11TH AUSTRALASIAN ORNITHOLOGICAL CONFERENCE
8–10 FEBRUARY
AUCKLAND 2022

# ABSTRACT BOOK


# Contents

# KEYNOTE PRESENTATIONS

# Conservation energetics of seabirds: Keeping alight the ocean's brightest Fires of Life

**KYLE ELLIOTT**

February 8, 2022, 11.10am

Animal ecology is shaped by energy costs, as is clearly shown by the diversity of life histories among birds and their links to energetics. Indeed, birds have the brightest "Fires of Life". That is, they have the highest mass-specific metabolic rates of any animal, leaving them vulnerable to overheating while opening foraging opportunities in an energy-rich, warmer world. How these extreme costs shape the evolution of birds is most clearly seen in seabirds. For example, albatrosses have some of the lowest flight costs, at or near resting, and can sail across oceans. In contrast, auks have exceptionally high flight costs, leading some of the extinct auk genera to follow their southern hemisphere analogues, the penguins, into flightlessness. The talk will highlight recent discoveries in seabird energetics from the cellular and molecular levels to its pivotal role in ecology and evolution.

*Kyle Elliott is the Canada Research Chair in Arctic Ecology and an Associate Professors in the Department of Natural Resource Sciences at McGill University in Montreal, Canada. His father was a biologist and he grew up visiting seabird colonies along the Pacific Coast of Canada before completing at BSc at the University of British Columbia. He went on to complete Master's and PhD degrees at the University of Manitoba, studying primarily thick-billed murres in Hudson Bay. He is a New Zealand citizen and holds a lifetime fascination with the Pacific Ocean, currently focusing on the conservation physiology, energetics and foraging behaviour of seabirds.*

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# Integrating avian behaviour and conservation biology in the Anthropocene; expanding knowledge from Tīeke / North Island saddleback translocations

**Dianne Brunton**

*February 9, 2022, 11.10am*

Tīeke are arguably Aotearoa's most successful conservation story. Once widespread, by 1964 they were reduced to one island population due to their extreme susceptibility to introduced predators. This vocal and charismatic species was subject of the first 'formal' bird translocation in New Zealand. Most of the translocations that followed succeeded. Less well known is the significance of this species in our understanding of cultural evolution – they have an amazing ability to rapidly evolve novel songs and establish song dialects. I will present highlights of the field-based research that my research group have undertaken over the last 15 years. We quantified Tīeke song and found that distinct song lineages have evolved, and that novel songs form rapidly. We then used real-world experiments to test whether this rapid evolution of song cultures impedes genetic mixing when translocations include multiple cultural sources. Focussing on Shakespear Sanctuary, we found that a mixed translocation can maximise both genetic and cultural diversity and that Tīeke song culture is resilient. Some assortative pairing did take place, but this was not exclusive. Within 2 years, genetic mixing occurred, and cultural diversity increased as ancestral dialects were preserved and innovative dialects arose. First-generation males did inherit ancestral song, but also innovate their songs. If the goal for the Shakespear Tīeke translocation was to increase both cultural and genetic diversity, it was a success. Sadly, following our work, predator incursions have decimated this population and eliminated these novel song dialects – a harsh reminder that Tīeke remain highly susceptible to predators.

*Professor Dianne Brunton is a behavioural ecologist and conservation biologist in the School of Natural Sciences at Massey University's Auckland Campus Dianne is currently the Chair of the Auckland Zoo Conservation Fund and a Scientific Advisor to TiME (This is My Earth), a non-profit international environmental organisation that offers every citizen of the world an opportunity to protect biodiversity.*

# Birds in a land of drought and flooding rain

**RALPH MAC NALLY**

*February 9, 2022, 3pm*


Projections of how the biota will be affected by human-accelerated climate change have been made for more than 30 years. Much of the earlier work developed expectations based on monotonic changes in temperature, precipitation or related or derived meteorological variables. It has become clearer that the effects of climate change may be dominated by increases in the amplitudes of weather variables, that is, more frequent or more pronounced 'extreme events'. Such increased variation has characterized the climate of southern and eastern Australia since the mid-1990s, and the impacts on many components of the biota have been related to such fluctuations. This talk will focus mainly on how the birds of floodplain forests have responded to a novel pattern (in the instrumental record) of much longer, deeper droughts interspersed with inordinately wet periods. Some solutions to managing the birds' habitats will be considered.

*Ralph is a Professorial Fellow at the University of Melbourne, from which he gained his PhD and later a DSc. He was formerly Professor of Ecology and Director of the Australian Centre for Biodiversity at Monash University (until 2013) and Centenary Professor of Ecology at the University of Canberra (2014–2020). Mac Nally's research interests are in conservation ecology, ecological futures, community ecology and quantitative ecology. Apart from work in eastern Australia, he has collaborated on research in western North America, Amazonia and Spain. He has published more than 300 papers and was awarded the 2020 D. L. Serventy Medal by BirdLife Australia for contributions to ornithological research in the Australasian region.*

# Predicting the evolutionary potential of the threatened hihi – what can genomic information tell us?

**ANNA SANTURE**
*February 10, 2022, 11.10am*

Species of conservation concern tend to have small population sizes, high levels of inbreeding, and occur in isolated populations, all of which lead to continued loss of genetic diversity and reduced evolutionary potential. Studies that investigate a small snapshot of the genome can offer some insight into the ability of species to adapt to future changes. However, one of the most promising applications of genomics is to be able to link fine-scale measures of diversity across the genome to characteristics, or traits, that are important for survival and reproduction, enabling much more accurate predictions of the species' evolutionary potential. Studies in the wild give particularly valuable insight because species are observed in their natural habitat, so we can assess which traits matter most for the fitness of individuals. Hihi (stitchbird, Notiomystis cincta) is a threatened endemic Aotearoa New Zealand passerine that has been undergoing intensive conservation management since the 1980s, and is a model species for successful reintroduction biology. Using extensive information available from the Tiritiri Matangi island population dating back to 2005, we have been able to determine the genetic versus environmental contribution to key fitness traits, and assess the impact of inbreeding on these traits. I'll discuss what our results mean in terms of how best to preserve this unique species, and how we might use genomic information to understand the evolutionary potential of other threatened species.

*Anna Santure is a Senior Lecturer in Te Kura Mātauranga Koiora – School of Biological Sciences at Waipapa Taumata Rau – The University of Auckland. She grew up in Gore, Southland, and completed her BSc(Hons) and PhD in the Department of Zoology at the University of Otago. Anna held two postdoctoral positions in the UK, one at the Institute of Zoology, Zoological Society of London, and one at the University of Sheffield, before returning to Aotearoa in late 2013. Since then, she has had the privilege to work with fabulous collaborators, research fellows and students on a number of taonga manu including hihi (Notiomystis cincta). Her main research projects centre around the use of genomic information to assess the potential of species to adapt to future challenges, including climate change.*

# Woodland birds in rural environments: landscape structure offers key insights for conservation and management

**ANDREW BENNETT**
*February 10, 2022, 2.10pm*

Which characteristics of rural landscapes make them more effective for nature conservation? Agricultural landscapes occupy a third of Earth's land surface and so answering this question, together with a capacity to take effective action, will profoundly influence the future for global biodiversity. Together with colleagues and students, I have employed a 'whole of landscape' approach to understanding landscape change for bird communities. We have carefully selected rural landscapes that differ in the amount, configuration and composition of wooded vegetation amidst productive land uses, and systematically surveyed birds. I will present results to support several conclusions. 1) Bird communities respond strongly to the spatial properties of 'whole' landscapes, although sub-groups and species respond differently. 2) For woodland birds, a key influence is total extent of wooded vegetation. 3) As the extent of wooded vegetation decreases, richness of woodland species declines in a non-linear manner (potentially with a threshold). 4) Certain landscape features have particular importance: streamside vegetation, for example, has a distinctive avifauna and contributes disproportionately to landscape-scale richness of woodland birds. 5). The composition of bird communities is dynamic and vulnerable to extremes such as drought, but some landscapes are more resistant than others. 6). Replanting vegetation turns around the loss of species in depleted landscapes but does not simply reverse native vegetation loss. 7). Restoration is most effective in landscapes with some existing native vegetation, by supporting a complementary avifauna. 8). Actions of individual landholders matter: their impacts accumulate and benefits extend beyond the property to the wider landscape.

*Prof Andrew Bennett's research interests centre on understanding how human land-use and landscape change affect native fauna and ecological processes. His career includes a PhD at the University of Melbourne, wildlife research at the Arthur Rylah Institute for Environmental Research, 18 years with Deakin University, and a joint position as Professor in Ecology at La Trobe University and Science Leadership at the Arthur Rylah Institute. Currently, he is Prof in Ecology and Director of the Research Centre for Future Landscapes at La Trobe University. He was awarded the HL Serventy Medal by Birdlife Australia in 2021.*

# 1A | SEABIRD SYMPOSIUM I

**FEBRUARY 8, 2022, 12:40 PM - 2:10 PM**

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# 29. Reporting from the Polar Front: an interannual analysis of diving petrel stress and foraging during breeding and non-breeding stages

Bates Williams H[1], Della Penna A[1], Dunphy B[1]
[1]*The University of Auckland*

1A | SEABIRD SYMPOSIUM I, February 8, 2022, 12:40 PM - 2:10 PM

Seabirds are prime candidates as marine biomonitors due to their strong reliance on ocean ecosystems. The common diving petrel (*Pelecanoides urinatrix*) is a native New Zealand procellariform that resides on offshore islands during the breeding season. Adult birds from the Hauraki Gulf spend their austral summer (Nov-Dec) at the Antarctic Polar Front (APF) before returning to their colony to breed. While studies of other avian taxa have linked corticosterone, an avian stress hormone deposited in feathers (*f*CORT), with food availability, it is unknown whether diving petrel *f*CORT laid down during the non-breeding season reflects APF productivity. This research helps address this gap and provides much-needed baseline knowledge of *P. urinatrix* biology by investigating petrel stress, foraging ecology, and oceanic productivity between seasons from 2014 to 2018.

To analyse petrel stress in relation to APF productivity, we compared *f*CORT extracted from archival feathers with APF chlorophyll-*a* concentrations obtained from satellite ocean colour data. Moreover, to identify potential changes in trophic feeding ecology and oxygen delivery capacity during breeding seasons, we compared stable isotopes in blood ($\delta^{13}$C and $\delta^{15}$N) and haematological parameters. Stable isotopes and haematological parameters differed significantly between years, suggesting environmental conditions within the Hauraki Gulf influenced petrel physiology and behaviour. Altogether, our results indicate that *P. urinatrix* shows significant promise as a biomonitor of at-sea conditions, which has important implications for petrel conservation and our understanding of oceanic environments.

*Holly Bates Williams is a BSc(hons) student at the University of Auckland with a keen interest in the ecology of New Zealand seabirds.*

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# 33. Ecophysiology of tītī wainui - fairy prions

Whitehead E[1], Gaskin C[1], Dunphy B[1]
[1]*The University Of Auckland Waipapa Taumata Rau*

1A | SEABIRD SYMPOSIUM I, February 8, 2022, 12:40 PM - 2:10 PM

Monitoring the health of seabird populations is a crucial tool to assist in the conservation of the world's most threatened group of birds. Ecophysiological methods hold promise to provide a more rapid insight into population health than long term studies of demographic metrics – but only if they are validated alongside these data. Here we present the initial findings of an ecophysiological investigation into the health of the northernmost population of any *Pachyptilla* species, fairy prions (*Pachyptilla turtur*) breeding on the Poor Knights Islands. This population may help us gain insights as to how the meta-population and the more southerly colonies will respond to warming oceans, due to their position at the very edge of the species geographic distribution. Integrative methods utilising physiological, remote sensing environmental, and movement data will assist in untangling the links between oceanic change and seabird health. Developing and validating these methods is an urgent goal for applying physiological research to species conservation.

*Edin Whitehead is a doctoral researcher at the University of Auckland Waipapa Taumata Rau. Her research focuses on integrative methods for seabird conservation combining ecophysiological data with movement and foraging ecology.*

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# 43. Rapid radiation of Southern Ocean shags in response to receding sea ice

Rawlence N[1], Kennedy M, Spencer H
[1]*Department of Zoology, University of Otago*

1A | SEABIRD SYMPOSIUM I, February 8, 2022, 12:40 PM - 2:10 PM

Understanding how wild populations respond to climatic shifts is a fundamental goal of biological research in a fast-changing world. The Southern Ocean represents a fascinating system for assessing large-scale climate-driven biological change, as it contains extremely isolated island groups within a predominantly westerly, circumpolar wind and current system. The blue-eyed shags (*Leucocarbo* spp.) represent a paradoxical Southern Ocean seabird radiation; a circumpolar distribution implies strong dispersal capacity yet their speciose nature suggests local adaptation and isolation. Here we use mitochondrial and nuclear sequence data to conduct the first global genetic analysis of this group using a temporal phylogenetic framework to test for rapid speciation. Our analysis reveals remarkably shallow evolutionary histories among island-endemic lineages, consistent with a recent high-latitude circumpolar radiation. This rapid sub-Antarctic expansion contrasts with significantly deeper lineages detected in more temperate regions such as South America and New Zealand that may have acted as glacial refugia. The dynamic history of high-latitude expansions is further supported by ancestral demographic and biogeographic reconstructions. The circumpolar distribution of blue-eyed shags, and their highly dynamic evolutionary history, potentially make *Leucocarbo* a strong sentinel of past and ongoing Southern Ocean ecosystem change given their sensitivity to climatic and anthropogenic impacts.

*Nic is the Director of the Otago Palaeogenetics Laboratory and Senior Lecturer in Ancient DNA in the Department of Zoology at the University of Otago. Nic's research uses ancient DNA to reconstruct prehistoric ecosystems, how they were impacted by climate change and humans, and how we can learn from that.*

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# 70. Hoiho Conservation: Current Trends, Threats and Opportunities

Schultz H[1], McKinlay B[1], Webster T[2]
[1]*Department of Conservation,* [2]*Yellow-eyed Penguin Trust*

1A | SEABIRD SYMPOSIUM I, February 8, 2022, 12:40 PM - 2:10 PM

Hoiho (Yellow-eyed penguin, *Megadyptes antipodes*) breed in New Zealand from Banks Peninsula in the North to Campbell Island in the New Zealand Subantarctic. They are a long-lived species and can produce up to two chicks per breeding season. In spite of these attributes, numbers have fluctuated and in the last decade have declined by *c*. 70%. Threats to hoiho are both terrestrial (e.g. predation, habitat loss, disease) and marine (e.g. fisheries interactions, predation) in nature. Significant conservation efforts have resulted in increased protection on land, including intensive terrestrial habitat management. Mitigation measures in the marine environment have occurred and continue to be refined. However, overall population trends remain negative and novel threats (i.e. diseases) continue to emerge. This presentation reviews the causes of decline in total numbers along the habitat of the south-eastern South Island and summarises conservation efforts and research initiatives. We demonstrate the complexity of challenges when working across terrestrial and marine domains and the diverse nature of the research efforts needed to investigate and provide management solutions. We also outline the framework established to support conservation management on the ground and highlight priorities for the future conservation of hoiho in the Subantarctic.

*Hendrik Schultz is a Technical Advisor with the Department of Conservation in Dunedin. He has a research interest in the conservation biology and foraging ecology of seabirds. For his PhD, Hendrik studied the foraging ecology of Chatham Island brown skuas.*

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# 73. Segregation of foraging areas by breeding Tākapu/ Australasian Gannets Morus serrator in the Hauraki Gulf

Adams N[1], Gaskin C[2], Lukies K[2], Whitehead E[3]
*[1]Unitec Institute Of Technology, [2]Northern New Zealand Seabird Trust, [3]University of Auckland*

1A | SEABIRD SYMPOSIUM I, February 8, 2022, 12:40 PM - 2:10 PM

Tākapu are common seabirds utilizing the waters of the Hauraki Gulf/ Tīkapa Moana. We present here the results of GPS tracking of adults attending chicks from two neighbouring colonies in the inner and outer Gulf across three consecutive breeding seasons. Activity hotspots away from the colony likely coinciding with intensive foraging showed substantial interannual variation but a range of patterns were identified. In years with simultaneous tracking from the two colonies, birds showed substantial segregation of foraging areas in spite of the potential for large overlap based on their flight capabilities. Tracking of birds in 2020 was restricted to the outer Gulf colony but similarly suggested foraging was constrained by presence of birds from the inner Gulf. Overlap in activity hotspots in November-December 2019, when we had intensive, simultaneous tracking from both colonies, occurred most noticeably in the mid Gulf area at approximately equidistance (40-50km) from each colony. A substantial number of birds from both colonies returned to this locality on successive trips although repeated trips to the same location was seen away from population level hotspots. This pattern was less obvious in 2020. Factors shaping the at sea distribution of breeding tākapu in the Gulf are likely the effect of density dependant competition with conspecifics from different colonies, as shown for a number of other seabirds, coupled with temporal and spatial fluctuations in the abundance of prey. The most parsimonious explanation for a pattern of individually repeated trips is that birds retain a memory of the locality of previously successful foraging trips.

*Dr Nigel Adams, Assoc. Professor School of Environmental and Animal Sciences, Unitec, Foraging, Feeding and stress responses of seabirds, Conservation of Kea.*

# 1B | MANAGING THREATENED SPECIES I

**FEBRUARY 8, 2022, 12:40 PM - 2:10 PM**

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# 12. Livestock production land and conservation areas play a complementary role in the conservation of a critically endangered grassland bird – the Plains-wanderer Pedionomus torquatus

Nugent D[1]

[1]*La Trobe University*

1B | MANAGING THREATENED SPECIES I, February 8, 2022, 12:40 PM - 2:10 PM

For native grasslands in agricultural landscapes, livestock production and biodiversity conservation are important uses of that land. Approaches to managing structural changes that result from climate cycles typically differ between production farms and conservation areas as they have different goals. This has the potential to shift habitat suitability for grassland fauna across landscapes.

The critically endangered Plains-wanderer *(Pedionomus torquatus*) is a habitat specialist that occurs on land managed for both livestock production and conservation in semi-arid grasslands of eastern Australia. It is unclear if habitat suitability for the Plains-wanderer is stable or shifts in response to interactions between different land uses and climate phases. Here we investigate if land use type (production, conservation) interacts with climate (rainfall) to affect habitat suitability of the Plains-wanderer using 11 years of bird occurrence and remotely-sensed habitat structure data.

We found habitat suitability for the Plains-wanderer was driven by an interaction between land use type and rainfall, with conservation areas supporting more high value habitat during dry periods but less during wet periods. Plains-wanderer occurrence was also influenced by interactions between land use and rainfall, with birds more likely to occur at production farms during wet periods.

Our findings show how land used for livestock production can complement conservation areas in providing high value habitat for the Plains-wanderer. Furthermore, they highlight that land use type and climate are important drivers of grassland dynamics, and approaches to biodiversity conservation should consider that patterns of habitat suitability may shift across landscapes over time.

*Daniel Nugent is a PhD candidate at La Trobe University studying the ecology of the Plains-wanderer and management of native grasslands in south-eastern Australia.*

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# 34. Would the only Tasmanian flightless rail become threatened?

Leveque L[1], Carver S[1], Buettel J[1], Brook B[1]
[1]*Univeristy Of Tasmania*

1B | MANAGING THREATENED SPECIES I, February 8, 2022, 12:40 PM - 2:10 PM

The Tasmanian native hen (*Tribonyx mortierii*) is a rare and emblematic case of a surviving flightless rail, as the Rallidae is the most extinction-prone bird family globally. The Tasmanian native hen remains relatively common in Tasmania but has already experienced localised and more generalised extinction events (e.g., on mainland Australia during the Holocene). Here, we explore the relationships between ecological changes and the population structure and reproductive rate of *T. mortierii*, using the Maria Island population, where major changes over the last two decades have created an opportunistic natural experiment. We combined these results with Habitat Suitability maps (from SDM) under climate change scenarios for the whole of Tasmania. We found that the native hen population on Maria Island has declined by 70% compared with two decades ago, with territories larger but of lower quality and a much lower reproductive rate (75% decrease in the proportion of breeding groups). While it is challenging to identify the exact causes of the decline on Maria Island, we hypothesised that the impact of over-grazing by macropods, coupled with climate variability like drought, is likely to have affected water retention and vegetation cover, leading to reduced habitat quality. Despite this decline, we found that native hens were expected to increase their range in Tasmania under climate change scenarios. Thus, while their future in Tasmania seems secure, a more complex model including land-use projection would be informative. Our results raise the question of the role of climate for their Australian mainland extinction.

*Lucile Leveque is a passionate science communicator based at the University of Tasmania (Australia) where she is finishing her PhD on the drivers of vulnerability in rails and the ecology of the flightless Tasmanian native hens. Before a PhD, she spent a year birdwatching and volunteering in New Zealand.*

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# 50. The Barking Owl Ninox connivens in south-western Australia: addenda to our current knowledge

Davis R[1,2], Joseph L[3], Johnstone R[2]
*[1]School of Science, Edith Cowan University, [2]Western Australian Museum, [3]Australian National Wildlife Collection, CSIRO*

1B | MANAGING THREATENED SPECIES I, February 8, 2022, 12:40 PM - 2:10 PM

The Southern Barking Owl *Ninox connivens connivens* ranges mainly south of Townsville in Queensland, south through New South Wales (NSW) and Victoria to Western Australia. The species is sparsely distributed across this range and listed as Near Threatened. The status of the Barking Owl in south-western Australia is very poorly known compared to all other range states and compared to the northern populations in WA. Several formal surveys using call playback across large areas in south-western Australia have failed to locate Southern Barking Owls. To clarify the current status of the Southern Barking Owl in Western Australia, we reviewed all known records. We identified 8 museum specimens, the latest of which was collected in 1963. We reviewed sightings from Birdata, e-bird and other sources and applied a veracity score to each. We identified only ten sightings since 2000 that met our criteria as certain. The subspecies name, *N. c. addenda* Mathews 1912, is available for south-west Barking Owls. We have located the hitherto missing holotype of *addenda*. Future work will focus on resolving the taxonomic validity of this subspecies name. The south-west population of Barking Owl may now be one of Western Australia's most threatened bird species. It requires urgent research to further locate individuals and assess the current conservation status.

