggers during hot periods. *Journal of Arid Environments* 222. **IF: 2.7** https://doi.org/10.1016/j.jaridenv.2024.105159

du Plessis, N.S., Turpie, J.K. and Letley, G.K. 2024. Feasibility of financing nature-based solutions for water security through water tariffs: evidence from South Africa. AQUA—Water Infrastructure, Ecosystems and Society. **IF: 1.9** https://doi.org/10.2166/aqua.2024.221

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Engesser, S., **Ridley, A.R.**, Watson, S.K., Kita, S., Townsend, S.W. 2024. Seeds of language-like generativity in bird call combinations. *Proceedings of the Royal Society B* 291. **IF: 3.8** https://doi.org/10.1098/rspb.2024.0922

Ezenwa, I.M., Orakwelu, C.H., Okechukwu, C.R., Ebido, C.C. and **Martin, R.O.** 2024. 'Night vision' cameras as a tool for consistent and repeatable counts at communal overnight roosts for parrots. *Journal of Ornithology*. **IF: 1.3** https://doi.org/10.1007/s10336-024-02219-3

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Illera, J.C., Rando, J.C., **Melo, M.**, Valente, L., Stervander, M. 2024. Avian island radiations shed light on the dynamics of adaptive and nonadaptive radiation. *Cold Spring Harbor Perspectives in Biology* 16. **IF 6.9** https://doi.org/10.1101/cshperspect.a041451

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Madagascar's grasslands? *Plants People Planet*. **IF: 5.1** https://doi.org/10.1002/ppp3.10474

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