*Dr Robert Davis is a Senior Lecturer in Wildlife Conservation at Edith Cowan University in Perth, Western Australia. He and his lab investigate the drivers of species decline and have a particular focus on birds in Australia and the Pacific.*

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# 61. Effects of an island-wide rodent eradication on two threatened bird species

Segal R[1]
[1]*Charles Sturt University*

1B | MANAGING THREATENED SPECIES I, February 8, 2022, 12:40 PM - 2:10 PM

For the last 50 years, rodent eradications have been conducted worldwide to reverse the devastating impacts of introduced rodents on island species. However, few studies have quantitatively measured the effects of rodent eradications on native species and ecosystems. This study investigated the effects of an island-wide rodent eradication on Australia's Lord Howe Island in 2019 on the Lord Howe currawong (*Strepera graculina crissalis*) and the white tern (*Gygis alba*). Currawongs were at risk of poisoning during the eradication, and hence 30-40% of the population were taken into captivity during the baiting programme (4 months). The island's white tern population was expected to benefit from the eradication, as predators of the species were decimated. We found that the rodent eradication had an immediate effect on the currawong population with a high proportion of banded currawongs disappearing during the eradication. In one area, from where no birds were taken into captivity, nesting densities of currawongs were significantly lower after the eradication than before the eradication. It is most likely that currawongs from these 17 previously occupied territories died of poisoning as they were not resighted for two seasons after the eradication. Necropsies on 25 currawongs found dead in the forest, confirmed that they had died due to poisoning. However, breeding success of currawongs was as high after the eradication (2019-2020) as before the eradication (2017-2018), and the period of captive management had little effect on the breeding success of those birds after release. White terns did not benefit from the eradication: their breeding success was as low after the eradication as before, with only a single chick fledging in 3 years. Our study has identified several unexpected outcomes of a rodent eradication and reinforces the necessity of integrating ecological monitoring as part of future eradications on islands.

*Final year PhD student at Charles Sturt University. I am researching the effects of the Lord Howe Island rodent eradication project on two native bird species, the currawong (Strepera graculina crissalis) and the white tern (Gygis alba).*

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# 66. Conservation ecology of the Abrolhos Painted Button-quail: averting another bird extinction

Carter R[1], Davis R[1], Burbidge A[1,2], Lohr C[2]
*[1]Edith Cowan University, [2]Department of Biodiversity, Conservations and Attractions*

1B | MANAGING THREATENED SPECIES I, February 8, 2022, 12:40 PM - 2:10 PM

Globally, islands suffer a disproportionate extinction rate of birds compared to mainland areas. Though comprising less than 5% of the global land area, they are global centres of endemism, containing at least 20% of endemic species and are the last remaining refuge for many species. Humans have facilitated the spread of rodents and other invasive mammals to over 80% of islands and are a leading cause of island bird extinctions. The Abrolhos Painted Button-quail (*Turnix varius scintillans*), is an endemic island subspecies from the Abrolhos Islands in Western Australia. It is considered highly vulnerable to extinction due to being confined to three islands, of which one has both introduced rodents and an introduced herbivore. We investigated the potential extinction of this subspecies on North Island where it has not been sighted since 2006. Camera traps were deployed over multiple years on all three islands where the bird is known to inhabit. Camera traps worked well to detect button-quail, but none were detected on North Island. We present data on changes to vegetation from introduced Tammar wallabies and the high density of house mice on North Island to suggest that these factors have interacted to cause the extinction of the North Island population.

*Ryan Carter is a Master by Research candidate. He has a strong interest in avian and reptile ecology, particularly on islands, as well as the management and ecology of invasive species.*

# 1C | ECOLOGY AND EVOLUTION OF AVIAN PATHOGENS AND THEIR HOSTS SYMPOSIUM I

**FEBRUARY 8, 2022, 12:40 PM - 2:10 PM**

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# 71. Increased disease prevalence and effects on the conservation management of hoiho

Webster T[1], McKinlay B[2], Schultz H[2]
[1]*Yellow-eyed Penguin Trust,* [2]*Department of Conservation*

1C | ECOLOGY AND EVOLUTION OF AVIAN PATHOGENS AND THEIR HOSTS SYMPOSIUM I, February 8, 2022, 12:40 PM - 2:10 PM

Increasingly diseases are a major challenge to the conservation management of wildlife, and the yellow-eyed penguin or hoiho (*Megadyptes antipodes*) is no exception. Hoiho are susceptible to a range of diseases, which can be age related or opportunistic if a bird's immune system is suppressed, particularly when a bird is environmentally or nutritionally stressed. The management and conservation of hoiho is becoming increasingly complex and disease has played a significant role in recent declines of this species. The Northern population (South Island and Rakiura, New Zealand) now number fewer than 250 breeding pairs and have declined by 70% since 2008. Diphtheritic stomatitis continues to cause death in young chicks and has reduced the number of chicks surviving to fledge since 2002. Hoiho also suffer mortality events of unknown cause, for example, mass mortalities in 1989/90 and 2012/13 which together resulted in the loss of more than 200 adult birds. Avian malaria has increased in prevalence in recent years, and has resulted in the deaths of *c*.50 hoiho on the South Island between 2017 and 2019. This is likely in part due to changes in climate which support prime breeding conditions for mosquitoes that transmit the *Plasmodium* blood parasites. Disease is likely to continue to be a major issue into the future as stress on hoiho populations increases due to a changing climate, food availability and disturbance. Given the significance of disease impacts there has been an intensification of the conservation management response for hoiho and a focus on disease research.

*Trudi Webster works as the Science Advisor for the Yellow-eyed Penguin Trust. Her research interests lie in the conservation ecology of marine vertebrates.*

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# 115. Wildlife Disease Risk Assessment for the Orange bellied Parrot (Neophema chrysogaster)

Eden P[1], Adams L, Tolpinrud A, Galligan T
[1]*Zoos Victoria - Werribee Open Range Zoo*

1C | ECOLOGY AND EVOLUTION OF AVIAN PATHOGENS AND THEIR HOSTS SYMPOSIUM I, February 8, 2022, 12:40 PM - 2:10 PM

A wildlife disease risk assessment was undertaken to assess and identify mitigation actions for risks associated with disease for key elements of the Orange-bellied Parrot recovery program. This project was undertaken following guidelines from a joint publication of the World Conservation Union (IUCN) and the World Animal Health Organisation (OIE), with modifications to adapt to COVID-19 pandemic restrictions. This presentation will provide an overview of how this project was approached and highlight some of the key outcomes and benefits to the species' recovery program.

*Paul Eden, Veterinarian (Werribee Open Range Zoo, Victoria) and Chair of the Orange-bellied Parrot Recovery Team's Veterinary Technical Reference Group. Research interests include the health and disease of threatened species and improving our understanding of the intersection between animal ecology and disease.*

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# 47. Evidence of many viruses, including human adenoviruses in apparently healthy Australian Neophema birds: An example of potential cross-species transmission

Sarker S[1]

[1]*Department of Physiology, Anatomy and Microbiology, School of Life Sciences, La Trobe University*

1C | ECOLOGY AND EVOLUTION OF AVIAN PATHOGENS AND THEIR HOSTS SYMPOSIUM I, February 8, 2022, 12:40 PM - 2:10 PM

Emerging viral diseases are a significant concern, with potential consequences for human, animal and environmental health. Over the past several decades, many novel viruses have been found in animals, including birds, and often pose a major threat to vulnerable species. Despite enormous interest in virus research, little is known about virus communities (viromes) in apparently healthy Australian *Neophema* birds. Therefore, this study was designed to characterise the viromes in the two species of *Neophema* birds using a metagenomic approach. This study identified 16 viruses belonging to the families *Adenoviridae, Circoviridae, Parvoviridae, Endornaviridae, Picobirnaviridae* and *Picornaviridae*. In addition to discovering many known and unknown viruses circulating in *Neophema* birds, this study also demonstrated a potential evolutionary relationship of a psittacine siadenovirus 2 sequenced previously from the critically endangered orange-bellied parrot. Strikingly, five adenoviral contigs identified in this study showed the highest identities with the human adenovirus 2 and human mastadenovirus C. This highlights an important and unexpected aspect of the avian virome and warrants further studies dedicated to this subject. The evidence of viral pathogens, particularly human adenoviruses, in these birds documents a concerning example of the case with which such infectious agents may spread to other birds and humans living in their proximity. Finally, the findings of this study warrant an integrated "One Health" actions with multisectoral engagement for working at human-animal-environmental interface to interrupt disease transmission dynamics.

*Dr Subir Sarker is an ARC, Discovery Early Career Researcher Award Fellow at La Trobe University, Melbourne. Dr Sarker uses cutting-edge molecular tools to explore evolutionary and macromolecular disease processes critical for animal health crucial and sustainable ecosystems.*

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# 62. Out of Australia? Insights into the Evolution, Diversity and Biology of Adenoviruses in Wild Birds

Phalen D[1], Vaz F, Athukorala A, Hunt T, Leishman A, Lacasse C, Curtiss J, Sarker S
[1]*University Of Sydney*

1C | ECOLOGY AND EVOLUTION OF AVIAN PATHOGENS AND THEIR HOSTS SYMPOSIUM I, February 8, 2022, 12:40 PM - 2:10 PM

Little is known about the diversity of adenoviruses in wild birds and how they evolved and are maintained in complex ecosystems. In this study samples were collected from Australian woodland birds, birds submitted for care, silver gulls, and feral pigeons. Samples were screened for adenovirus DNA using a polymerase chain reaction. Adenovirus sequences were detected in 86 samples representing 35 novel adenovirus sequences. Complete genomes of three adenoviurses were determined using next generation sequencing. Fifteen novel sequences were atadenoviruses, seven were aviadenoviruses, thirteen were siadenoviruses, and one was a mastadenovirus. Sequences were compared with published adenovirus sequences. Sequences from passerine birds mapped to one or more lineages in the atadenovirus, siadenovirus, and aviadenovirus genera. Viruses from Australian passerines appeared to have co-evolved with a diverse group of woodland birds that share similar habitat. Evidence for host/virus co-evolution in some viruses and a wide host range in others was observed. Sequences from psittacine birds were either identical or similar to adenovirus sequenced from captive birds, suggesting a possible origin of the psittacine adenoviruses in ancestral Australian psittacine birds. Whole genome sequencing of an adenovirus from an orange-bellied parrot and an eastern spinebill provided additional evidence that ancestorial Australian birds were the origin of the atadenoviruses and avian siadenoviruses. Increasing data suggest that disease outbreaks in avicultural and rehabilitation collections result from infection spreading from an adapted host to a naïve host. Lastly, the study provided evidence for host switching between invasive and native species and native and invasive species.

*David is a Professor at the University of Sydney where he teaches wildlife and exotic animal medicine to veterinary students. His research interests are diverse ranging from infectious, nutritional, and toxicological diseases of wildlife and pet and aviary birds to conservation of koalas and endangered birds and reptiles.*

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# 106. How water in the Australian landscape governs duck numbers, Avian Influenza epidemiology and AI outbreaks in poultry

Klaassen M[1], Yu H
[1]*Deakin University*

1C | ECOLOGY AND EVOLUTION OF AVIAN PATHOGENS AND THEIR HOSTS SYMPOSIUM I, February 8, 2022, 12:40 PM - 2:10 PM

Globally, outbreaks of Avian Influenza Virus (AIV) in poultry continue to burden economies and endanger human, livestock and wildlife health. Wild waterbirds are often identified as possible sources for poultry infection. Therefore, it is important to understand the ecological and environmental factors that directly influence infection dynamics in wild birds, as these factors may thereby indirectly affect outbreaks in poultry. In Australia, where large parts of the country experience erratic rainfall patterns, intense rainfalls are thought to result in waterfowl breeding events and increased proportions of immunologically naïve juvenile birds. It is hypothesized that after breeding, when the temporary wetlands dry, increasing densities of immunologically naïve waterbirds returning to permanent water bodies contribute to AIV prevalence in wild waterfowl in Australia. Since rainfall has been proven to be an important environmental driver in AIV dynamics in wild waterbirds in southeast Australia and wild waterbirds are identified globally to have a role in virus spillover into poultry, we hypothesise that rainfall events have an indirect effect on AIV outbreaks in poultry in southeast Australia. We evaluated these hypotheses by analysing how temporal fluctuations in water availability in the landscape drives duck numbers, with cascading effects of AIV epidemiology and outbreaks of AIV in the Australian poultry industry. An exercise that is aimed at leading towards an early-warning, risk-assessment model for the Australian poultry industry, which is increasingly at risk due to the demand for free-range poultry products.

*Marcel Klaassen is Alfred Deakin Professor and Chair in Ecology with broad research interests involving theoretical, experimental and observational studies on all sorts of life. Nevertheless, disease ecology and the ecology of migratory shorebirds and waterbirds have his particular attention.*

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# 58. The ecology of avian influenza virus in Australian wild birds

Wille M[1], Lisovski S, Roshier D, Ferenczi M, Hoye B, Leen T, Warner S, Foucier R, Hurt A, Holmes E, Klaassen M

[1]*University Of Sydney*

1C | ECOLOGY AND EVOLUTION OF AVIAN PATHOGENS AND THEIR HOSTS SYMPOSIUM I, February 8, 2022, 12:40 PM - 2:10 PM

Avian influenza virus is ubiquitous in wild waterbirds, and in the Northern Hemisphere, viral prevalence may be up to 30% in Mallard populations during the autumn months. While these viruses do not cause observable disease in their wild bird hosts, avian influenza may have a substantial negative impact when introduced to poultry populations, particularly following the emergence of high pathogenicity viruses. Despite long term surveillance for these viruses in Australia, the ecology of avian influenza in Australia remains opaque. To address key gaps, we analysed 12184 oropharyngeal and/or cloacal swabs and 10658 serum samples collected over 11 years from wild birds in Australia for the presence of AIV and anti-AIV antibodies. As well as describing species level differences in prevalence and seroprevalence, we reveal that host phylogeny is a key driver in susceptibility, even within avian families with established AIV reservoir status, and observed large differences in AIV competence among both ducks and sandpipers. We further demonstrate that juveniles generally have higher viral prevalence, but lower seroprevalence compared to adults, thereby confirming previous studies. In contrast to studies from the Northern Hemisphere, we found that seasonality in prevalence was limited or non-existent. Despite this, significant variation existed between years, perhaps linked to El Niño–Southern Oscillation related boom and bust cycles in bird populations. Taken together, our study provides new insights into evolutionary ecology of AIV in its avian hosts, defining distinctive processes on the continent of Australia.

*Michelle Wille is an ARC DECRA Fellow with an interest in avian virus ecology. She has two main focuses, (1) the ecology of avian influenza and (2) virus discovery and characterising the ecology of avian virus communities.*

# 1D | AVIAN BIOLOGY, ECOLOGY & POPULATION MONITORING I

**FEBRUARY 8, 2022, 12:40 PM - 2:10 PM**

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# 4. Avoid, adapt or exploit: Modelling avian species responses to housing and canopy tree cover

Humphrey J[1,2], Haslem A[1,2], Bennett A[1,2]
*[1]Research Centre for Future Landscapes, La Trobe University, [2]Department of Ecology, Environment & Evolution, School of Life Sciences, La Trobe University*

1D | AVIAN BIOLOGY, ECOLOGY & POPULATION MONITORING I, February 8, 2022, 12:40 PM - 2:10 PM

Avian responses to urbanisation are often complex and species-specific. Whilst many bird species are negatively affected by increased human infrastructure or reduced native vegetation, others may benefit from these changes. To better understand the spread of responses, researchers have classified birds into groups based on urban tolerance, including urban avoiders, adapters, and exploiters. The current understanding of these groups, however, is based primarily on human infrastructure and may overlook measures of natural habitat. An improved understanding of how individual species respond to both human infrastructure and habitat may help to better predict shifts in community composition and identify groups threatened by development. We used a landscape-scale approach to investigate how individual bird species respond to urbanisation in Melbourne, Australia. We selected 30 study landscapes (each 100 ha), stratified to represent gradients of cover of housing (from 9 – 39%) and canopy trees (13 – 63%), and conducted 1,500 timed bird surveys (50 per landscape) over 16 months. The occurrence of species classified as avoiders, adapters and exploiters differed significantly across the study region. However, current classifications explain only 18% of the variation observed among landscapes. Half of all avoiders and adapters declined with increasing housing cover, and increased with canopy tree cover. In contrast, up to 40% of urban exploiters showed the opposite trends. These findings suggest that if development continues in greater Melbourne, there will be further declines in urban avoiders and adapters, and an increase in urban exploiters, resulting in a measurable shift in avian community composition.

*Jacinta Humphrey is a PhD student with the Research Centre for Future Landscapes, La Trobe University. She is passionate about making urban spaces more wildlife-friendly, and is interested in all aspects of urban ecology, landscape change, and science communication.*

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# 5. Plastics and parasites have increased over the past two centuries in Australian bird nests

Potvin D[1], Opitz F[3], Townsend K[2], Knutie S[4]
*[1]University of the Sunshine Coast, [2]University of the Sunshine Coast, [3]Justus-Liebig Universitat, [4]University of Connecticut*

1D | AVIAN BIOLOGY, ECOLOGY & POPULATION MONITORING I, February 8, 2022, 12:40 PM - 2:10 PM

Global plastic production has increased exponentially since the 1940s, resulting in the increased presence of anthropogenic debris in the environment. Recent studies have shown that birds incorporate anthropogenic debris into their nests, which can reduce nest ectoparasite loads. However, we know little about the long-term history of interactions among birds, anthropogenic debris, and ectoparasites. Our study took a unique approach to address this issue by determining the prevalence of anthropogenic debris and ectoparasitic nest flies (*Protocalliphora* and *Passeromyia* spp.) in 893 bird nests from 224 species between 1832 and 2018, which were sourced from Australian museum collections. The prevalence of anthropogenic material increased from approximately 4% in 1832 to almost 30% in 2018. This change was driven by an increase in the incorporation of synthetic rather than biodegradable anthropogenic debris (by 2018 ~ 25% of all nests contained synthetics), with the first synthetic item being found in a nest from 1956 in the city of Melbourne. Nest parasite prevalence increased over time but contrary to other studies, there was no relationship between habitat type or anthropogenic material and parasite presence. Our study is the first to use museum specimens to quantify temporal and spatial impacts of anthropogenic material on birds, the results of which justifies contemporary concerns regarding the ubiquitous nature of human impacts on terrestrial wildlife.

*Dr. Dominique Potvin is a Senior lecturer in Animal Ecology at the University of the Sunshine Coast. She specializes in behavioural ecology, evolution and bioacoustics, especially in the context of anthropogenic habitat change.*

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# 20. Escaped pet birds are a high-risk pathway for parrot invasion

Stanley M[1], Fewster R, Galbraith J, McNaughton E
[1]*University Of Auckland*

1D | AVIAN BIOLOGY, ECOLOGY & POPULATION MONITORING I, February 8, 2022, 12:40 PM - 2:10 PM

Native birds experience multiple stressors in urban environments, particularly habitat loss and predation by rats and cats. Although less obvious, invasive birds also pose a threat to native species through disease transmission and competition for food and nest sites. Given the expense and difficulty of eradicating or managing invasive birds, preventing their establishment is the most effective way of protecting native birds from this type of threat. The pet trade plays an important role in facilitating the spread of invasive species, with pet birds either being deliberately released or accidentally escaping. Even if only a few individuals escape during any one incident, the cumulative effect of these escapes over time increases the likelihood of establishment. We analysed online listings of lost birds from two popular websites in New Zealand to evaluate the invasion risk from pet birds. A total of 1,205 birds were listed as lost over ~3.5 years, a rate of loss of 331 birds per year. Parrots made up 92% of all lost birds, with human population size and median income influencing rate of loss. While single individuals accounted for 77% (n = 931) of lost birds, the remainder were lost as a part of a group (n = 96 groups, group size range 2 – 20). Simulations of propagule pressure show that the proportion of time with at least one male-female pair at large somewhere in Auckland is very high for species such as ring-necked parakeets (*Psittacula krameria*) and Alexandrine parakeets (*Psittacula eupatria*).

*Margaret Stanley is an Associate Professor at the University of Auckland. Her research primarily focuses on how to mitigate the impacts of invasive species and urbanisation on biodiversity in Aotearoa.*

# 31. Evolution of egg colour in Australian songbirds

L'herpiniere K[1]
[1]*Macquarie University*

1D | AVIAN BIOLOGY, ECOLOGY & POPULATION MONITORING I, February 8, 2022, 12:40 PM - 2:10 PM

Why are birds the only living vertebrate to lay colourful eggs? The last century has opened a pandora's box of explanations for the extensive variation we see today. The vast array of colours only stem from two pigments produced in the uterus, at the egg shell-forming stage. Research using museum and field data has found that the colour used in eggs plays a signalling or structural function. We approached the question by looking at the ancient radiations of songbirds in their region of origin, Australia. We explored the colour used in response to nest phenotype evolution and found that egg colour diversified alongside the evolution of open cupped nests. The correlated evolution between nest type and colour diversification led us to question what drivers could be contributing to such changes. We asked if the newly evolved colour was related to climatic variables, such as radiation from the sun, acting as a potential thermoregulatory barrier. We also asked if the colour was related to a bird's particular diet. Positive correlations between colour metrics and toxicity exist in invertebrates, and we, therefore, investigate the relationship further. The function of egg pigmentation is still, in large, a mystery; however, we do provide some substantial advancement of our understanding of the subject matter.

*Kiara L'Herpiniere is a wildlife biologist and PhD student in the department of Biological Sciences- her research is focused on bird egg colouration.*

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# 35. 3D surface scanning as a viable method for morphometrics in avian museum specimens

Ryding S[1], Symonds M[1]
[1]*Deakin University*

1D | AVIAN BIOLOGY, ECOLOGY & POPULATION MONITORING I, February 8, 2022, 12:40 PM - 2:10 PM

Digital methods are being increasingly used to study museum specimens because they provide the most accurate measures of morphology. Of digital methods, 3D models of museum specimens have typically been obtained by CT scanning. While valuable, the cost and time associated with CT scanning usually limits studies to a few representative individuals of each species. However, larger sample sizes are often needed for more detailed spatial and temporal studies. 3D surface scanning has been suggested as a more time- and cost-effective alternative to CT scanning, but it has not yet been used extensively. We outline the use of 3D surface scanners on museum specimens of bird bills, showing that they are as accurate as CT scanners but that there is a significant difference between the surface area measurements yielded with the 3D surface scanner and with manual measurements. Lastly, we use comparisons between manual measurements and 3D methods to develop a statistical model for converting simple manual measurements into more accurate bill surface area measurements. Our study shows that 3D surface scanning is a viable, more accessible, alternative to CT scanning in order to study morphometrics, and our statistical model makes more detailed morphometrics accessible to those who lack access to all 3D methods (e.g. when in the field). Our method allows for collection of larger datasets than previous methods, and provides high-quality images which can be easily shared for public use or future research.

*Sara is a PhD candidate at Deakin University. Her research uses 3D scans of museum skins to study how birds are responding to climate change by increasing bill and leg size.*

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# 44. Ghosts of mutualisms past? NZs truffle-like fungi and our native birds.

Martin A[1], Gaskett A[2], Wood J[1]
*[1]Manaaki Whenua - Landcare Research, [2]The University of Auckland*

1D | AVIAN BIOLOGY, ECOLOGY & POPULATION MONITORING I, February 8, 2022, 12:40 PM - 2:10 PM

New Zealand's truffle-like fungi are unlike any other: brightly coloured and emerging from the forest floor. However, we know very little about how these fungi are dispersed. The unusually bright colours of their sporocarps (such as blue, purple and red) suggest they may have evolved to exploit the sensory preferences of our native birds - and yet observations of New Zealand birds eating these fungi are rare. We propose that this is because the fruit-like truffle-like fungi we see today are remnants, or ghosts, of past mutualisms – targeted towards New Zealand fauna that are now rare or extinct. We will present a proposal for determining why these unusual traits evolved, and whether truffle-like fungi have been affected by the 'feathers to fur' transformation of New Zealand's avifauna. Here, I present some preliminary findings for our investigation of the dispersal ecology of these fungi using spectral analysis and modelling bird vision to examine adaptations to putative past and present dispersers.

*Amy Martin is a post-doc at Manaaki Whenua, Landcare research. She completed her PhD in 2020 at The University of Auckland.*

# 2A | SEABIRD SYMPOSIUM II

**FEBRUARY 8, 2022, 2:40 PM - 4:25 PM**

# 74. Seabird surveillance: Developing a new genetic analysis for bycatch species identification

Foote I[1], Chambers G[1], Rawlence N[2], Debski I[3], Ritchie P[1]
*[1]Victoria University Of Wellington, [2]University of Otago, [3]Department of Conservation*

2A | SEABIRD SYMPOSIUM II, February 8, 2022, 2:40 PM - 4:25 PM

NZ is a global hotspot for seabird diversity, however is also home to the greatest number of threatened seabird species. Bycatch in fisheries poses one of the highest levels of threat to these taxa but determining the level of risk to each species is difficult due to challenges in identifying some birds that are caught. Fisheries observers who are responsible for identification at-sea may only have limited taxonomic knowledge of seabirds. In addition, damage of specimens during fishing operations and the costs and logistical constraints of returning specimens to land can be a barrier to expert identification. We are developing a simple, yet robust, DNA-based methodology for accurate species identification which only requires a small tissue sample. This will complement the current formal identification process especially when identification by external morphology is not possible. The 'barcoding gene' cytochrome oxidase I (COI) in the mitochondrial genome is being assessed for its suitability in identifying seabird species and to construct a species reference database from known samples. Implementation of this methodology will provide more precise information to support conservation management decisions and prioritisation. This molecular analysis is the beginning of an in-depth whole genome analysis of selected seabird taxa.

*Imogen Foote is a PhD candidate at Victoria University of Wellington with a research interest in the application of genetic tools to understand populations, and how this knowledge can be used in threatened species management.*

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# 89. State of our seabirds: north-eastern North Island, including the Hauraki Gulf

Gaskin C[1]
[1]*Northern New Zealand Seabird Trust*

2A | SEABIRD SYMPOSIUM II, February 8, 2022, 2:40 PM - 4:25 PM

The wider Hauraki Gulf region is a place of striking seabird diversity. A combination of multiple predator-free breeding sites on islands, and productive waters, it is a globally significant seabird biodiversity hotspot. Remarkable given its proximity to our largest city. However, far too many of our seabirds remain under threat or, in the case of tara-iti / New Zealand fairy tern, at dire risk of extinction. If we look at trends over ten years (2010-2020), seabirds breeding in the region appear to be faring reasonably well with several species' populations shown to be increasing, largely through successful eradication of predators from islands across the outer Gulf, mostly species that feed in pelagic waters outside the region. But these gains need to be tempered. For example, the New Zealand storm petrel population has increased significantly since eradication of cats and rats but are known to be breeding only on one island. Amongst the remaining species, those that forage inshore, all resident species, we see declining populations, declines accompanying marine habitat degradation. The species that utilise the extensive shelf waters are those we will be watching closely, as that degradation spreads further out. How northern seabirds will fare in the future under climate change, increasing fishing and other pressures may come down to how adaptable they are unless we halt these losses. That can only happen through the holistic restoration of Hauraki Gulf food webs coupled with marine protection measures that recognise highly mobile marine species: seabirds, marine mammals and pelagic fish.

*Chris has worked with seabirds in northern New Zealand for 20 years, first through observing them at sea, then through island visits and surveys including a leading role in finding the breeding site of the NZ storm-petrel. He's fascinated by seabirds' lives and their capabilities and enjoys telling their stories.*

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# 109. Adaptive management options to increase resilience of little penguins to extreme temperatures on land

Tworkowski L[1], Dann P[2], Ellenberg U[1], Robert K[1]
[1]*Department of Ecology, Environment and Evolution, La Trobe University,* [2]*Conservation Department, Phillip Island Nature Parks*

2A | SEABIRD SYMPOSIUM II, February 8, 2022, 2:40 PM - 4:25 PM

Although heat stress can be observed in other life history stages, little penguins are especially vulnerable during moult. Unlike other birds, moult in penguins is 'catastrophic' meaning all feathers are shed and replaced in ~18 days. Without adequate insulation and waterproofing to forage at sea, little penguins are constrained to land in some of the hottest parts of the year. During a heat wave in 2019, the largest mortality event of moulting little penguins on record occurred at Phillip Island in south-eastern Australia. Long-term survival analysis suggests that adult mortality is greatest in years when high ambient temperatures are paired with low humidity. Given current climate projections, successful management of this species will require a better understanding of the physiological processes and habitat features that influence mortality events. In this study, we quantified the thermal properties of burrows and vegetation and investigated how birds are utilising structural habitat during extreme weather events. Results are helping us determine how penguins are currently coping with extreme temperatures on land, predict how this might change under future climate scenarios, and identify adaptation options most likely to reduce negative climate change impacts for little penguins across their distribution.

*Lauren is a PhD candidate currently investigating the impacts of terrestrial heat waves on little penguins. More broadly, her research interests include understanding and mitigating human disturbance impacts on native fauna, and the use and development of non-invasive monitoring techniques.*

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# 113. Phylogeography, Taxonomic Status and the Effect of Human Colonisation on the Genetic Structure of the Pied Shag, Phalacrocorax varius

Fox M[1]
[1]*University Of Auckland,* [2]*University of Otago*

2A | SEABIRD SYMPOSIUM II, February 8, 2022, 2:40 PM - 4:25 PM

Modern and ancient DNA is an important tool that can provide detail into relationships between closely related species and insights into demographic histories. Two subspecies of pied shag (*Phalacrocorax varius*) are recognised, the nominate *varius* in New Zealand and *hypoleucos* in Australia. The subspecies rank is based on slight morphological differences between regions and the geographic distance between regions (the Tasman Sea). To date, this species delineation has not been challenged. Previous research focused on blue-eyed shags (*Leucocarbo*) in New Zealand has unveiled new species definitions and geographically contrasting biodiversity reductions across New Zealand. Past research suggests other shag species complexes may demonstrate similar trends. This research identified two genetically separate clades of pied shag, one restricted to New Zealand and one to Australia, supporting the traditional subspecies delimitation. Using ancient DNA from museum specimens, palaeontological, and archaeological remains, this study did not find evidence of strong geographic structuring in the New Zealand pied shag, potentially indicating a remnant more widespread pre-human distribution. Furthermore, this research indicated that New Zealand pied shag may have experienced a loss of genetic variation through time, potentially related to subsistence hunting by Māori or persecution by European fishermen, supported by archaeological data and historical accounts. These findings, as well as previous research, highlight the potential for not just region-specific human impacts on hunted species but the potential for contrasting human impacts across a range of species in New Zealand.

Michael is a first year PhD student at the University of Auckland, working with Prof. Russell on Seabird Restoration. Michael's  presentation is focussed on his honours dissertation supervised Dr Rawlence, the project covers human impacts, ancient DNA, phylogeography and genetic structure, building on work done by Dr Rawlence

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# 116. Translocated petrels return to ancestral feeding grounds

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[1]*Museum of New Zealand, Te Papa Tongarewa,* [2]*School of Environmental Sciences, University of Liverpool,* [3]*CEBC, CNRS - Université de La Rochelle*

2A | SEABIRD SYMPOSIUM II, February 8, 2022, 2:40 PM - 4:25 PM

Translocation of pre-fledged chicks is a relatively new technique used in seabird restoration projects. The few reported successful translocation projects for petrels (Procellariidae) have involved translocations over short distances (< 80 km), while translocations > 100 km have yet to be proven to succeed. A possible cause of translocation failure is the absence of suitable foraging sites near the restoration site, or translocated individuals having an innate disposition to forage at the same sites as their parents. We tracked common diving petrels (*Pelecanoides urinatrix*) from a population derived from translocated chicks. During chick-rearing, adults at the restoration site predominantly foraged at the same sites as birds from their main source colony, which were all much closer to the source colony (28 km from the restoration site). As a result, adults at the restoration site were flying c. 55 km further per day than adults tending chicks at the source colony. Diving petrels were able to successfully rear young at the restoration site. However, the energetic costs of attempting to return to ancestral feeding grounds may be insurmountable when source sites and restoration sites are widely separated.

*Colin Miskelly is a curator of vertebrates at Museum of New Zealand Te Papa Tongarewa, and formerly worked for the Department of Conservation as a scientist and manager. colin.miskelly@tepapa.govt.nz*

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# 117. Collapse: An agent-based model of seabird colony dynamics

Bellvé A, Wilmshurst J[2], George P[2]
[1]*The University of Auckland,* [2]*Manaaki Whenua LandCare Research*

2A | SEABIRD SYMPOSIUM II, February 8, 2022, 2:40 PM - 4:25 PM

Aotearoa host an incredible diversity of seabirds during their breeding season (~25% of all seabird species breed here, 10% are endemic breeders). However, 90% of NZ's seabird species are threatened with extinction. These threats are primarily the result of predation and habitat destruction, with many mainland breeding colonies having been extirpated during the last two centuries. Strong feedback dynamics, particularly among procellariiformes, mean that once colonies are lost, they are challenging to re-establish, and new colonies rarely naturally establish. I will describe a novel agent-based model that represents procellariformes colony selection behaviour to identify the determinants of contemporary spatial patterns of seabird colonies. By understanding the implications of seabird's decision-making criterion for breeding ground selection, we may be able to leverage their behaviour in reforming colonies, establishing new ones, or determining what pre-historic distributions looked like.

*André is a doctoral researcher at the University of Auckland whose research revolves around reconstructing the marine-terrestrial nutrient fluxes that seabirds are responsible for in Aotearoa New Zealand and the methodology for investigating these kinds of questions.*

# 2B | MANAGING THREATENED SPECIES II

**FEBRUARY 8, 2022, 2:40 PM - 4:25 PM**

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## 93. Saving the Regent Honeyeater – what comes next?

Ingwersen D[1], Bell S[2], Crates R[3], Elphinstone A[5], Geering D[2], Heinsohn R[3], Johnson G[4], Roderick M[1], Schmelitschek E[5], Shiels M[5], Van Sluys M[5]
*[1]BirdLife Australia, [2]Department of Planning, Industry and Environment NSW, [3]Australian National University, [4]Department of Environment, Land, Water and Planning, Vic, [5]Taronga Conservation Society Australia*

2B | MANAGING THREATENED SPECIES II, February 8, 2022, 2:40 PM - 4:25 PM

For over 25 years the national Regent Honeyeater recovery team has worked tirelessly to save this species from extinction. In that time thousands of hectares of habitat have been replanted or protected, birds banded to understand their survival, movements and breeding, and a large community survey effort undertaken. But despite our best efforts the population continues to decline.

Over the past decade the recovery team has refined the recovery objectives and, crucially, in recent years we've improved the science behind the recovery effort. This has included uncovering novel nest predators previously unknown, designing and implementing a standardised national monitoring program, and trialling implementation of novel habitat restoration whereby mistletoe is being actively reintroduced into key regions where it had succumbed to drought or fire.

Following on from the devastating 2019-20 bushfires, the recovery team sought to assess the impact of those fires and evaluate the current and potential future trajectory of the species. In early 2021 a Population Viability Analysis (PVA) was completed which highlights two key areas of focus, over and above existing recovery efforts, to potentially save the Regent Honeyeater – larger and more consistent releases of zoo-bred birds into the wild, and improving the breeding outputs of the in-situ population which is at historically low levels. In this presentation we will discuss the science behind the PVA, present the outcomes and challenges of the two latest captive releases in NSW, and show what is being trialled to improve the breeding success of the species in the wild.

*Dean Ingwersen is the Woodland Bird Program Leader at BirdLife Australia and has been the national Regent Honeyeater recovery coordinator for over a decade.*

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# 103. Overcoming the challenges of recovery for kyloring

Burbidge A[1], Comer S[1], Ford S[1], Berryman A[1], Thomas A[1], Blythman M[1], Stokes H[2], Barrett B[3]
*[1]Dept of Biodiversity, Conservation & Attractions, [2]BirdLife Australia, [3]University of Western Australia*

2B | MANAGING THREATENED SPECIES II, February 8, 2022, 2:40 PM - 4:25 PM

One of Australia's rarest birds, the critically endangered Kyloring (Western Ground Parrot) is (apart from a few translocated and a few captive individuals) currently restricted to an area of less than 60,000 ha on the south coast of Western Australia. Protecting the perilously low numbers (<150 birds) from fire and introduced predators, in particular the feral cat, is therefore a priority for the recovery team. Significant conservation efforts in managing these threats over decades have yielded positive results in population trends, and passive acoustic monitoring methods and site occupancy have been a key to understanding management effectiveness. Building ecological resilience through increasing the number of populations is now a priority recovery action but resourcing such actions and being confident that they will have no impact on the wild population is challenging. In 2019 a landscape scale network of Autonomous Recording Units (ARUs) was established to collect data for modelling ground parrot occupancy and distribution. This ARU network, combined with more intensive monitoring of occupied habitat, has provided an opportunity to track whole population trends over time, inform management strategies and decisions, and evaluate the response to management of introduced predators and fire. In particular, it has provided context for a recently commenced wild-to-wild translocation of kyloring to establish a second, geographically separated population of a small number of founders to a previously occupied area of habitat. Initial translocation results are promising, but ultimate success will depend on supplementation of the founding population and continued management of fire and predators.

*Allan Burbidge is a Principal Research Scientist involved in conservation research and management in relation to threatened birds. This has involved basic ecology, population monitoring, genetics, acoustics, and assisting to promote and maintain partnerships with key participants in recovery efforts.*

11TH AUSTRALASIAN ORNITHOLOGICAL CONFERENCE
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# 107. You can't judge a bird by its cover – the potential role of intersex in the threatened species narrative.

Hall C[1]
[1]*University Of The Sunshine Coast*

2B | MANAGING THREATENED SPECIES II, February 8, 2022, 2:40 PM - 4:25 PM

Identifying the *why* in a threatened species mystery is a key step in crafting a happy ending. Some why's are observable, with clear paths forward, while others are veiled by layers of complex side stories. One such side story may arise with intersex birds, or, when there is a discordance between the genetic sex that is determined at fertilisation, and the adult phenotype of an individual. This may occur in birds during early embryonic development due to endocrine disruptors in the maternal environment, or, be triggered in adult females by ovarian disease or trauma.

The twist in the tale is that intersex birds are most often reproductively redundant. What effect do such birds have on the operational sex ratio of their population? We know the stress hormone corticosterone is one of the identified causes of intersex; however, we do not know how this will manifest as threatened populations come under increasing pressure for resources.

Results from an intersex study of over 400 individuals from south-east Queensland wildlife hospitals will be discussed as well as general information about the phenomena and its potential role in the threatened species narrative.

*Clancy Hall is a PhD candidate at the University of the Sunshine Coast. Her research interest is in maternal sex determination and sex reversal in birds.*

11TH AUSTRALASIAN ORNITHOLOGICAL CONFERENCE
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# 118. Protection and mortality of non-target terrestrial bird species during the eradication of rodents on Lord Howe Island, Australia

O'Dwyer T[1], Nicholas C[1], Lisa O[1], Helen F[1], Hank B[2]
*[1]NSW Department of Planning, Industry and Environment, [2]Lord Howe Island Board*

2B | MANAGING THREATENED SPECIES II, February 8, 2022, 2:40 PM - 4:25 PM

To eliminate the destructive impact of rodents on islands, conservation practitioners commonly use rodenticides to eradicate these pests. Frequently used rodenticides, such as brodifacoum, are non-specific, consequently non-target species (NTS), such as birds, may also be killed by the poison. Therefore, eradication plans need to mitigate against unwanted impacts on NTS. In 2019, a rodent eradication program (REP) was implemented on Lord Howe Island to remove ship rats and house mice. To protect the island's unique suite of endemic avian fauna, a comprehensive monitoring and mitigation plan was implemented. Following assessments of potential impacts from baiting on island-species, two endemic species were taken into captive management during the REP. To assess impacts on other species, a total of 240 ha of bushland was searched over a 14-week period and an additional 3000 ha was searched in the island's settlement area for NTS carcasses. The captive management program was successful with more than 90% of individuals taken into captivity being released at the end of the program. Post eradication surveys have shown that the woodhen population has increased by nearly 200% on pre-eradication levels in 14 months since their release and that currawong numbers were steady 12 months after their release. Surveys of other bushbirds have shown that numbers have not decreased and shows that pre-eradication assessments of these species being at at-risk species were appropriate.

*Dr Terry O'Dwyer is Senior Scientists at the NSW Department of Planning, Industry and Environment. He has a strong interest in avian conservation with a focus on seabirds and island restoration.*

11TH AUSTRALASIAN ORNITHOLOGICAL CONFERENCE
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# 77. Restoring mistletoe on Wonnarua Country: a novel regeneration technique weaving together ecological and cultural knowledge to heal Regent Honeyeater habitat

Peters K[1], Dever T[2], Ingwersen D[3], Mowat E[4], Roderick M[5]
*[1]Birdlife Australia, [2]Mindaribba Local Aboriginal Land Council, [3]BirdLife Australia, [4]BirdLife Australia, [5]BirdLife Australia*

2B | MANAGING THREATENED SPECIES II, February 8, 2022, 2:40 PM - 4:25 PM

A partnership between BirdLife Australia and Mindaribba Local Aboriginal Land Council (LALC) aims to bring the critically endangered regent honeyeater (*Anthochaera phrygia*) back to traditional lands ravaged by wildfires in NSW's Hunter Valley. The long-flowered mistletoe (*Dendrophthoe vitellina*) and regent honeyeaters that rely on it once flourished on Mindaribba LALC's lands on Wonnarua Country; in 2018 this was their only known breeding site in NSW.

Mistletoe is a vital resource for birds that feed on its flowers and fruits or use it to roost or nest in. It sustains dozens of bird species, especially when other resources throughout the landscape are scarce. Yet unlike many native Australian plants, mistletoe does not regenerate after fire and is killed when burnt. Much of the Mindaribba lands were burnt in the 2016 and 2017 fire seasons, effectively destroying the mistletoe resource. With the main vector for reestablishment being birds that deposit seeds, we sought to expedite the process by planting the seeds ourselves.

In badly burnt areas on Wonnarua Country, we are seeding the forests with long-flowered mistletoe – a world-first in habitat restoration of this type and scale.

We focus on the development of a meaningful two-way knowledge sharing relationship with the local Aboriginal community, challenges and successes experienced to date, and provide practical guidance to others wanting to restore mistletoe where it once occurred. Our innovative conservation work recognises an ecological and cultural responsibility to heal the Country that the Wonnarua people and this iconic woodland bird are so deeply connected to.

*Kristy Peters is an ecologist with 15 years' experience working in the field of ornithology. Currently employed as a Woodland Birds Project Officer with BirdLife Australia, her role focuses on conserving woodland bird habitat through private land conservation mechanisms and improving it through novel regeneration techniques such as mistletoe propagation.*

11TH AUSTRALASIAN ORNITHOLOGICAL CONFERENCE
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# 123. A New Zealand island in change: 38 years of landbird populations affected by succession and predator control as the community evolves

Ralph C[1, 2], Pearson C[1], Martins P[3], Ralph P[4]
*[1]Moturoa Island, Private Bag, Paihia, New Zealand , [2]U.S.D.A., Forest Service, Redwood Sciences Laboratory, Arcata, California USA, [3]Observatório de Aves da Mantiqueira, Bocaina de Minas, Minas Gerais, Brazil, [4]Institute of Ecology and Evolution, University of Oregon, Eugene, Oregon USA*

2B | MANAGING THREATENED SPECIES II, February 8, 2022, 2:40 PM - 4:25 PM

We describe here the results of a thirty-eight-year standardised, longitudinal survey of bird abundances on a small (150 ha) island near the mainland of northern Aotearoa/New Zealand. The basic question of interest is: have restoration efforts on the island been effective for individual species? This study period included habitat restoration, reintroductions of several native bird species, and control of rats and stoats. Our study also asked the question, did changes in habitat, rat control, and species interactions influence population trajectories of any of the species on the island, both native and non-native? We were able to robustly estimate time-series abundances of 33 bird species and found substantial population shifts shared by many taxa, including a common increase in abundance likely due to rat control. In the nearly three decades since the rat control, other factors appear to be influencing the trajectory of the populations, perhaps succession, changing weather, and species interactions. These results provide important context for ongoing restoration efforts elsewhere by showing species-specific responses to long-term restoration, and alert managers to the possibility that some species decline after first responding positively to pest control.

*C. John Ralph, Research Wildlife Ecologist Emeritus at the USDA Forest Service's Redwood Sciences Laboratory, and Faculty Associate Humboldt State University. Principal research is bird migration, behavioural ecology of Hawaiian birds, and landbird monitoring (involving censusing and constant effort mist-netting).*

11TH AUSTRALASIAN ORNITHOLOGICAL CONFERENCE
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# 40. Acoustic divergence between populations of an endangered passerine in the Galapagos Islands

Reyes E[1], Brunton D[1], Ortiz-Catedral L[1,2], Roper M[1], Smith A[1]
*[1]Massey University, [2]World Parrot Trust*

2B | MANAGING THREATENED SPECIES II, February 8, 2022, 2:40 PM - 4:25 PM

The Floreana Mockingbird is an endemic passerine restricted to two islets of the Galapagos Islands, occupying 0.5% of its original distribution range after local extinction from Floreana Island in the early 1990s. With an estimate of 300 individuals across two isolated populations, the species is one of the least studied birds in the Galapagos Archipelago. Currently there is no active conservation management due to its population's being considered as stable with no immediate risk of extinction. However, a plan for its reintroduction to Floreana Island has been proposed for 2025.

Following the reintroduction plan which aims to improve the genetic diversity and viability of the species. A third population will be created on Floreana Island by reintroducing individuals from both extant populations. To date, besides genetics and population monitoring, no other aspects of the ecology have been considered for the conservation of the species. Especially, exploring the potential impact of cultural divergence on the success of its reintroduction.

We investigated the effects of cultural divergence between the two remaining populations of Floreana Mockingbirds as an important factor to be incorporated in the reintroduction plan of this species. We compared acoustic characteristics of the vocalisations and found evidence of cultural divergence between populations. With our study, we highlight a behavioural problem that might arise in this highly social bird. Cultural divergence might act as a possible gene flow barrier hindering the success of the reintroduction itself. We recommend more studies regarding signal responses between populations before any reintroduction is attempted.

*Enzo M. R. Reyes is a PhD student at Massey University. His work is focused on population dynamics, social interactions, and cultural diversification of the endangered Floreana mockingbird in the Galapagos Island.*

# 2C | ECOLOGY AND EVOLUTION OF AVIAN PATHOGENS AND THEIR HOSTS SYMPOSIUM II

**FEBRUARY 8, 2022, 2:40 PM - 4:25 PM**

11TH AUSTRALASIAN ORNITHOLOGICAL CONFERENCE
8–10 FEBRUARY
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# 51. Avian Chlamydia psittaci infections in Australia: One clone to rule them all?

Jelocnik M[1], Anstey S[1], Kasimov V[1]
[1]*University Of The Sunshine Coast*

2C | ECOLOGY AND EVOLUTION OF AVIAN PATHOGENS AND THEIR HOSTS SYMPOSIUM II, February 8, 2022, 2:40 PM - 4:25 PM

*Chlamydia psittaci* is a globally distributed avian pathogen that easily spills over to other animals and importantly, humans, causing zoonotic disease. In Australia, infections with this avian pathogen remain enigmatic. Molecular research has identified an extended global host range and significant genetic diversity. However, Australia has reported a reduced host range (avian, horse, and human) with a dominance of clonal virulent strains, denoted ST24.
To better understand the widespread of this strain type in Australia, genotyping using MultiLocus Seqeunce Typing and/or whole genome sequencing was applied on samples from a range of Australian hosts (avian, equine, marsupial, and bovine) from various clinical cases and surveliance studies. Furthermore, we sneak peek into genetic diversity of *C. psittaci* isolates from New Zealand.
Genotyping confirms that clonal ST24 strains dominate infections of Australian psittacine, equine and human hosts (85/93; 91.4%). However, this study also found novel hosts (bovine, and a wallaby) and demonstrated that strain diversity does exist. Similarly, ST24 was the most detected in set of NZs psittacine and pigeon birds and field isolates (13/15; 86.67%).
Analysis of the results of this study applied a multidisciplinary approach regarding avian *Chlamydia* infections, equine chlamydiosis, ecology, and One Health. We provide evidence that *C. psittaci* are prevalent in a wider range of avian hosts than previously anticipated, increasing the risk of spill over to Australian wildlife, livestock, and humans. Due to this, effective management of *C. psittaci* infections in humans, wildlife and domesticated animals should be incorporating and implementing the "One Health" approach.

*Dr. Martina Jelocnik is ARC DECRA Fellow Veterinary Microbiologist. She leads the Molecular Chlamydia group, USC. Her research is focused on chlamydial infections in animals, with special interest in zoonoses. She aims to understand dynamics of (where, when, what/who and how) chlamydial infection spill-over occurs between different hosts.*

11TH AUSTRALASIAN ORNITHOLOGICAL CONFERENCE
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# 105. Chlamydial infections in wild Australian parrots

Stokes H[1,2], Martens J[1,2], Walder K[3], Segal Y, Berg M, Bennett A
*[1]Centre for Integrative Ecology, School of Life and Environmental Sciences, Deakin University, [2]BirdLife Australia, [3]IMPACT, Institute for Mental and Physical Health and Clinical Translation, Deakin University, [4]Department of Jobs, Precincts and Regions*

2C | ECOLOGY AND EVOLUTION OF AVIAN PATHOGENS AND THEIR HOSTS SYMPOSIUM II, February 8, 2022, 2:40 PM - 4:25 PM

*Chlamydia psittaci* is a globally distributed bacterium that can cause potentially fatal disease in birds and humans. Captive parrots are a major host of *C. psittaci*, and in Australia, wild parrots are a hypothesised wildlife reservoir. In addition to *C. psittaci*, recent research indicates that a diverse range of novel related *Chlamydiales* are likely to be circulating in wildlife reservoirs, of unknown pathogenicity. We tested several abundant Australian parrot species for chlamydial bacteria, and analysed multiple risk factors for infection. Our primary objective was to determine the prevalence and dynamics of chlamydial infections in wild parrot populations. We sampled from >200 individuals from seven parrot species in Victoria, Australia, over a two-year period. We determined *C. psittaci* and *Chlamydiales* prevalence from cloacal swabs using PCR and sequencing, and determined seroprevalence from blood samples. We recaptured n=39 individuals to assess changes in infection status over time. We discovered *C. psittaci* at 6.7% overall prevalence, which is higher than previously reported in wild Australian parrots. We discovered an overall *Chlamydiales* prevalence of 32.1%, and identified at least two potentially novel *Chlamydiales* bacteria. Prevalence and seroprevalence varied between host species, with seroprevalence as high as 74% in some parrot species. There were geographic differences in seroprevalence, and longitudinal sampling showed potential evidence of chronic infections. Our results show that chlamydial infections are widespread in some abundant Australian parrot species. Given the pathogenicity and host-switching capabilities of many chlamydial bacteria, we discuss the potential implications of our findings for avian conservation and public health.

*Dr Helena Stokes is a project coordinator with BirdLife Australia. She currently works on Western Ground Parrot recovery. Her primary research interests include wildlife and ecosystem health and conservation.*

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# 76. Beak and feather disease virus and Platycercus elegans: recent insights and future directions

Bennett A[1], Alexandersen S[2], Berg M[1], Blanch-Lázaro B[1], Eastwood J[1], Martens J[1], Stokes H[1], Ribot R[1], Walder K[3]

*[1]Centre for Integrative Ecology, Deakin University, [2]Geelong Centre for Emerging Infectious Diseases, Deakin University, [3]School of Medicine, Deakin University*

2C | ECOLOGY AND EVOLUTION OF AVIAN PATHOGENS AND THEIR HOSTS SYMPOSIUM II, February 8, 2022, 2:40 PM - 4:25 PM

Infectious diseases of birds can be of major conservation or public health concern, yet our understanding of the threats is often limited by a lack of long-term studies of wild hosts. One pathogen causing serious conservation concern, particularly to parrots, is beak and feather disease virus (BFDV), which causes psittacine beak and feather disease in Psittaciformes. A model system for studying it in the wild is the crimson rosella, *Platycercus elegans,* and here we review our findings about BFDV in this host species from our long-term study. Although BFDV can be fatal in some host species, *P. elegans* is particularly interesting because clinical signs of BFDV are non-existent to rare in the wild. Our findings reveal that BFDV prevalence and intensity of infection is similar across sexes, but varies dramatically across subspecies and age classes (younger birds are more likely to be infected). Breeding birds are less likely to be infected, and infected males in particular rarely breed, suggesting that infection status may be related to reproductive success. Samples from recaptures suggests that *P. elegans* are capable of clearing the virus and surviving infection. Genetic studies show that host genetic diversity is associated with probability of infection, which may have implications for the impact of inbreeding on BFDV outbreaks in threatened populations. Taken together, our findings from over a decade reveal complex infection dynamics, and suggest that BFDV may have hitherto overlooked influences on host ecology and evolution even in host species where clinical disease is rarely observed.

*Andy Bennett did honours at University of Adelaide before a D.Phil. in the Edward Grey Institute of Field Ornithology. He became Reader in Sensory and Behavioural Ecology at University of Bristol, before moving back to Australia (Deakin University). Major research interests are avian disease ecology and waterbird navigation.*

11TH AUSTRALASIAN ORNITHOLOGICAL CONFERENCE
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# 91. Investigating beak and feather disease virus infection in crimson rosellas (Platycercus elegans)

Blanch-lázaro B[1,2], Chamings A[2,3], Ribot R[1], Berg M[1], Alexandersen S[2,3,4], Bennett A[1]
*[1]Centre for Integrative Ecology, School of Life And Environmental Sciences, Deakin University, [2]Geelong Centre for Emerging Infectious Diseases , [3]School of Medicine, Deakin University, [4]Barwon Health*

2C | ECOLOGY AND EVOLUTION OF AVIAN PATHOGENS AND THEIR HOSTS SYMPOSIUM II, February 8, 2022, 2:40 PM - 4:25 PM

Beak and feather disease virus (BFDV) infects parrots and is of major conservation concern, as it was listed as a 'key threatening process to biodiversity' by the EPBC Act. Infection with BFDV may cause chronic and often fatal disease, with feather dystrophy and loss, and immunosuppression. *Platycercus elegans* is an abundant parrot and previous research has shown that, unlike in other species, wild individuals can have high BFDV prevalence on blood samples without showing clinical signs, and they can seroconvert and clear the virus from blood. We aimed to investigate: (1) if BFDV persisted in other tissues after clearing from blood, as seen for similar virus infections such as porcine circovirus-2; and (2) whether virus load in tissues was higher in subadults than adults. We necropsied and sampled tissues from 66 wild *P. elegans* from Victoria and obtained virus load data from blood and 10-12 other tissues by real-time qPCR, and their antibody titres to BFDV. We revealed that BFDV load in tissues were much higher, and detected in more tissues, in subadults than in adults. For subadults (n=32) virus load in bursa, spleen and skin were higher than other tissues, like blood and muscle. Of special note, while BFDV was detected in all tissues from most subadults, in adults (n=34) BFDV was often not detected in blood but was still detected in multiple other tissues. Antibodies to BFDV were primarily detected in adults. Our study has major implications for assessment of BFDV disease status and management of threatened avifauna.

*My name is Berta and I am a PhD candidate at Deakin University, interested in wildlife health. My current project focuses on disease ecology and pathology of beak and feather disease virus in wild crimson rosellas.*

11TH AUSTRALASIAN ORNITHOLOGICAL CONFERENCE
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# 111. Investigating health impacts on birds in Victoria, Australia.

Whiteley P[1], Amery-Gale J[1], Bushel R[1], Chen Y[1], Death C[1], Devlin J[1], Hampton J[1], Legione A[1], Marenda M[1], Noormohammadi A[1], Ploeg R[1], Skerratt L[1], Vaz P[1], Chamings A[2], Cooke R[2], White J[2], Cox-Witton K[3], Hawes M[4], Hill R[5], Peters A[6], Raidal S[6], Sutherland M[7]
*[1]The University Of Melbourne, [2]Deakin University, [3]Wildlife Health Australia, [4]Agribio, Agriculture Victoria, [5]Victorian Department of Environment Land Water & Planning, [6]Charles Sturt University, [7]Burwood Bird and Animal Hospital*

2C | ECOLOGY AND EVOLUTION OF AVIAN PATHOGENS AND THEIR HOSTS SYMPOSIUM II, February 8, 2022, 2:40 PM - 4:25 PM

Since 2008 a collaborative general passive wildlife health surveillance system at the Melbourne University Veterinary School investigated avian mortalities and diagnosed infectious and environmental contaminant factors that may impact population health and biodiversity in Victoria. Infections included: necrotic enteritis from *Clostridium perfringens* in Rainbow Lorikeets and spironucleosis in King Parrots possibly associated with bird feeding, circovirus in Red-tailed Black Cockatoos, and botulism, *Pasteurella multocida* and *Mycobacterium spp*, in waterbirds. Infection with Avian Influenza and Avian Paramxyoviruses have usually been ruled out. A Ramsar wetland Disease Risk Analysis was undertaken. Environmental contaminants detected or diagnosed include anticoagulant rodenticides in raptors.

Birds are exposed to a range of infections and toxicants that can impact their fitness, reproduction, immune function, disease resistance and health. To better understand and manage these impacts stakeholders need to partner wisely to strengthen wild bird health systems at state, national and international levels. Citizen science including organizations such as Birdlife Australia can help detect, identify and collect dead birds for diagnosis at veterinary laboratories. Ecosystem health risk analyses can be used to identify priorities, mitigation strategies and gaps including threats from infections and toxic environmental contaminants. Molecular epidemiological approaches using tools such as next generation sequencing can be used to detect risks from virus, bacteria, fungi, protozoa, parasitic infections and toxic algal blooms. Environmental contaminants and other environmental factors need to be considered along with host, agent and human factors. Wildlife Health Australia is our peak body to lead wildlife health management prevention, preparedness, response and recovery.

*Pam Whiteley, Wildlife Health Victoria: Surveillance Coordinator, Melbourne University Veterinary School wishes to strengthen Wildlife Health Australia's collaborative network including communities and First Nations colleagues, local state national and international agencies, universities etc.to protect wildlife and ecosystem, domestic animal and human health, One Health.*

11TH AUSTRALASIAN ORNITHOLOGICAL CONFERENCE
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# 85. Beak deformation and altered foraging niche in Darwin's finches: impacts of the avian vampire fly accidentally introduced to the Galápagos

Katsis A[1], Kleindorfer S[1,2], Adreani N[2], Colombelli-Négrel D[1], Common L[1], Dudaniec R[3], García-Loor J[4], O'Connor J[1,5], Peters K[1,6,7], Sulloway F[8]
*[1]College of Science and Engineering, Flinders University, [2]Konrad Lorenz Research Center for Behaviour and Cognition and Department of Behavioural and Cognitive Biology, University of Vienna, [3]Department of Biological Sciences, Macquarie University, [4]Independent researcher, [5]Department for Environment and Water, Government of South Australia, [6]Cetacean Ecology Research Group, School of Natural and Computational Sciences, Massey University, [7]Evolutionary Genetics Group, Department of Anthropology, University of Zurich, [8]Department of Psychology, University of California, Berkeley*

2C | ECOLOGY AND EVOLUTION OF AVIAN PATHOGENS AND THEIR HOSTS SYMPOSIUM II, February 8, 2022, 2:40 PM - 4:25 PM

First discovered in Darwin's finch nests (Passerida: Thraupidae) on the Galápagos Islands in 1997, the avian vampire fly (*Philornis downsi*) is the major cause of mortality in all Galápagos land birds, and the biggest threat to avian population persistence in the archipelago. The adult vampire fly is vegetarian, but its larvae consume the blood and tissue of developing birds and cause beak deformation in developing birds. Darwin's finch beaks have famously been shaped by natural selection to exploit foraging niches spanning surface prey removal to sub-surface prey extraction. Few studies measure cross-scale ecological impacts from change in host phenotype caused by a parasite, which we aimed to do in sympatric Darwin's finch species on Floreana Island. In this study, we measured 1) the magnitude of beak deformation caused by vampire fly larvae in Darwin's finch nestlings, and 2) changes in foraging niche overlap by adult birds in relation to beak deformation. Mean parasite abundance in the nest (number of *P. downsi* per nestling) was positively associated with the size of the hole in the naris (beak deformation). The percentage of mist-netted adult birds with enlarged naris size was 37% in C*amarhynchus parvulus*, 47% in hybrid birds, 35% in *C. pauper*, and 21% in *Geospiza fuliginosa*. Birds with enlarged naris size had a significant reduction in subsurface excavation (probe, pry, chip-off) and overlapped in foraging niche with surface prey removal species. Our results demonstrate behavioural and ecological consequences of changes to a functional trait for foraging caused by an introduced parasite.

Andrew Katsis is a behavioural ecologist with an interest in songbird personality, vocal learning, and prenatal communication. Sonia Kleindorfer is an organismal systems biologist with a research focus on how animal behaviour shapes evolutionary dynamics in birds and parasites.

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# 25. Chlamydia of a Feather: Chlamydial Prevalence and Diversity in Wild Australian Birds

Kasimov V[1], Dong Y, Shao R, Anstey S, Hall C, Chalmers G, Conroy G, Booth R, Timms P, Jelocnik M
[1]*University Of The Sunshine Coast*

2C | ECOLOGY AND EVOLUTION OF AVIAN PATHOGENS AND THEIR HOSTS SYMPOSIUM II, February 8, 2022, 2:40 PM - 4:25 PM

Birds are a key part of "One Health", being successful long-distance vectors for numerous zoonotic bacterial, parasitic and viral pathogens. Such avian "One Health" pathogens include species of the genus *Chlamydia*. Presently, there is a lack of studies investigating chlamydial species in Australian wild and captives birds and the risks they pose to humans and other animals. Recent studies also indicated that coinfection with the most significant psittacine virus in Australia, Beak and Feather Disease Virus (BFDV), is common.

We investigated the prevalence and genetic diversity of chlamydial organisms infecting wild birds from Queensland and coinfections with BFDV. We screened 564 different birds from 16 orders admitted to the Australia Zoo Wildlife Hospital from May 2019 – February 2021 for *Chlamydi*a and BFDV. Utilising species-specific qPCR assays, we revealed an overall *Chlamydiaceae* prevalence of 29.3% (165/564), including a 3.19% (18/564) prevalence of the zoonotic *C. psittaci*. *Chlamydiaceae* coinfection with BFDV was detected in 9.8% (55/564) birds. Molecular characterisation further revealed that *C. psittaci* and novel genetically diverse *Chlamydia* species, such as avian *C. abortus*, *C. ibidis* and *C. pneumoniae*, were detected for the first time in Australia, infecting novel avian hosts (crows, figbirds, herons, kookaburras, lapwings and shearwaters) besides psittacine species.

This study provides evidence that *Chlamydia* are prevalent in a wider range of avian hosts than previously anticipated, increasing the risk of spillover to Australian wildlife, livestock and humans. Going forward, we need to characterise these Chlamydial species to determine their genetic identity, potential reservoirs and factors influencing infection spillover.

*I am a 2nd year PhD student from the University of the Sunshine Coast, Queensland, Australia. My interests and my area of research is in infectious and zoonotic diseases in wild native and migratory Australian birds.*

# 2D | AVIAN BIOLOGY, ECOLOGY & POPULATION MONITORING II

**FEBRUARY 8, 2022, 2:40 PM - 4:25 PM**

11TH AUSTRALASIAN ORNITHOLOGICAL CONFERENCE
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# 45. Generalist avian scavenger benefits from the loss of native mammalian carnivores

Fielding M[1,2], Brook B[1,2], Buettel J[1,2], Cunningham C[1], Jones M[1], Stojanovic D[3], Yates L[1,2]
*[1]School of Natural Sciences, University of Tasmania, [2]ARC Centre of Excellence for Australian Biodiversity and Heritage, [3]Fenner School of Environment and Society, Australian National University*

2D | AVIAN BIOLOGY, ECOLOGY & POPULATION MONITORING II, February 8, 2022, 2:40 PM - 4:25 PM

Top carnivores are declining across the world sparking trophic shifts within ecosystems. As many carnivores are facultative scavengers, their decline can lead to the increased abundance of smaller scavengers due to low competition. Here, we used a naturally occurring experiment to examine how the loss of mammalian carnivores within a community impacts carcass use by avian scavengers. Firstly, we monitored the locations of roadkill and forest ravens (*Corvus tasmanicus*), an abundant scavenger species, on eight road transects across the Tasmanian mainland (high scavenging competition) and the Bass Strait islands (low scavenging competition). We represented raven observations as one-dimensional point patterns, using hierarchical Bayesian models to investigate the dependence of raven spatial intensity on habitat, season, distance to roadkill and route location. We found that roadkill carcasses were a strong predictor of raven presence along road networks. The effect of roadkill was amplified on roads on the Bass Strait islands, where roadside carrion was a predictor of raven presence across the entire year. Secondly, we deployed camera traps with experimentally placed carcasses across the two regions to monitor carcass discovery and use by forest ravens. Ravens were the main beneficiary of carnivore loss, scavenging for five times longer in the absence of native mammalian carnivores. This lack of competition could be disproportionately benefiting forest ravens, leading to augmented raven populations. Our study provides evidence that scavengers modify their behaviour in response to reduced scavenger species diversity, highlighting the importance of conserving or reintroducing top carnivores within ecosystems.

*Matthew Fielding is a raven mad PhD student from the University of Tasmania who is interested in scavenger dynamics and the role of avian scavengers within an environment.*

11TH AUSTRALASIAN ORNITHOLOGICAL CONFERENCE
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# 63. Interaction between divergent subspecies of Splendid Fairywren Malurus splendens in South Australia

Black A[1], Blaylock B, Horton P, Johnston G
[1]*S A Museum*

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The genetically divergent and phenotypically distinct Black-backed Fairywren *Malurus splendens melanotus* and Turquoise Fairywren *M. s. callainus* are not currently in geographical contact. A population of Turquoise Fairywrens on the eastern flank of the North Flinders Ranges, South Australia, is separated by more than 150 km from outliers of Black-backed Fairywrens in the North Olary Plains and east of Orroroo. There are few records of the Turquoise Fairywren elsewhere in the Flinders Ranges but it is also present on the western flank of the South Flinders Ranges immediately east of Port Augusta. There it is separated by about 80 km across the Willowie Plain from Black-backed Fairywrens east of Orroroo. Historical Turquoise Fairywren specimens from southeast of Port Augusta are intergradient in plumage with the Black-backed Fairywren, suggesting earlier secondary contact and hybridisation between the two subspecies. This may have occurred during the mid to late Pleistocene but with subsequent loss of contact.

*Andrew Barham Black OAM is a retired neurologist and research associate at the SA Museum. His chief research interest is in the history, distribution, habitats, conservation, biogeography and taxonomy of Australian birds, notably grasswrens genus Amytornis. He is the author of six new subspecies of Australian birds.*

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# 64. Evaluating the evidence of culling a native species for conservation benefits

Melton C[1], Reside A[1], Simmonds J[1], McDonald P[2], Major R[3], Crates R[4], Catterall C[5], Clarke M[6], Grey M[6], Davitt G[1], Ingwersen D[7], Robinson D[6,8], Maron M[1]

*[1]The University of Queensland, [2]University of New England, [3]Australian Museum Research Institute, [4]Australian National University, [5]Griffith University, [6]La Trobe University, [7]BirdLife Australia, [8]Trust for Nature*

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Controlling problem species for conservation can be a fraught exercise, particularly in the case of native species subject to lethal control. In Australia, overabundance of the native noisy miner (*Manorina melanocephala*) is a key threatening process and is contributing to the decline of dozens of woodland bird species. Although lethal control of the species has been implemented, outcomes have varied substantially, so identifying the circumstances under which they are effective is essential to guide ethical and effective management. We compiled data for all noisy miner removals we could discover ($n$ = 45), including both permit-based and 'unofficial' removals. We investigated whether methodological and ecological factors explained the effectiveness of removals in reducing noisy miner density or increasing woodland bird richness and abundance. We found no consistent correlates of 'successful' noisy miner removals. We were surprised to find that, despite rapid recolonisation meaning that removals mainly failed to reduce noisy miner density to below a previously identified threshold above which noisy miners impact smaller birds, woodland birds abundance and richness usually still increased. Disrupted social structure as noisy miners recolonised may have led to less effective aggressive exclusion of small birds. Consistent monitoring and reporting of future noisy miner control actions will help support ongoing evaluation of effectiveness and the identification of correlates of success.

*Biography of presenting author: Martine Maron is a Professor of Environmental Management whose research group focusses on conservation ecology, particularly of woodland birds, and conservation policy*

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# 81. Southern NSW Birds on Farms Project: An approach to conserving woodland birds in agricultural landscapes

Humphries B[1]
[1]*BirdLife Australia*

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As an extension and evolution of the national-scale Birds on Farms project first undertaken in the 1990s, the new Southern NSW Birds on Farms project aims to become a model for woodland bird conservation on private land across south-eastern Australia and beyond. The project is for rural landholders, scientists, bird-lovers, and the general public to learn more about birds and their habitats on private rural properties – and to use this information in woodland bird education, conservation and habitat protection. Our long-term objective is to support landholders and local communities to enhance woodland bird populations, diversity and habitats within a landscape that continues to be agriculturally productive and profitable. To achieve this, we are providing participants with opportunities to be involved in a range of activities including the development of tailored habitat plans, regular bird monitoring surveys and site visits, training workshops and educational events, and access to partnerships and subsidies for on-ground works. The activities are all being undertaken in accordance with the management interventions outlined within BirdLife Australia's Temperate Woodland Bird Conservation Action Plan. This Southern NSW Birds on Farms project is facilitated by BirdLife Australia and has a broad range of supporters and partners including philanthropists, government agencies, Landcare, regional BirdLife branches, volunteers, universities, and farming groups. Here we will discuss initial findings from the Southern NSW Birds on Farms project, management implications, challenges, and future directions.

*Ben Humphries, Southern NSW Woodland Bird Project Coordinator of the Birds on Farms program, engaging local communities, landholders, and citizen scientists in woodland bird conservation in agricultural landscapes.*

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# 90. Conservation campaigning in collaboration with scientific and local community groups – Toondah Harbour Case Study

Hunter A[1]

[1]*Birdlife Australia*

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There are a myriad of threats and pressures facing native threatened birds. In many cases the avoidance of threats come down to the discretion of one decision maker. While it is critical that these decision makers have the best available science and data to inform their policies and decisions often there are competing influencing factors. Advocacy campaigns are an important tool for conservationists to rebalance the power, demonstrate public support and create political will to protect local bird populations and habitat. I will demonstrate the utility of a conservation campaign that is underpinned by strong science and data and driven by local community groups to advocate for the protection of migratory shorebird feeding and roosting habitat at Toondah Harbour, Queensland.

*Biography: Andrew Hunter is the Conservation Campaigner at BirdLife Australia and has extensive experience developing and implementing strategic campaigns to deliver conservation outcomes.*

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# 96. The case for a national bird community benchmarking program

Radford J[1], Maron M[2], Reside A[2]
*[1]La Trobe University, [2]The University of Queensland*

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Despite recent advances in species-based metrics such as the threatened species index and geometric mean of relative abundance, challenges remain when trying to measure, compare and communicate the "naturalness" of bird communities across sites, habitat types and regions. Here, we present the value proposition for a national bird community benchmarking program and outline the pre-requisites for developing the same. We propose a system analogous to, but independent of, that used by vegetation ecologists to benchmark habitat relative to reference condition, and provide a worked example using woodland birds. The elements of a national bird benchmarking program include: regionally-defined guild-based communities (e.g., Murray Valley grassland birds, sub-tropical savannah birds, south-eastern wetland birds); clear criteria for defining "reference" communities; metrics for departure from reference condition; and a robust, structured citizen science monitoring program that leverages existing databases and monitoring programs. Community benchmarks that are regionally-scaled and habitat-specific allow us to move away from species richness as the key indicator of quality to more ecologically relevant and interpretable measures that are not overly influenced by the presence or absence of a few key species and address issues associated with shifting baselines. The development of standardised metrics to describe "departure from reference" or the "naturalness" of the bird community at a particular site would benefit management effectiveness monitoring and reporting, natural capital accounting, and evaluation of offsets, biodiversity stewardship schemes and other market-based instruments. While ambitious, we are confident a national bird community benchmarking program would reap significant return on investment.

*Jim Radford is Principal Research Fellow in the Research Centre for Future Landscapes at La Trobe University, and Chair of the Birdlife Australia Research and Conservation Committee. Jim has particular interest in avian conservation in agricultural landscapes.*

# 3A | SEABIRD SYMPOSIUM III

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# 32. Seabird action plan (Pacific islands regional marine species programme 2022-2026)

Baird K[1], Borrelle S[2], Gaskin C[3]
*[1]Secretariat For The Pacific Environment Programme, [2]BirdLife International, Pacific Secretariat, [3]Northern New Zealand Seabird Trust*

3A | SEABIRD SYMPOSIUM III, February 9, 2022, 12:10 PM - 1:40 PM

Since 2003, SPREP has developed and implemented a regular series of regional Marine Species Action Plans initiated and endorsed by the 26 SPREP member countries and territories. Marine species are iconic in the Pacific for their integral role in the region's cultures and traditions. Action Plans for Dugong, Marine Turtles and Whales and Dolphins were the first to be initiated, joined by Sharks and Rays in 2009. An Action Plan for Seabirds has now been developed through a collaboration between BirdLife International and SPREP. Forty-two species of seabird are known to breed within Oceania, 17 of which are unique to the region. Seabirds remain a source of nutrition for some Pacific Island communities and are often totems and a source of Pacific identity. Threatened gadfly petrels of the *Pterodroma* genus are a feature as well as critically endangered petrels in the *Pseudobulweria* genus, with some species amongst the least known and poorly studied species of seabirds. The Seabird Action Plan provides priority actions within overarching themes of the Regional Marine Species Programme. Here we present the Seabird Action Plan by showcasing key conservation priorities including research on resolving the taxonomic uncertainty over several taxa; conservation threat assessments, tracking and biological studies, and bespoke conservation responses to threats. The Plan provides a framework for locally led conservation priorities for Pacific seabirds and their many remote habitats. Implementation of the plan, with support from the international seabird community, will contribute to building capacity, Pacific livelihoods and to protect vulnerable species from extinction.

*Karen Baird is the Threatened and Migratory Species Adviser for the Secretariat of the Pacific Regional Environment Programme. Previous roles include Seabird Adviser, NZ Forest and Bird; Marine Adviser, BirdLife Pacific and Programme Manager for the Kermadec Island Restoration Programme, NZ Department of Conservation.*

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# 19. Multi-species foraging associations: Investigating the fine-scale foraging behaviours of marine megafauna

Davis W[1], Dell'Ariccia G[2], Gostischa J[3], Constantine R[4]
*[1]Institute of Marine Science, University of Auckland – Waipapa Taumata Rau, [2]Research and Evaluation Unit, Auckland Council , [3]Ethology Unit, Department of Biology, University of Pisa, [4]School of Biological Sciences, University of Auckland – Waipapa Taumata Rau*

3A | SEABIRD SYMPOSIUM III, February 9, 2022, 12:10 PM - 1:40 PM

Multi-species foraging associations (MSFA's) are characterised by the joining of two or more species to feed on ephemeral prey patches. Determining the spatial and temporal dynamics of MSFA's is essential for understanding species roles in dynamic predator communities. Between September 2019 and August 2021, 55 hours of data on the foraging behaviours and associations of marine predators within MSFA's were collected. Of the 173 MSFA's encountered, all (100%) involved seabirds, 116 (67%) involved both cetaceans and seabirds and none involved pinnipeds or sharks. Eighteen foraging community groups were identified, with common dolphins, Australasian gannets, Buller's, flesh-footed and fluttering shearwaters, and white-fronted terns found to be important corresponding variables influencing MSFA composition. This is reflected in social affinity indexes in which these species share the highest social affinities (% co-occurrence within MSFA's). Differences in MSFA composition can also be attributed to season ($p=0.0008$), reflecting the seasonal movements of some species. We provide a baseline for detecting future changes in MSFA community composition and highlight marine predators' role in facilitating MSFA formation. We are developing machine learning tools to audit fine-scale foraging behaviours of these species from drone footage of MSFA's, to increase our understanding of the role of sub-surface predator interactions.

*Wednesday Davis has recently completed her MSc in Marine Science at the University of Auckland. She has a fondness for marine conservation, education and sustainability with her research focusing on the fine-scale foraging behaviours of marine predators.*

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# 65. Experiments in line weighting options for seabird bycatch reduction in Korean distant water tuna longline fisheries

Lee S[2], Kim Y[1], Rollinson D[3], Wanless R[3], Kitakato T[4], Kim D[2]
*[1]Dr Kim's Conservation Solutions, [2]National Fisheries Research and Development Institute, [3]University of Cape Town, [4]Tokyo University of Marine Science and Technology*

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Bycatch is a major threat to albatrosses and petrels, which has lead most tuna Commissions to require the use of bycatch mitigation measures. In the Southern Hemisphere, and with one exception, longliners operating south of 25°S must use at least two out of the following three measures: night setting, deploying bird-scaring lines, and branchline weighting. Adding weights is complex, and concerns about a possible reduction of catch rate for target species and crew safety remain high. We conducted trials onboard Korean longliners to investigate the effect of line weighting on seabird bycatch, target species catch rates, and safety, using the Sliding Leads. From 2013 to 2016, seven trials were undertaken using 45 g and 60 g weights with varying distance from hook (range 0 - 200 cm), totalling 358,649 unweighted lines and 468,476 weighted lines over 483 sets. The seabird bycatch rate in weighted branchlines was significantly lower than that in unweighted branchlines ($p<0.01$). There were slight differences in catch rates when targeting southern bluefin tuna (SBT) and yellowfin (YFT). The catch rate of albacore (ALB) on weighted branchlines was significantly lower ($p<0.01$). No safety incident was reported during the experiment. The reduction in ALB catch rate might be attributable to fishermen's inexperience with branchline weighting but needs further work. These results suggested that the Sliding Lead could be recommended as a safe and effective seabird bycatch mitigation measure for Korean longliners. Nonetheless, line weighting alone cannot eliminate bycatch and should be used with bird-scaring lines or night setting.

*Dr Yuna Kim is a director of Dr Kim's Conservation Solutions in Australia where it supports ecological studies of seabirds and shorebirds. She is a co-investigator of National Fisheries Research and Development Institute in Korea, working on seabird bycatch mitigation program. Also she is a production editor of Tattler, Australasian Wader Study Group's publication.*

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# 119. Not the 'stay-at-home' type: the first tracking of at-sea movements for the Common White Tern

Carlile N, O'Dwyer T

3A | SEABIRD SYMPOSIUM III, February 9, 2022, 12:10 PM - 1:40 PM

We present the first tracked movements of the medium sized tropical Common White Tern *Gygis alba*, using Global Location Sensors (GLS), from a breeding colony on Lord Howe Island, South Pacific. The tracking period encompassed pre-breeding in one year to chick provisioning in the following season. Breeding movements were mostly restricted to the seas immediately surrounding Lord Howe Island within the Marine Park boundaries, with some pre-egg laying and post-nest failure trips 1,000 km distant. We report the first migration movements for this species into the north-western Coral Sea bounded by the New Guinea archipelago to the north and North Queensland to the west, encompassed by much of the Coral Sea Marine Park. Utilising GLS changes in light levels, we documented the day visits to the island and approximate incubation shifts, where the pair would share the 35-day incubation period in 10, almost equal, shifts of 1.7 days each. From GLS measures of saltwater immersion, the species spent 2.4% of the total time of the breeding season (August to March) in contact with seawater. In the nonbreeding season (April to July), it equated to 8.9% of the time. Annual peak monthly contact was during July (37 % – 62 % of all records), likely coinciding with annual moult. The species was almost never in contact with water at night. Despite previously held beliefs of this species remaining close to breeding islands throughout the year, our preliminary study shows them to be long distance ocean seafarers.

*Nicholas Carlile has been carrying out ecological research in New South Wales for more than 30 years. His work with Department of Industry, Planning and Environment (previously NPWS) has focused mainly on island biodiversity restorations of flora and fauna and surveys for vertebrates and invertebrates. Over the last 15 years he has been involved in the planning and completion of the rodent eradication on Lord Howe Island where his team were responsible for the protection of native fauna during the poison baiting in 2019. Monitoring of the impact of rodent removal on biodiversity here commenced in early 2020 and is expected to continue until 2023.*

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# 9. Feeding ecology of a threatened coastal seabird across an inner shelf seascape

Greenwell C[1], Tweedley J[1], Moore G[2], Lenanton R, Dunlop N[3], Loneragan N[1]
*[1]Murdoch University, [2]Collections and Research, Western Australian Museum, [3]Conservation Council of Western Australia*

3A | SEABIRD SYMPOSIUM III, February 9, 2022, 12:10 PM - 1:40 PM

This study investigated the diet composition of a bill-loading seabird, the Australian Fairy Tern *Sternula nereis nereis*, at three colony sites across an inner shelf seascape (two marine and one estuarine), using non-invasive digital photography and direct observations (*n* = 9854). It is the first major dietary study undertaken on this threatened (Vulnerable) tern species and provides important information about their feeding ecology during the breeding season. Small, surface schooling, inshore spawning fishes were the most important prey at all three sites. Blue Sprat *Spratelloides robustus*, hardyheads (Atherinidae spp.) and garfishes *Hyporhamphus* spp. dominated the diet, contributing ≥ 75% of all prey at each site. The abundance of these fishes, whose spawning period overlapped the Fairy Tern breeding season in south-western Australia (October to February), is likely an important factor influencing the location of colonies. Multivariate statistical analyses showed that prey composition differed significantly among locations and breeding seasons. Fish donated for courtship were ~ 21% (12 mm) longer than those provisioned to chicks and the composition of prey in the diet of Fairy Terns differed between courtship and chick feeding. Prey composition differed significantly among diurnal periods, with the greatest differences observed between morning and afternoon periods. The capture of at least 30 prey species suggests a degree of feeding opportunism, however, the large proportion of Blue Sprat, particularly at marine colony sites, highlights a potential vulnerability of Fairy Terns to changes in prey availability during their breeding period.

*Claire Greenwell, PhD Candidate Murdoch University. Investigating the behaviour, reproductive biology and feeding ecology of the Australian Fairy Tern in south-western Australia.*

# 3B | BIRD SONG: AUSTRALASIAN SIGNIFICANCE

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# 79. Female birdsong in Australasia: understanding sexual and temporal variation in New Zealand bellbird syllable repertoires

Roper M[1], Webb W[1], Fukuzawa Y[1], Evans C[1,2], Harmer A[1], Brunton D[1]
[1]*Massey University,* [2]*Flinders University*

3B | BIRD SONG: AUSTRALASIAN SIGNIFICANCE, February 9, 2022, 12:10 PM - 1:40 PM

How song repertoires vary within species and change over time is well studied in Northern hemisphere male songbirds. However, variation in female song repertoires remains largely unstudied despite female song being much more common than once assumed, especially in Australasia. We investigated the song syllable repertoire of the New Zealand bellbird (*Anthornis melanura*), a species where both sexes have complex but sexually dimorphic song. We compared songs at individual and population levels to investigate sex and temporal variation of syllable repertoires. We detected 96 syllable types in the population over four years, of which 58% were unique to males, 32% unique to females and 9% were shared between the sexes. The population syllable repertoire of both sexes changed substantially across years with similar turnover rates (Jaccard's similarity coefficients; female 52.9–69.0%; male 58.6–73.7%). Furthermore, many syllable types, unique to each sex, varied in prevalence within the population across years. The syllable repertoire sizes of individuals were higher for males than females (13-32, n = 7 and 6-16, n = 8, respectively). Although these sample sizes were low, the temporal variation in syllable prevalence and turnover for individuals were similar to patterns at the population level. Overall, male and female bellbirds exhibited similarities in temporal patterns of yearly repertoire composition, with rapid changes in syllable prevalence, but females had fewer syllable types than males. We suggest that these similarities and differences are consistent with male and female song repertoires being driven by similar but not identical selection pressures.

*Michelle M. Roper, Postdoctoral Researcher with interests in bioacoustics, focusing on female songbirds to understand the evolution of birdsong. I research birdsong development, song repertoires and their cultural divergence, syrinx morphology and links between vocal production, ecology and life-history traits.*

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# 17. Effects of manipulated corticosterone on vocal performance of common mynas

Gaviraghi Mussoi J[1], MacQueen R[1], Stanley M[1], Cain K[1]
[1]*The University of Auckland*

3B | BIRD SONG: AUSTRALASIAN SIGNIFICANCE, February 9, 2022, 12:10 PM - 1:40 PM

In a dynamic environment, birds can be subjected to many sources of stress, such as predation, competition, food availability, temperature fluctuations and pollution. When faced with a stressful situation, birds increase corticosterone production, affecting how they behave and interact with their environment. Early life stage stress can have a negative impact on adult birds' survival, reproductive success, and vocal learning. However, little is known about how acute stress in adult birds affects their vocal performance. In this study, we aim to understand how corticosterone levels affect the vocal performance of common mynas (*Acridotheres tristis*). We fed 13 mynas mealworms injected with crystalline corticosterone (CORT) dissolved in a solvent (dimethyl sulfoxide - DSMO). On day 1 (control), mynas were fed a mealworm with 20µl of DSMO and no CORT; on day 2 (low CORT), the birds were fed a mealworm with a CORT concentration of 0.5 µg/µl; and on day 3 (high CORT) mynas received a mealworm with a concentration of 1µg/µl. Across all treatments, we recorded the birds via audio and video to quantify changes in vocal performance and activity levels in response to different CORT concentrations. We also collected fecal samples to measure metabolised CORT from each bird. Changes in vocal performance in response to CORT elevations would suggest that stressful situations have important consequences for avian vocal communication, and therefore social interactions.

*Juliane Gaviraghi Mussoi is a 3rd year PhD candidate from The University of Auckland. In her PhD, she is investigating the importance of sleep on avian vocal performance. Her main interests are the ecological and evolutionary factors driving animal behaviour.*

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# 22. Sequences of vocal mimicry performed by male Albert's lyrebirds are socially transmitted and enhance acoustic contrast

Backhouse F[1], Dalziell A[1,2,3], Magrath R[4], Welbergen J[1]
*[1]Hawkesbury Institute for the Environment, Western Sydney University, [2]Centre for Sustainable Ecosystem Solutions, School of Earth, Atmospheric and Life Sciences, University of Wollongong, [3]Fuller Evolutionary Biology Program, Cornell Lab of Ornithology, Cornell University, [4]Research School of Biology, the Australian National University*

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Most studies of acoustic communication focus on short units of vocalisation such as songs, yet these units are often hierarchically organised into higher-order sequences. However, outside human language, little is known about the proximate and ultimate causes of sequence structure. Here we investigate the organisation, transmission, and function of vocal sequences sung by male Albert's lyrebirds (*Menura alberti*), a species renowned for extended bouts of accurate vocal imitations of other species. We quantified the organisation of mimetic units into sequences and examined the extent to which these sequences are repeated within and between individuals, and shared among populations. We found that individuals organised their mimetic units into stereotyped sequences. Sequence structures were shared within and to a lesser extent among populations, implying that sequences were socially transmitted. We next examined structural rules in the acoustic composition of the sequence as a guide to possible function. Across the species range, mimetic units were sung with immediate variety and with increased acoustic contrast between consecutive units. These two features imply that sequence structure functions to enhance the listeners' perceptions of repertoire complexity. Our results suggest that higher levels of organisation of vocalisations can be socially transmitted, and that the order of vocal units can be functionally significant. We conclude that, to fully understand proximate and ultimate causes underlying vocal behaviours, we must study both the individual vocal units and their higher-order temporal organisation.

*Fiona Backhouse is a PhD student at Western Sydney University interested in the cultural evolution of bird song and the role of cultural diversity in species conservation.*

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# 24. Plasticity in the adult contact calls of the titipounamu (Acanthisitta chloris granti), a vocal relict of the songbirds

Loo Y[1], Moran I[1], Withers S[1], Hall M[2,3,4], Cain K[1]
*[1]School of Biological Sciences, The University of Auckland, [2]Bush Heritage Australia, [3]School of Biological Sciences, University of Western Australia, [4]School of BioSciences, The University of Melbourne*

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Social species often use vocal signals to exchange information, maintain hierarchies, and coordinate activities. Species with vocal plasticity are able to adjust their vocalizations and communicate additional information such as motivational state, breeding status, or level of threat, thus improving social cohesion. Vocal plasticity is also a fundamental requirement of vocal learning. Songbirds (*Passeriformes*) are a model group for understanding vocal plasticity, with a wide array of vocalizations ranging from single-note calls to complex songs. In order to understand the evolutionary origins of vocal plasticity, we examined the extent of vocal plasticity in the titipounamu (*Acanthisitta chloris granti*), one of the two extant New Zealand-endemic species from the most basal songbird suborder (*Acanthisitti*). The vocalizations of New Zealand wrens have been assumed to be innate and non-plastic. Here we test this assumption by using spectrographic cross-correlation to determine whether individuals vary between years and are more similar to their mates than to random individuals in the population. We found that the extent of vocal similarity within and between individuals depended on call type and partnership status. One type of contact call was consistent within individuals and showed no similarity to the mate, while other contact calls were more similar between mates. We also found that within-individual call similarities significantly decreased between years, illustrating that individuals were plastic between years. Taken together, these data suggest that plasticity in this group is much higher than previously assumed and provide crucial insight into rudimentary forms of vocal learning.

*Yen Yi is a PhD candidate at the University of Auckland. Her research interest is on the relationship between life history strategies and evolutionary origins of behavioral traits. Her PhD focusses on the development, functions, and plasticity of titipounamu vocalizations.*

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# 56. Sexually distinct song cultures across a songbird metapopulation

Webb W[1], Roper M[1], Pawley M[1], Fukuzawa Y[1], Harmer A[1], Brunton D[1]
[1]*Massey University*

3B | BIRD SONG: AUSTRALASIAN SIGNIFICANCE, February 9, 2022, 12:10 PM - 1:40 PM

Songbirds learn their songs culturally, through imitating tutors. The vocal culture of a songbird population changes as new song units (syllables) are introduced through immigration, copying errors, and innovation, while other syllables fall out of use. This leads to a diversification of the syllable pool across the species, much like the diversification and spatial patterns of human language. Vocal cultures have been well studied in male songbirds but have been largely overlooked in females. Here we undertake one of the first comparisons of male and female song cultures across a songbird metapopulation—studying New Zealand bellbirds *Anthornis melanura* spanning a network of six islands. Having classified 20,700 syllables (into 702 syllable types), we compare population syllable repertoire sizes and overlap between sites and sexes. We show that males and females—both with complex songs—have distinct song cultures, sharing only 6–26% of syllable types within each site. Furthermore, male and female syllable types can be statistically discriminated based on acoustic properties. Despite diverse syllable repertoires within sites, few syllable types were shared between sites (both sexes had highly distinct site-specific dialects). For the few types shared between sites, sharing decreased with distance only for males. Overall, there was no significant difference between sexes in degree of site-site repertoire overlap. These results suggest different cultural processes at play for the two sexes, underlining the inadequacy of male-centric song research and calling for comparisons of male and female song cultures in many more species.

*Wesley Webb is a Research Officer at Massey University. His PhD was on female birdsong, and he is now leading a Marsden Fast-Start research project on song complexity in songbirds.*

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# 78. Influence of stress personality on common myna vocalisations

Macqueen R[1]
[1]*University Of Auckland*

3B | BIRD SONG: AUSTRALASIAN SIGNIFICANCE, February 9, 2022, 12:10 PM - 1:40 PM

The production of complex song is an important mechanism for both male and female songbirds, impacting their fitness. The complexity of an individual's song can be affected by stress during early development, although the effect of short-term stress on vocalisations is not known. The impact of a particular stressor is also dependant on individual identity or 'stress personality'. Therefore, short-term stressors, such as predator encounters, may differentially impact an individual's song quality and fitness. However, it can be difficult to assess the impact of stress without the use of invasive techniques. Recent developments using thermal imaging have shown that eye temperature can reflect acute changes in the physiological status of birds in a non-invasive manner.
We used this advancement to identify how short-term stress is reflected in common mynas (*Acrotheres tristis)* vocalisations and behaviours. Due to their complex song displayed in both sexes, myna are a useful model species in which to test stress and vocalisation hypotheses. We measured stress levels at elevated and baseline levels in a controlled lab environment using a thermal imaging camera and faecal hormone analyses. We compared these data with the speed individuals take to complete neophobia tests and created a profile of stress personality for each bird. We also compared each individual's behaviour and vocal activity at elevated and baseline stress levels to see how short-term stress impacts vocalisations. Our findings highlight the impact of short-term stress on individual fitness, specifically how this affects both male and female vocalisations.

*Rebecca MacQueen is a Master's student from the University of Auckland. She is investigating individual and sex differences in avian behaviour. She hopes findings will help inform and improve conservation management practices.*

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# 49. Why are parrots so gaudy and popular? Lessons from colour signalling in wild Platycercus elegans

Berg M[1], Ribot R[1], Buchanan K[1], Bennett A[1]
[1]*Deakin University*

3B | BIRD SONG: AUSTRALASIAN SIGNIFICANCE, February 9, 2022, 12:10 PM - 1:40 PM

Apart from parrots, most species of bird have long-wavelength reflecting plumage that is produced by carotenoid pigments, and short wavelength rich plumage produced by coherent scattering, and the signals from both types are often condition-dependent. Parrots are arguably the gaudiest taxon of birds, yet whether their unique (psittacofulvin) based pigment system or structurally based coloration is condition dependent remains unknown. We test this using data from a long-term field study of the crimson rosella (*Platycercus elegans*) subspecies complex. We tested for condition-dependence, sexual dichromatism and assortative pairing in eight plumage patches (three pigmentary and five structural) and two populations. We found evidence of condition dependence in both pigmentary and structural coloration, but not in all patches studied. Condition-dependence was evident through associations with physical body condition (mass independent of tarsus length), packed red blood cell volume, and disease status. In some instances, condition dependence differed between the sexes. Sexual dichromatism was widespread in structural coloration but less common in pigmentary coloration, as was evidence for assortative pairing. Taken together, our findings show that plumage coloration may provide condition-dependent signals in parrots, particularly at shorter wavelengths, but also that parrots of both sexes can maintain plumage coloration which remains brilliant to the human eye irrespective of their condition and health. We hypothesize that this same capacity has contributed to their popularity as caged birds and in turn, via the wild bird trade, their imperilled conservation status in the wild.

*Matt Berg is a research fellow in Deakin's Centre for Integrative Ecology. His research interests include disease ecology, landscape ecology, sensory ecology and behaviour. His main study system is parrots, and crimson rosellas in particular, with some work on song birds from time to time as well.*

# 3C | RAPTORS

**FEBRUARY 9, 2022, 12:10 PM - 1:40 PM**

11TH AUSTRALASIAN ORNITHOLOGICAL CONFERENCE
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# 114. Home range and habitat selection of an urban, threatened apex predator

Bradsworth N[1], Cooke R[1], White J[1]
[1]*Deakin University*

3C | RAPTORS, February 9, 2022, 12:10 PM - 1:40 PM

As anthropogenic-induced landscape modification (such as urbanisation) increases in association with the human population, wildlife will either adapt to, exploit or completely avoid these environments. Wildlife with specific resource requirements such as threatened species or apex predators are generally at risk due to limited or fragmented habitat. Identifying species-specific thresholds of tolerance to landscape modification will provide an understanding of what resources they are using, those they are avoiding, and their interactions with the surrounding environment. In this research we used a threatened apex predator, the powerful owl (*Ninox strenua*) in Greater Melbourne as an example to investigate home range, habitat selection and landscape tolerances. We deployed GPS devices to 21 urban powerful owls over five years and found owls had an average home range size of 397 hectares, while core home range was 84 hectares. Home-range size and positioning is driven by tree cover and urban land-use, while core range is restricted to treed environments with limited impervious surfaces and housing. Owl home-ranges are less likely to occur in areas of increasing property density, in particular, densities of greater than 1000 properties per square kilometre seem to be the average threshold where owls will not occupy. This understanding will contribute to direct conservation outcomes for the powerful owl by local land managers and planning departments alike. We provide a critical example about how species-specific thresholds of tolerance could be an important metric in ensuring threatened species persistence in future modified landscapes.

*Nick Bradsworth is a PhD Candidate in urban ecology at Deakin University. His main life-long interest and passion is with threatened birds and has worked extensively with species such as the powerful owl, helmeted honeyeater and Norfolk Island morepork.*

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# 80. The Square-tailed Kites, Lophoictinia isura, on the Mid-North Coast of NSW: Succeeding despite the 2019 fires and habitat change?

Fisher K[1]
[1]*NSW Department Of Education*

3C | RAPTORS, February 9, 2022, 12:10 PM - 1:40 PM

After the fires of 2012, BirdLife Australia assisted Keith Fisher in conducting a short two year study into the breeding success of the Square-tailed Kite, *Lophoictinia isura*, on the mid-north coast of NSW, and so far, the evidence supports the conclusion that there have been fire-related failures and site disturbances for some pairs, but others have fledged young successfully. To September 2021, no pairs have been found breeding where they had been at the time of the papers that were published in the late 1990s and early 2000s. Those studies resolved gaps in knowledge about the breeding biology and ecology of the species, however more long-term studies are needed: particularly in the face of urban expansion and the unprecedented 2019 bushfires. The Square-tailed Kite is an uncommon to rare endemic Australian raptor, the only member of its genus, *Lophoictinia*, and it is listed as vulnerable. The species is an important bio-indicator because of its dependence on the breeding of small forest dwelling birds for prey. Keith will use photography and data from his study, along with literature review, in order to raise awareness about, and encourage long-term studies into factors such as breeding success and density of this elegant, long-winged and very special raptor.

*Keith Fisher is a school teacher, and editor of 'Boobook' the newsletter of the BirdLife Australia Raptor Group. He is currently studying the Square-tailed Kite and the Pacific Baza, Aviceda subcristata.*

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# 112. Is lead from ammunition a threat to mainland wedge-tailed eagles?

Hampton J[1]
[1]*University Of Melbourne*

3C | RAPTORS, February 9, 2022, 12:10 PM - 1:40 PM

Despite the worldwide nature of lead exposure in scavenging wildlife, little research has been performed on this threatening process in Australia. The use of lead-based ammunition continues to be widespread throughout Australia, placing scavenging raptor species at risk. Lead exposure is a conservation concern as it can be acute and lethal but, more commonly, can cause chronic non-lethal neurological damage that increases the risks of birds dying from other causes, e.g. vehicle collisions. This presentation describes progress made in improving understanding of this issue for mainland Australia's largest raptor, the wedge-tailed eagle (*Aquila audax*). No research had been conducted on this issue prior to 2020, when studies commenced on the Tasmanian wedge-tailed eagle (*A. a. fleayi*), which found elevated lead levels in 4–10% of birds, depending of the tissue type examined (bone or liver). A 2021 project examined the utility of portable X-ray fluorescence (XRF) for measuring lead levels in 92 archived bone samples from wedge-tailed eagles from eastern Victoria and, concerningly, found elevated levels in 60% of birds. A passive surveillance project with a wider geographical scope has begun to measure lead levels in liver and bone from archived specimens from across mainland Australia. This study is in progress with results expected to be published in 2023. It is hoped that the culmination of these research efforts will enable Australia to make a more substantial contribution to the international conversation surrounding lead poisoning in raptors.

*Jordan Hampton is a veterinarian with broad research interests in wildlife management, animal welfare, toxicology, public health and ethics. He is currently studying the ecotoxicology of lead (Pb) from ammunition in Australia using a One Health framework.*

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# 46. Sibling Rivalry in breeding White-bellied Sea-Eagles – from EagleCAM observations in the Newington Nature Reserve

Harrington J[1], Hutchinson G, Mcgregor S
[1]*Birdlife Southern Nsw*

3C | RAPTORS, February 9, 2022, 12:10 PM - 1:40 PM

EagleCAM has allowed close observation of the breeding behaviour of Sea-Eagles, without disturbance or interfering in their natural behaviour. In many raptor species it is common to see sibling rivalry, with the older nestling usually the more dominant, monopolising food or even attacking the weaker . Over some 12 years of observations, there has been a definite trend for delayed incubation between laying of the two eggs- allowing the second hatched to "catch up" somewhat with the first hatched stronger chick. We have still observed some competition after hatching, gradually lessening as both chicks grow. The older chick initially nearly always receives the first feed and may peck at its sibling, causing it to retreat in submission. This is natural behaviour and we have seen no intervention from the parents. We have not observed "obligate siblicide," in which the larger chick invariably kills its smaller sibling. However, In 2018, the death of the smaller nestling was caused by sibling rivalry. Relentless pecking caused the weaker nestling to cower into submission when food was offered. As food was scarce over several days, the older stronger nestling monopolised the food, causing the injury to and eventual starvation of its sibling. In 2021, we again observed increased aggression when food was scarce for a short time. The competition lessened and both nestlings continued to receive food and develop as expected.

Our observations have indicated increased sibling aggression when food is scarce. Indeed survival of the fittest.

*Judy Harrington is currently Chair of BirdLife Southern NSW and a founding member of the EagleCAM team. Research interest is in the breeding of White-bellied Sea-Eagles, particularly threats in the urban area. Also migratory Shorebirds. She has a particular interest in education – encouraging children to love and care for birds.*

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# 100. Archaehierax sylvestris: a unique late Oligocene (26–24 Ma) raptor from the prehistoric forests of inland South Australia.

Mather E[1]
[1]*Flinders University*

3C | RAPTORS, February 9, 2022, 12:10 PM - 1:40 PM

For many years, the fossil history of pre-Pleistocene Australian Accipitridae has been poorly understood due to a lack of material. Only two species were known from this time period: the Oligo-Miocene *Pengana robertbolesi* from Riversleigh, Queensland, and the Miocene *Aquila bullockensis* from Bullock Creek, Northern Territory. Both these species were described from isolated, incomplete bones, making meaningful phylogenetic comparisons with other species of fossil and living accipitrids difficult. The recent discovery and description of a new species from Lake Pinpa, South Australia, has greatly expanded our understanding of early raptor evolution in Australia. *Archaehierax sylvestris* is known from a partial skeleton comprised of 63 bones and lived when the Australian continent was covered by great expanses of forests. It is the largest terrestrial predator known from the Pinpa Local Fauna, and one of the largest known from Australia during the Oligocene. It had short wings and long legs relative to its body size, similar to modern species of forest-dwelling accipitrids. Through morphological and molecular phylogenetic comparisons, it was found that *Archaehierax* was part of an extinct basal subfamily of accipitrids that was endemic to Australia. This reveals that the Accipitridae were both established in Australia and diversifying from their relatives in the northern hemisphere by the late Oligocene.

*Ellen Mather is a recent postdoctoral graduate of Flinders University, specializing in palaeontology, phylogenetics and ecology of extinct birds.*

# 3D | INTEGRATED RESPONSES: PHYSIOLOGY AND COGNITION

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# 72. Local adaptation to thermal stress in house sparrows.

Buchanan K[1], Griffith S[2], Deviche P[3]
[1]*Deakin University,* [2]*Macquarie University,* [3]*Arizona State University*

3D | INTEGRATED RESPONSES: PHYSIOLOGY AND COGNITION, February 9, 2022, 12:10 PM - 1:40 PM

In a warming world, birds can employ a range of behavioural and physiological strategies to enable successful survival and reproduction, but important questions arise about whether their rate of adaptation can be rapid enough for the speed of environmental change. Physiological adaptations to temperature stress include adaptation of the physiological stress response. Whilst, diurnal elevations in temperature provide a regular, predictable stressor which would allow for physiological adaptation, unpredictable heat wave events, which are predicted to become both more frequent and more extreme offer less capacity for local adaptation. Here, we tested the physiological stress response with changes in ambient temperature in free-ranging House Sparrows, *Passer domesticus*, sampled across a transect from Geelong, through Mildura to Broken Hill. We sampled adult males and females to test whether the physiological response to capture and restraint stress is associated with diurnal temperature changes. We measured plasma corticosterone (CORT) and blood glucose levels within three minutes of capture (baseline) and again 30 minutes later (stress-induced). Neither plasma CORT, nor plasma glucose levels were sex-dependent. Baseline CORT, (but not glucose) differed between locations, but during capture both increased in a location-unrelated manner. Neither baseline CORT nor baseline glucose changed with diurnal change in temperature. Thus, acute stress in House Sparrows increased plasma CORT and glucose concentrations, as expected. However, comparisons across populations revealed no support for the hypothesis that populations show differences in the modulation of their stress response in response to diurnal temperature changes.

*Kate Buchanan gained her PhD from University of London. She moved to Deakin University in 2008 and held a Future Fellowship 2015-21. Her research focuses on the impacts of early development on adaptive physiological and behavioural change, using a range of songbird model species*

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# 11. Heat stress inhibits cognitive performance in wild Western Australian magpies (Cracticus tibicen dorsalis)

Blackburn G[1], Ashton B[1,2], Broom E[1], Ridley A[1], Thornton A[3]
[1]*University Of Western Australia,* [2]*Macquarie University,* [3]*University of Exeter*

3D | INTEGRATED RESPONSES: PHYSIOLOGY AND COGNITION, February 9, 2022, 12:10 PM - 1:40 PM

Cognition enables animals to respond and adapt to environmental changes and has been linked to fitness in multiple species. Identifying the potential impact of a warming climate on cognition is therefore crucial. Although rising temperatures are known to have lethal and sub-lethal consequences on wildlife, the effects of temperature on cognition are unknown in wild animals, despite heat stress being a well-established cause of cognitive impairment in humans. We quantified individual performance in an ecologically relevant cognitive trait, associative learning, under both heat stress and non-heat-stress conditions to investigate the relationship between heat stress and cognition in wild Western Australian magpies (*Cracticus tibicen dorsalis*) over two consecutive years. We found that heat stress had a significant negative effect on performance in both testing periods, with individual pass rates of 5.6% and 15% under heat stress, compared to 82.4% and 76% under non heat stress conditions. The long-term repeatability of cognitive performance within temperature conditions was high (i.e. consistent fails under heat stress and consistent passes under non heat stress conditions between years), but repeatability between conditions was low. This suggests that the observed effect could not be attributed solely to natural fluctuation in cognitive performance. This study is one of the first to reveal the negative influence of heat stress on cognitive performance in a wild animal, drawing attention to the potential cognitive consequences of rising temperatures.

*Grace Blackburn, PhD student at the University of Western Australia studying the relationship between anthropogenic change, cognition and sociality.*

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# 21. Historical group size and intra-group aggression predict cognitive performance in Western Australian magpies

Speechley E[1], Ashton B[2], Thornton A[3], King S[4], Simmons L[1], Woodiss-Field S[1], Ridley A[1]
*[1]Centre for Evolutionary Biology, University Of Western Australia, [2]Department of Biological Sciences, Macquarie University, [3]Centre for Ecology and Conservation, University of Exeter, Penryn Campus, [4]School of Biological Sciences, University of Bristol*

3D | INTEGRATED RESPONSES: PHYSIOLOGY AND COGNITION, February 9, 2022, 12:10 PM - 1:40 PM

Cognition provides the mechanisms by which animals can learn from their environment and flexibly adjust their behaviour, with high variability in cognitive performance both among and within species. The social intelligence hypothesis argues that the cognitive demands of social living, such as maintaining and coordinating multiple relationships, accounts for this variation. Previous work on the Western Australian magpie *(Gymnorhina tibicen dorsalis)* has demonstrated that individuals in larger social groups have higher general cognitive performance. Here, we use social network analysis and long-term data to test the factors underpinning this relationship. Specifically, we investigate whether social network position is related to learning performance in a task requiring test subjects to associate a colour cue with a food reward (n=53). We found that cognitive scores were not predicted by current group size, but by an individual's historical group size. Specifically, individuals with historically larger group size performed best in cognitive tests. Cognitive scores were also predicted by the rate of within-group aggression, with individuals who initiated more aggression performing worst in cognitive tests. Overall, our results show the benefits of combining long-term data and social network analyses to shed light on the factors underlying natural variation in cognitive performance in wild populations.

*Elizabeth (Lizzie) Speechley is a behavioural ecologist and PhD candidate at the University of Western Australia. Lizzie is particularly interested in animal behaviour and her PhD research explores the relationship between sociality and cognition in the Western Australian magpie.*

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# 75. The influence of parental pre-natal exposure to heat calls on thermal tolerance of their offspring

Galletta L[1], Craven M[1], Meillère A[1], Crowley T[1], Buchanan K[1], Mariette M[1,2]
*[1]Deakin University, [2]Estación Biológica de Doñana EBD-CSIC*

3D | INTEGRATED RESPONSES: PHYSIOLOGY AND COGNITION, February 9, 2022, 12:10 PM - 1:40 PM

Phenotypic plasticity allows organisms to adapt to local environmental conditions. Understanding the mechanistic limits of phenotypic plasticity is valuable in predicting the consequences of the current climate crisis for natural populations. Zebra finches (*Taeniopigia guttata*), produce heat calls when the ambient temperature rises above 27°C. Embryos exposed to heat calls show adaptive changes in growth and development, physiology, and a preference for hotter nesting conditions when adult. Here, we test the hypothesis that parents that were prenatally exposed to heat calls go on to produce embryos that are more tolerant of high temperatures. To test this hypothesis, we collected fertile eggs 7-days postlay from parents which had either been exposed to heat or control calls as embryos. We experimentally exposed embryos to an acute heat challenge and quantified their expression levels of heat shock proteins (HSPs), compared to a control treatment (same handling, but no heat challenge). Our results suggest that embryos of parents exposed to heat calls may adaptively alter their upregulation of heat shock proteins, although this result holds only for a single gene, when controlling for multiple tests. Our work represents the first experimental test of the capacity for transgenerational impacts of prenatal acoustic information on adaptive cellular changes promoting thermal resilience.

*Lorenzo Galletta is currently enrolled as a PhD candidate in the Centre for Integrative Ecology at Deakin University, Australia. His interests concern the impact of current climate change projections on wildlife, as well as the potential adaptive mechanisms wildlife may employ to develop resilience*

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# 26. Drivers of intraspecific variation in cognitive performance in a wild bird

Soravia C[1], Ashton B[1,2], Ridley A[1,3]
*[1]Centre for Evolutionary Biology, University Of Western Australia, [2]Department of Biological Sciences, Macquarie University, [3]FitzPatrick Institute of African Ornithology, University of Cape Town*

3D | INTEGRATED RESPONSES: PHYSIOLOGY AND COGNITION, February 9, 2022, 12:10 PM - 1:40 PM

Cognition comprises the mechanisms that allow animals to process information from the environment and respond appropriately, including learning, memory, and decision-making. There can often be high intraspecific variation in cognitive performance, which can result in differential survival and reproductive success. It is therefore crucial to identify the drivers of intraspecific variation in cognitive performance. Here, we test if social group size, rank, sex, and age explain individual differences in cognitive performance in 31 wild pied babblers (*Turdoides bicolor*). To quantify cognitive performance, we presented each bird with 3 cognitive tasks testing their ability to (1) associate a colour cue with a food reward (associative learning); (2) switch cue when the previous one is no longer rewarded (reversal learning); and (3) control behavioural responses (inhibitory control). A single factor explained 58% of variation in individual cognitive performance across tasks, supporting the existence of general intelligence (*g*) in this species. General intelligence was not predicted by confounding factors such as latency to approach the task, interval between trials, weight, and foraging efficiency. Instead, we found that *g* declined with age in females but not males. Female competition for breeding is frequent in pied babblers, and negatively impacts female fitness, whereas the same has not been observed in males. Older females (but not males) also produced on average more nestlings per year than younger females. Our finding suggests that the cost of reproduction and female competition for breeding may be associated with cognitive decline in aging females.

*Camilla Soravia is a PhD student at the University of Western Australia. Camilla is interested in animal communication, cognition, and their application to wildlife conservation; her PhD investigates the impact of rising temperatures on cognition in a wild bird.*

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## 2. Geographical variation in the thermal energetics of Yellow robins

Aharon-Rotman Y[1], McEvoy J[2,3], Beckmann C[4,5,6], Geiser F[1]
*[1]University Of New England, [2]Bush Heritage Australia, [3]Smithsonian National Zoo and Conservation Biology Institute, [4]Western Sydney University, [5]Hawkesbury Institute for the Environment, [6]Deakin University*

3D | INTEGRATED RESPONSES: PHYSIOLOGY AND COGNITION, February 9, 2022, 12:10 PM - 1:40 PM

Torpor is a controlled reduction of metabolism and body temperature, and has a great energetic advantage for small passerine birds during challenging conditions. However, despite its great energy conservation potential, the extent of torpor use by passerines is understudied. Here, we first determined if a small <20 g Australian passerine, the Eastern yellow robin, express torpor in relation to ambient temperature ($T_a$) using skin temperature ($T_s$) as a proxy for body temperature. We then compared our results to published data on a closely related species, the Western yellow robin, which at a lower elevation remained euthermic. We found that, unlike the Western robin, the $T_s$ of the Eastern yellow robin fluctuated during winter by 9.1±3.9°C on average (average minimum $T_s$ 30.1±2.3°C), providing the first evidence of torpor expression in this species. $T_s$ decreased with $T_a$, reducing the estimated metabolic rate by as much as 32%. Our study is the first to suggest geographical variations in thermal energetics in wild passerines, likely as a result of long-term thermal adaptation to the conditions in the habitat that they occupy. Species with highly flexible energy requirements have an advantage over strict homeotherms during the current increasing frequency of unpredictable changes in climate.

*Yaara is a Postdoctoral Research Fellow at the University of New England. Her main interest is avian migration and physiology, specifically, how species are responding to challenges such as climatic changes.*

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# 69. Effects of early life noise exposure on the spatial learning and memory of zebra finches (Taeniopygia guttata).

Wellard C[1], Buchanan K[1], Mariette M[1], Meillère A[1]
[1]*Deakin University*

3D | INTEGRATED RESPONSES: PHYSIOLOGY AND COGNITION, February 9, 2022, 12:10 PM - 1:40 PM

Anthropogenic noise is almost omnipresent. Consequently, birds are constantly exposed with studies documenting widespread impacts on important processes such as reproduction and acoustic communication. But a notable gap in the literature relates to how anthropogenic noise could impact early avian development and specifically behavioural development. To investigate this, we first experimentally exposed zebra finch (*Taeniopygia guttata*) eggs for the last 5 days of incubation to either traffic noise or bird song, in artificial incubators. Post-hatch from days 4 to 12, nestlings were again exposed to the acoustic treatments in a balanced 2x2 full factorial design. The spatial memory of the experimental subjects was tested once adult, over a series of trials in an apparatus designed to test the ability of small birds to learn and remember the location of a food source. We predicted that compared to control birds, adult finches exposed both pre and postnatally to traffic noise would perform worst in the spatial memory task. Whilst birds in all treatments showed signs of learning and improvement across the trials, there were no significant differences in performance between treatments. Significant differences in performance were found when comparing sexes, with males taking longer to find their food sources compared to females. Although these results fail to support our initial predictions, they generate many more questions about how anthropogenic noise can impact early development.

*Caleb Wellard has recently graduated from Deakin University where he completed his bachelors of zoology and animal science. Afterwards, he completed a summer scholarship on zebra finches and has since continued to study them into his honours year.*

# 4A | CONSERVATION GENETICS AND EVOLUTIONARY RELATIONSHIPS

**FEBRUARY 10, 2022, 12:10 PM - 1:40 PM**

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# 38. Did the rodent eradication program impact the genetic health of an endemic bird species? A genomic investigation of the Lord Howe currawong.

Prystupa S[1], Dutoit L[1], Foster Y[1], Grosser S[1], Robertson F[1], Stubbs A[1], Massaro M[2], Robertson B[1]
*[1]University Of Otago, [2]Charles Sturt University*

4A | CONSERVATION GENETICS AND EVOLUTIONARY RELATIONSHIPS, February 10, 2022, 12:10 PM - 1:40 PM

Over the last 50 years, rodent eradications have been conducted on islands worldwide to reverse the devastating effects of introduced rodents on native island biota. However, few studies have quantified whether non-target mortality caused by baiting operations have long-term genetic effects on species. This study investigated the effects of an island-wide rodent eradication on Australia's Lord Howe Island in 2019 on the genetic health of the Lord Howe currawong (*Strepera graculina crissalis*). The Lord Howe currawong is a subspecies of the nominate pied currawong (*S. graculina*) and listed as threatened because of their small population size (~400 birds) and restricted habitat. Furthermore, the LH currawong population has shown signs of inbreeding in the form of physical deformities. To ensure population persistence, 124 birds were taken into captivity during the baiting programme to protect them from poisoning. Here we used a genomics approach (Genotyping-by-Sequencing, GBS) on samples taken before and after the rodent eradication (2018-2020, n=116) to investigate genetic diversity, population structure and inbreeding levels of LH currawong relative to the mainland nominate pied currawong. The findings of this study will help to inform conservation management of the LH currawong.

*Samuel Prystupa is currently completing his MSc in the Zoology Department at the University of Otago. Sam's research interests focus on conservation genetics. Of particular interest to Sam is assessing the genetic health of a population to inform management decisions.*

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# 41. A genomics approach to kea (Nestor notabilis) conservation management

Stubbs A[1], Dutoit L[1], Foster Y[1], Grosser S[1], Jenkinson T[2], McKinlay B[3], Robertson F[1], van Stijn T[4], Robertson B[1]

*[1]Department of Zoology, University of Otago, [2]Zoo and Aquarium Association, [3]New Zealand Department of Conservation, [4]AgResearch*

4A | CONSERVATION GENETICS AND EVOLUTIONARY RELATIONSHIPS, February 10, 2022, 12:10 PM - 1:40 PM

Incorporating genetic management into captive management programs is essential to maintain genetic diversity and ensure long-term population viability. This is because captive populations are often small and established with only a few wild-born founders with unknown relationships. Ideally, before commencing a captive management program, it is important to understand population genetic structure and the relatedness amongst founders to prevent the loss of genetic diversity. Kea (Nestor notabilis) are a declining species of parrot endemic to the Southern Alps of New Zealand. Currently, the population structure and relationships amongst captive kea are unknown, limiting their suitability as an insurance population for the species. Here we use a population genomics approach (Genotyping-by-Sequencing; GBS) to examine the population structure of captive and wild kea to inform genetic management. We compare genetic diversity and inbreeding in the captive population to the known wild kea population structure to determine if the captive flock is representative of the wild kea. We also investigate the genetic origins of the captive individuals and examine their relatedness to detect unappreciated relationships and help reconstruct the captive kea pedigree. Our study will assist the long-term and sustainable conservation management of kea by informing genetic management of the captive flock with the goal of optimising retention of genetic diversity and minimise inbreeding. Importantly, our findings will determine whether the current captive population is a viable insurance population for the iconic New Zealand parrot.

*Aimee Stubbs is a Master of Science (Zoology) student at the University of Otago. Her primary interests are conservation genetics and endangered species biology. In particular, she is interested in integrating genomic and bioinformatic analyses into endangered species management.*

# 98. Genyornis, the Australian hybrid: Skull morphology, ecology and evolutionary relationships of Australia's avian giants

Mcinerney P[1], Worthy T[1]
[1]*Flinders University*

4A | CONSERVATION GENETICS AND EVOLUTIONARY RELATIONSHIPS, February 10, 2022, 12:10 PM - 1:40 PM

The variety of niches occupied by extinct and fossil birds is evidence of the avian skull's ability to change and adapt. Australia's extinct avian giants, the Dromornithidae, are of no exception. We present novel skull descriptions of the single Pleistocene representative of this family, *Genyornis newtoni,* that further reveal the complex relationship between adaptation to niche occupation and features linked to phylogenetic constraints. Distinguishing morphologies which derive from either of these, is not dissimilar to the challenging question of 'nature or nurture'. This challenge is made greater, however, when discussing species within very old, extinct families, such as the Dromornithidae. As we don't often know the ecological niches of such groups, we can only determine what is 'nurture' if we understand their 'nature', although identifying phylogenetic relationships, and thus, resolving the 'nature', has complexities of its own. Previously described dromornithid skulls led to the identification of morphologies which supported their affinities with the galloanseres. Their current placement as basal galliforms is only tentative though, as their skulls retain features which are typically 'galliform' or 'anseriform'. The discovery of the only known complete skull and 3 rostra of *G. newtoni* has facilitated a revision of dromornithid skull morphology and the unravelling of the ecology of this interesting family. Phylogenetic affinities are highlighted and aspects of adaptation, such as the striking similarity of the craniofacial hinge to that of parrots, provide insight into the complex interactions of 'nature' and 'nurture' within these ancient giants.

*Phoebe L. McInerney is a PhD Candidate under the supervision of Associate Professor Trevor H. Worthy and Professor Mike Lee at Flinders University. Phoebe is studying palaeo-ornithology with a focus on the ecology, cranial morphology and systematics of a unique, extinct group of galloanseriform, the Dromornithidae.*

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# 16. Host genomic variation and beak and feather disease virus infection in crimson rosellas (Platycercus elegans)

Lachenicht C[1], Garcia-Termignoni [2], Blanch-Lázaro [1,3], Ribot [1], Berg M[1], Alexandersen [1,3], Edwards [2], Bennett A[1]

*[1]Deakin University, [2]Harvard University, [3]Geelong Centre for Emerging Infectious Diseases*

4A | CONSERVATION GENETICS AND EVOLUTIONARY RELATIONSHIPS, February 10, 2022, 12:10 PM - 1:40 PM

Beak and feather disease virus (BFDV) is a global threat to parrots (Psittaciformes). In Australia, BFDV is considered a "key threatening process to biodiversity" by the Australian government's EPBC Act. The outcomes of BFDV infection vary across species, with some showing severe signs leading to death, whilst others are relatively unaffected, like the crimson rosella (Platycercus elegans). Host genetics may play a fundamental role in determining differences in disease outcomes within and across species. The aim of this study was to determine the relationship between BFDV infection and genomic variation in crimson rosellas, with particular attention to the immune genes of the major histocompatibility complex (MHC). After producing a reference genome, genome resequencing was performed on 54 crimson rosellas whose BFDV infection status was determined by real-time quantitative PCR. Genotype likelihoods were obtained from the resequenced individuals for variant discovery to perform population genomic analyses such as admixture, principal component analyses and scan for selection. The first four PCs explained about 9.53% of the total variability. The data clustered into 2 to 4 groups depending on the PCA figure. Genomes were annotated and used to identify genes under selection, particularly with relation to BFDV infection, and candidate genes in the MHC. The MHC class I, class II genes and toll-like receptors were mapped to scaffolds of the crimson rosella genome. Understanding associations between host genomics and BFDV infection status should benefit conservation efforts for vulnerable Psittaciforme populations.

*Candice Lachenicht is a PhD student at Deakin University focusing on disease ecology and genomics in parrots. The main focus of her research is beak and feather disease virus and the role genomics plays in infection status in crimson rosellas.*

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# 92. The phylogenetic affinities of early Miocene fossil rails (Aves, Rallidae) from New Zealand, and their relation to the modern radiation

Blokland J[1], De Pietri V[2], Lee M[3], Scofield R[2], Tennyson A[4], Worthy T[1]
*[1]Flinders University, [2]Canterbury Museum, [3]South Australian Museum, [4]Museum of New Zealand Te Papa Tongarewa*

4A | CONSERVATION GENETICS AND EVOLUTIONARY RELATIONSHIPS, February 10, 2022, 12:10 PM - 1:40 PM

Rails (Aves, Rallidae) are an ecologically diverse, widespread, and speciose family of birds, predominately associated with wetland habitats. Numerous studies have tackled the taxonomic and phylogenetic affinities of living rails, however, understanding regarding evolutionary interrelationships involving fossil taxa is relatively less established. While an Eocene origin for the Rallidae has been proposed, many pre-Pliocene fossils have only tentative associations with this family, and even uncertain assignment within the superfamily Ralloidea itself. Unambiguous Oligocene-Miocene fossil ralloids from Europe, Russia, and Australasia, however, are represented by relatively complete skeletons, or diagnostic elements, which allow for their comprehensive comparison to modern forms. Recently described *Priscaweka parvales* and *Litorallus livezeyi*, from the early Miocene St Bathans Fauna of New Zealand, are among these. Phylogenetically confounded by convergence of appendicular morphologies in accordance with the evolution of flightlessness, we refer additional material to each of these taxa to better represent their skeletons, for robust comparison with modern forms, and to resolve their phylogenetic placement within Ralloidea. Both fossil species are subsequently analysed within a parsimony and Bayesian framework, integrating living and extinct taxa into the same analyses using detailed osteological information and molecular data where available, and combined with stratigraphic information for fossils in the form of tip-dating, to most accurately converge upon their true affinities. We present resultant phylogenetic hypotheses regarding the placement of both fossil species within the context of a large sample of their successful modern counterparts, and inform upon the evolutionary composition of New Zealand's rail fauna during the Miocene.

*Jacob Blokland is a palaeoornithology PhD candidate under the supervision of Professors Trevor Worthy and Mike Lee at Flinders University. There he is researching Oligocene-Miocene fossil rails of the world, with a focus on investigating their taxonomic and phylogenetic affinities.*

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# 48. Estimating contemporary effective population size in an island population of collared flycatchers (Ficedula albicollis)

Dutoit L[1,2], Nadachowska-Brzyska K[2], Smeds L[2], Kardos M[3], Gustafsson L[2], Ellegren H
[1]*University Of Otago,* [2]*University of Uppsala ,* [3]*National Oceanic and Atmospheric Administration*

4A | CONSERVATION GENETICS AND EVOLUTIONARY RELATIONSHIPS, February 10, 2022, 12:10 PM - 1:40 PM

The long term effective population size ($N_e$) is a central parameter in evolutionary biology and population genetics that has been estimated for many populations over a wide-range of taxa. However, estimating contemporary effective population size remains challenging. Theoretically, Contemporary $N_e$ can be estimated measuring drift directly using temporal changes in allele frequencies or through the extent of linkage disequilibrium (LD) between unlinked markers. We applied these approaches to estimate contemporary $N_e$ in an island population of collared flycatchers (*Ficedula albicollis*). We sequenced the genomes of 85 birds sampled in two time cohorts around 9 generations apart before applying several temporal methods to estimate $N_e$ at a few thousand (4,000 - 7,000). The approach based on LD was limited and resulted in high estimates with high variance. Overall, our study provides insights in the power of large genomic datasets to estimate relatively high contemporary $N_e$ (>1000).

*Ludovic Dutoit is a Lecturer in Evolutionary Biology at the University of Otago. He has a range of interests in Molecular Ecology. He is using population genomics , eDNA and transcriptomics tools to approach research questions investigating the evolutionary forces shaping genomic variation both fundamentally and in conservation biology.*

# 4C | WATERBIRDS AND SHOREBIRDS; RECENT INSIGHTS INTO ECOLOGY, BEHAVIOUR, AND CONSERVATION

**FEBRUARY 10, 2022, 12:10 PM - 1:40 PM**

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# 86. Pollution in shorebirds of the East-Asian Australasian Flyway

Ross T[1], Zhang J[2], Asimakopoulos A[2], Choi C[3], Lai E[4], Chiang C[4], Jaspers V[2], Klaassen M[1]
*[1]Centre for Integrative Ecology, Deakin University, [2]Norwegian University of Science and Technology, [3]Southern University of Science and Technology, [4]Tunghai University*

4C | WATERBIRDS AND SHOREBIRDS; RECENT INSIGHTS INTO ECOLOGY, BEHAVIOUR, AND CONSERVATION, February 10, 2022, 12:10 PM - 1:40 PM

The prime threats perceived to contribute to the global decline of shorebirds include climate change and habitat loss. Potentially compounding these threats is growing pollution along the flyway. Of particular concern are per/polyfluoroalkyl substances (PFASs), an emerging class of chemicals shown to persist in the environment with detrimental effects to wildlife. As part of our ongoing work on pollutants in shorebirds, we are conducting two studies, one on shorebirds in Taiwan, and another in Victoria, Australia. In the first, we used blood samples from 6 species of shorebirds caught in Taiwan to examine PFAS levels during their migration. We disturbingly found that among these species those with high levels of pollution have faster rates of population decline.
Building on these findings and alarmed with the suggestive effect of emerging pollutants on survival, in our second study we compare pollution and local survival in two of these species using two contrasting habitats while on their Australian non-breeding grounds: a natural wetland and a putatively more polluted artificial wetland at a wastewater treatment plant. Using both pollutant and 40 years of population data, we show minimal difference in PFAS pollution between each habitat, and negligible site effects on survival. However, we also show that pollution may be a growing problem in these species, but, if managed properly, suggest that wastewater treatment wetlands may provide an alternative habitat to migratory species. In the face of widespread habitat destruction, these artificial wetlands may prove critical in curbing the decline of shorebird populations.

*Tobias Ross is a PhD candidate at Deakin University in Waurn Ponds, Victoria, Australia and has a keen interest in ecology of migratory shorebirds, and habitat management for conservation.*

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# 10. Shorebirds and waterbirds in the NSW Hunter River Estuary: the winners and losers from local habitat changes

Stuart A[1], Lindsey A
[1]*Hunter Bird Observers Club Inc*

4C | WATERBIRDS AND SHOREBIRDS; RECENT INSIGHTS INTO ECOLOGY, BEHAVIOUR, AND CONSERVATION, February 10, 2022, 12:10 PM - 1:40 PM

Since April 1999 the populations of shorebirds and waterbirds in the Hunter River Estuary in New South Wales have been monitored through monthly surveys carried out by a team of volunteers. Several species have declining populations, but many other species have benefited from rehabilitation projects in the estuary. The global declines being experienced by migratory shorebird species such as Far Eastern Curlew *Numenius madagascariensis*, Bar-tailed Godwit *Limosa lapponica* and Curlew Sandpiper *Calidris ferruginea* have been more severe locally, possibly as a result of contamination by fire-fighting chemicals at their main foraging grounds within the estuary. Other species have benefited from rehabilitation projects which have restored tidal flushing to wetlands which for decades previously were isolated from the estuary by flood control gates. Shorebird winners include Pacific Golden Plover *Pluvialis fulva* and several endemic shorebirds such as Red-necked Avocet *Recurvirostra novaehollandiae*. Waterbird species with increased populations include Australian Gull-billed Tern *Gelochelidon macrotarsa*, Caspian Tern *Hydroprogne caspia*, Whiskered Tern *Chlidonias hybrida*, White-faced Heron *Egretta novaehollandiae* and Black-necked Stork *Ephippiorhynchus asiaticus*. There were two records of latter species in surveys spanning 1999-2013; since then it has been recorded in 39% of the monthly surveys and has become a breeding resident, with two known pairs breeding successfully. Chestnut Teal *Anas castanea* is often present as more than 1% of the total population and the peak count was 3.8% of the total population.

*Alan Stuart is a retired scientist with a passion for studying and documenting the birdlife of his local area, the Hunter Region of New South Wales. He leads several long-term studies, all involving teams of volunteers.*

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# 57. A new system for continuous on-board behaviour classification using accelerometer data – a case study with Pacific Black Ducks

Yu H[1], Klasseen M[1]
*[1]Deakin University, [2]Druid Technology Co., Ltd*

4C | WATERBIRDS AND SHOREBIRDS; RECENT INSIGHTS INTO ECOLOGY, BEHAVIOUR, AND CONSERVATION, February 10, 2022, 12:10 PM - 1:40 PM

Over the past two decades accelerometer (ACC) has been increasingly used to study animal behaviours and energetics. However, the large amount of raw ACC data can be a burden to device storage and power consumption and in many cases may also require device retrieval for data collection. On-board data processing to reduce data volume and reduce power consumption for data transmission may hold promise for next-generation, smart trackers. We developed a system processing raw ACC data on-board of trackers into behaviours using XGBoost machine learning. We used this system on 3 free-ranging Pacific black ducks (*Anas superciliosa*) to study eight behaviours every 2 seconds, continuously for periods ranging between 50 days and 10 months. The behaviours were further compressed to decrease transmission cost through the mobile network. The on-board XGBoost model had 92.04% overall accuracy. The continuous behaviour records not only improved the accuracy of the behaviour time budgets but also provided new insights into animal home range estimation. On-board processing of raw ACC data and data transmission proofed highly energy efficient and came at a minimal weight cost to the trackers, providing great potential to open up new areas in ecological and behavioural research. (230 words)

*Hui Yu, PhD candidate in Deakin University, research on new technology to study wild animal behaviours.*

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# 68. FAR EASTERN CURLEW AND WHIMBREL PREFER FLYING LOW - WIND SUPPORT AND GOOD VISIBILITY APPEAR ONLY SECONDARY FACTORS IN DETERMINING MIGRATORY FLIGHT ALTITUDE

Galtbalt B[1], Lilleyman A[2], Coleman J[3], Cheng C[4], Rogers D[5,7], Woodworth B[6], Fuller R[6], Garnett S[2], Klaassen M[1,8]
*[1]Deakin University, [2]Threatened Species Recovery Hub, National Environment Science Programme, Research Institute for Environment and Livelihoods, Charles Darwin University, [3]Queensland Wader Study Group, [4]Ministry of Education Key Laboratory for Biodiversity Science and Ecological Engineering, Coastal Ecosystems Research Station of the Yangtze River Estuary, Institute of Biodiversity Science, School of Life Sciences, Fudan University, [5]Department of Environment, Water, Land and Planning. Arthur Rylah Institute, [6]School of Biological Sciences, University of Queensland, [7]Australian Wader Study Group, [8]Victorian Wader Study Group*

4C | WATERBIRDS AND SHOREBIRDS; RECENT INSIGHTS INTO ECOLOGY, BEHAVIOUR, AND CONSERVATION, February 10, 2022, 12:10 PM - 1:40 PM

In-flight conditions are hypothesized to influence the timing and success of long-distance migration. Wind assistance and thermal uplift are thought to reduce the energetic costs of flight, humidity, air pressure and temperature may affect the migrants' water balance, and clouds may impede navigation. Recent advances in animal-borne long-distance tracking enable evaluating the importance of these factors in determining birds' flight altitude. Here we determine the effects of wind, humidity, temperature, cloud cover, and altitude (as proxy for climbing costs) on flight altitude selection of two long-distance migratory shorebirds, far eastern curlew (*Numenius madagascariensis*) and whimbrel (*Numenius phaeopus*). To reveal the predominant drivers of flight altitude selection during migration we compared the atmospheric conditions at the altitude the birds were found flying with conditions elsewhere in the air column using conditional logistic mixed effect models. Our results demonstrate that despite occasional high-altitude migrations, our study species typically forego flying at high-altitude, limiting climbing costs and potentially alleviating water loss and facilitating navigation. While mainly migrating at low altitude, the birds also preferred flying with wind support to likely reduce flight costs. They avoided clouds, perhaps to help navigation or to reduce the risks from adverse weather. We conclude that the primary determinant of avian migrant's flight altitude selection is a preference for low altitude, with wind support as an important secondary factor. Our approach and findings can assist in predicting climate change effects on migration and in mitigating bird strikes with air traffic, wind farms, power lines, and other human-made structures.

*My name is Batbayar Galtbalt, a PhD student at Deakin University, studying weather and climate change effects on avian migrants.*

# 4D | ARID ENVIRONMENTS AND FIRE IMPACTS

**FEBRUARY 10, 2022, 12:10 PM - 1:40 PM**

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# 7. Movement strategies and avian responses to forest fire history

Franklin M[1], Major R, Bedward M, Bradstock R
[1]*Centre for Environmental Risk Management of Bushfires, University of Wollongong*

4D | ARID ENVIRONMENTS AND FIRE IMPACTS, February 10, 2022, 12:10 PM - 1:40 PM

Frequent forest fire is a strong, cyclical disturbance for birds and alters habitat at landscape-scales in favour of short fire-ages. Climate change will continue to drive increases in fire frequency worldwide, so understanding the implications for birds at the trait and species levels is imperative. We explored relative avian mobility, with species assigned to migratory, nomadic or exclusively sedentary groups, as a mechanism that may influence species susceptibility to increased fire activity. Forest patches representing combinations of levels of fire frequency and the presence/absence of long unburnt forest in the surrounding landscape were established as sites in the Blue Mountains, south-eastern Australia. A Bayesian multispecies occupancy model with bird data obtained from acoustic recordings was used to ascertain 1) whether movement groups and species responded to fire on the basis of relative mobility, and 2) the direction (positive/negative) of responses to fire frequency and long unburnt forest.

The migratory movement group preferred forest patches with long unburnt forest in the surrounding landscape. No other group-level responses were observed, but there were twice as many mobile species (migrants, nomads) than sedentary species in the 20% of species that responded to fire. Species responses to the presence of long unburnt forest were all positive, and were much stronger than the positive or negative responses to fire frequency. Within movement groups, particular species with foraging or nesting niche overlap responded similarly to fire. Relative mobility enables birds to occupy their preferred fire-affected habitat, which for many includes long unburnt forest in the landscape.

*Michael Franklin is a PhD student at the University of Wollongong and is investigating the fire ecology of birds.*

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# 99. Breeding biology of babblers in the Australian arid zone - coping with climatic adversity

O'neill L[1], Herberstein M[1], Russell A[2]
[1]*Macquarie University,* [2]*University of Exeter*

4D | ARID ENVIRONMENTS AND FIRE IMPACTS, February 10, 2022, 12:10 PM - 1:40 PM

Climate change is predicted to increase the frequency and intensity of extreme weather events such as drought, which can already be seen with the recent increase in frequency and extent of bush fires and drought in Australia. This will have serious consequences on our already-vulnerable wildlife, one key aspect at significant risk is reproductive success. To understand the impacts that increasing aridity will have on our avifauna we investigate chestnut-crowned babblers (*Pomatostomus ruficeps*) living in the arid zone. We studied a population at Fowlers Gap Research Station over a fifteen year period with high inter-annual precipitation variability. These birds live in the outback year round and vary their breeding efforts significantly in response to climatic factors. Here, we use sliding-climate windows to identify the weather conditions and their timing which can predict breeding efforts. We then describe the effects of environment on maternal investment in egg and clutch sizes to ascertain how these might be affected by future climate scenarios. Next, we show the extreme variation in breeding output between years with differing aridity and finally investigate the sex ratio of the offspring under different environmental conditions to identify if this may be prone to climatic variation. Thus, we provide a broad account of the effects of an arid climate on breeding success in an arid-zone species, which can help predict future scenarios under climate change.

*Louis is imminently completing his PhD and is excited for the future. He aspires to combine his research with his passion for conservation to maximize conservation success. Aside from his research he is an enthusiastic bird bander and wildlife carer.*

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# 59. Geographic and environmental variation influences the post-fire responses of birds in a semi-arid landscape

Makdissi R[1], Radford J[1], Bennett A[1], Verdon S[1], Clarke M[1]
[1]*Research Centre for Future Landscapes, La Trobe University*

4D | ARID ENVIRONMENTS AND FIRE IMPACTS, February 10, 2022, 12:10 PM - 1:40 PM

In fire-prone landscapes, fires can act as a threat to species persistence but also an important ecological process that promotes populations. A key objective of fire management is to foster a fire regime that promotes species persistence. A species' ability to persist in fire prone landscapes is influenced by the prevailing fire regime (i.e. frequency, severity, patchiness, seasonality and inter-fire interval, spatial context of fire (size, configuration, contiguity) and the species' life-history traits and ecological requirements.

We surveyed birds in two distinct semi-arid vegetation types (Heathland Sands and Lowan Mallee) and geographic regions (Big Desert Wyperfeld and Little Desert) in south-eastern Australia. We conducted four surveys at each of 288 sites that represented a 75-year chrono-sequence of time-since-fire. We used generalized additive models to predict how the occurrence of species changed in response to time-since-fire. Time-since-fire was a significant predictor for 9 of the 18 bird species modelled in Heathland Sands and 9 of the 21 species modelled in Lowan Mallee. We detected considerable geographic and environmental variation in fire responses: post-fire responses were not consistent between geographic regions or vegetation types within or between species. This finding highlights the need to consider environmental variation when developing species' fire-response curves for ecological fire management. Despite their mobility, for many species of birds their use of these vegetation types is significantly affected by fire history. Integrating these results into future fire planning will enhance the conservation of the region's birds.

*Rhys is a PhD candidate in the Department of Ecology, Environment & Evolution, at La Trobe University in Melbourne. His research focuses on how birds, at both the species and community levels, are influenced by wildfires and current fire management practices.*

# 60. Birds and fire. Old rules no longer apply.

Kuchinke D[1]
[1]*Federation University*

4D | ARID ENVIRONMENTS AND FIRE IMPACTS, February 10, 2022, 12:10 PM - 1:40 PM

Birds respond to changes in vegetation structure. Ergo, fire impacts birds. A seminal work and for so long an established framework - key to much fire research - is Bradstock's paper on fire drivers (2010). The notion of on/off switches: 1) biomass growth; 2) availability of vegetation for burning; 3) ambient fire weather; and 4) ignition, from lightning and anthropogenic sources, has resonated with many fire ecologists. Others have supplemented this scheme by adding a range of time-scales over which the four switches operate. However clearly, these factors alone are still too simplistic. For, overarching all, in south-east Australia, there is further moderation by the four key climate drivers: Pacific Decadal Oscillation, El Niño Southern Oscillation, Indian Ocean Dipole, and the Southern Annular Mode. Driven by winds and temperature variations, these four variants to the local circulation patterns impact fire frequency, severity, intensity and rainfall – across time-scales. They are the key climate elements to consider when forecasting future wildfire patterns across this region. My own research, reviewing fire impacts on birds in the heathy-dry forests of Victoria, considers factors of prescribed burn severity, fire frequency, fire interval and time-since-fire, and has highlighted complexities. But in this presentation, I want to explore the notion that the old rules no longer apply. The fire season of 2019/20 in SE Australia has flagged for us all that the ideas behind Bradstock's 4 switches need revising; climate change has resulted in synergies. I'll present an amended framework for us all to consider.

*I am a Sessional Lecturer at Federation University, and passionate about fire ecology. The fire season of 2019/20 left us all scrambling, in our efforts to make sense of a fire season that spanned one full year.*

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# 30. Two decades of dynamism: up and downs in desert birds and Australasian ornithology

Watson D[1]
[1]*Charles Sturt University*

4D | ARID ENVIRONMENTS AND FIRE IMPACTS, February 10, 2022, 12:10 PM - 1:40 PM

In December 2001, the first Australian Ornithological Conference was held. The following week, I undertook my first fieldtrip to Sturt National Park, and have been returning every year to keep tabs on the dynamics of bird assemblages. Here, I reflecting on two decades of change, in both desert birds and Australasian ornithology. While initially monitoring birds using creek-line surveys, acoustic monitoring stations were installed in 2014, prototypes for an array of sensors that form the Australian Acoustic Observatory. Although the assemblage of species found along these creek-lines has remained remarkably stable during this time, ground-nesting species are the exception, with irruptions in some species and steady declines in others. The millennium drought and successive heatwaves pronounced effects on plant mortality, especially mistletoes, with four species declining to local extinction across three of the four creek-lines surveyed. During this period, Australasian ornithology has also had its share of ups and downs, as evidenced by reduced investment in protected area management, threatened species recovery actions and baseline monitoring. Membership in Birds New Zealand and Birdlife Australia are trending upwards, and there is increasing broader awareness of birds, their sensitivity to environmental degradation and their the influence as ambassadors of Nature. [Note to selection committee—Although I can deliver a précis in a regular slot, this presentation has been tailored to a keynote address]

*Professor of Ecology at CSU and organiser of the first AOC, Dave's research program spans acoustic monitoring, community ecology and plant-animal interactions, with particular emphasis on mistletoes, woodlands and survey methods.*

# Poster Session

**FEBRUARY 9, 2022, 2:10 PM - 2:40 PM**

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# 39. Stress Physiology of Grey-Faced Petrel as a Conservation Tool

Fessardi M[1]
[1]*University Of Auckland*

Poster Session, February 9, 2022, 2:10 PM - 2:40 PM

Seabirds are the most threatened group of birds globally, as well as ecologically relevant top predators and ecosystem engineers. Breeding seabirds are touted as a potential low-cost bioassay of ocean health. The effectiveness of that relationship, however, remains unclear. Shifts in ocean conditions influence foraging opportunities. Stress hormones show a strong negative relationship to food supply and detrimental effects to organisms, becoming a strategic tool that connects climate change, forage conditions and population processes. In birds, corticosterone (CORT) is the predominant stress hormone. Higher CORT levels in chicks experiencing stress are deposited in developing feathers. Thus, measures of feather CORT are an ideal source of data for estimating environmental stressors. The pattern of regulation in stress hormone levels, however, varies among species, requiring validation studies to allow drawing reliable conclusions. This study will investigate whether variation in grey-faced petrel *(Pterodroma gouldi)* feather CORT can be used as a proxy of ocean conditions and as a monitoring tool for population breeding success. Reproduction will be monitored, and feathers collected from chicks at Ihumoana Island in different years. Measures will be matched to remote sensing data to investigate whether feather CORT reflects changes in ocean conditions, and to measurements of breeding success (i.e. chicks weight, morphometric measurements, fledging success). We predict that our population will show higher detectable levels of feather CORT in years under increased environmental stress, with poorer oceanic foraging conditions, and higher CORT levels in adults will result in lower quality offspring and predict lower population breeding success.

*Maira is doing her Masters in Biosecurity and Conservation at University of Auckland. She is studying the stress physiology of Grey-faced Petrels (Pterodroma macroptera) as a conservation tool. She has worked in the wildlife conservation field for about five years.*

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# 15. Inbreeding and inbreeding depression in the threatened Aotearoa New Zealand hihi

Duntsch L[1], Whibley A[1], Bailey S[1], Brekke P[2], Ewen J[2], Santure A[1]
*[1]University Of Auckland, [2]Zoological Society of London*

Poster Session, February 9, 2022, 2:10 PM - 2:40 PM

When a population undergoes a bottleneck event that results in a decrease in population size, researchers often observe an increase in inbreeding, a term used to describe the mating between relatives. As inbreeding combined with a small population can lead to a loss of genetic diversity in the population, it may reduce the adaptive potential of the species. Further, many studies show that inbreeding can also lead to a reduction of fitness in such a population, termed inbreeding depression.

One of Aotearoa's species of conservation concern is the hihi (stitchbird; *Notiomystis cincta*), a threatened endemic passerine. In 1995, hihi individuals were translocated onto Tiritiri Matangi, a small island that has undergone a massive transformation from farmed grassland to pest-free native bush over the last 50 years. Since reintroduction, a wealth of life history, pedigree and genetic data has been collected for hihi. Together with a recently developed genome assembly and 50k single nucleotide polymorphism (SNP) array, these resources provide a unique opportunity to measure inbreeding in 500 hihi from the Tiritiri Matangi population, and specifically infer how severely the population has been impacted by the effects of inbreeding depression. We present population-based and individual-based homozygosity levels and examine whether global effects of many slightly deleterious variants across the genome are contributing to inbreeding depression in the hihi, if at all, rather than fewer (but distinct) homozygous regions. With my work, we hope to draw a clearer picture of the potential of the species to adapt to future global change.

*Laura Duntsch is a 3rd-year PhD candidate at SBS at the University of Auckland, under the supervision of Anna Santure. She aims to understand and apply the latest conservation genetic tools in order to help bridge the gap between genomic research and threatened species management.*

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# 104. Fertility and early embryo death in the critically endangered kakapo (Strigops habroptilus)

Savage J[1,2], Crane J[3], Kakapo Recovery Team[3], Hemmings N[2]
*[1]Southern Institute of Technology, [2]Department of Animal and Plant Sciences, University of Sheffield, [3]Kakapo Recovery, Department of Conservation*

Poster Session, February 9, 2022, 2:10 PM - 2:40 PM

Hatching failure is a common problem for endangered birds, and kākāpō (Strigops habroptilus), are a particularly clear example. In these critically endangered flightless parrots around 61% of eggs fail to hatch, with 73% of these showing no sign of development. The low hatching success of kākāpō was previously attributed to fertilization failure, but undeveloped eggs can also result from embryo death during early stages of development. As the underlying causes of fertilization failure and embryo death differ, identifying the relative importance of these effects in driving hatching failure has implications for effective conservation management.

The entire remaining population of 200 kākāpō is managed by the New Zealand Department of Conservation on several predator-free offshore islands. During the 2019 breeding season we preserved the yolks of undeveloped kākāpō eggs, then investigated their fertilization status using fluorescence microscopy. We found that the majority (72%, n=124) of undeveloped kākāpō eggs were fertilised, suggesting early embryo death is a much more important contributor to hatching failure than previously realized. We also found positive effects of artificial insemination on the numbers of sperm reaching the egg. We are continuing our investigation into kākāpō hatching failure during the 2022 breeding season, with the aim of building a more complete picture of how multiple mating, maternal traits, and other factors combine to explain fertilization failure and embryo death in kākāpō and other threatened bird species.

*Dr James Savage is the Research Coordinator of the Southern Institute of Technology in Invercargill, NZ. He previously worked as a lecturer and postdoctoral researcher in the UK, Ireland, and the Netherlands. His research focuses on social and reproductive behaviour, particularly maternal investment and parental care.*

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# 83. The impact of urbanisation on Australia's raptors and owls

Headland T[1], Colombelli-Négrel D[1], Callaghan C[4,5], McPherson S[2,6], Kleindorfer S[1,2], Sumasgutner P[2,3]
*[1]College of Science and Engineering, Flinders University, [2]Konrad Lorenz Research Centre, Core Facility for Behaviour and Cognition, The University of Vienna, [3]FitzPatrick Institute of African Ornithology, DSI-NRF Centre of Excellence, University of Cape Town, [4]German Centre for Integrative Biodiversity Research (iDiv), [5]Centre for Marine Science and Innovation, School of Biological, Earth and Environmental Sciences, University of New South Wales, [6]The University of KwaZulu-Natal*

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Urbanisation is a key driver of biodiversity and species loss across the globe. Understanding how species adapt to an ever-changing environment enables shrewd management practices to be implemented, although the mechanisms that underpin these adaptations are often poorly understood. Raptors are on top of the food chain and sensitive to disturbance; however, some are becoming increasingly well adapted to an urban lifestyle. Which specific traits are associated with urbanisation is largely unknown for the Australian raptor community (including diurnal raptors and owls). Resource availability, in terms of prey, and suitable nesting sites, are limiting raptor abundance and distribution. Thus, we hypothesise that the presence of Australia's raptors and owls is shaped by diet, hunting mode and nesting structure. To test this, avian citizen science data (eBird) records will be intersected with a continuous measure of urbanisation, artificial light at night (ALAN). Modelling will produce a continental measure of urban tolerance for each species. Using this approach, inferences can be made about the adaptability of each species to urbanisation and how we can best manage key habitat to ensure the survival of important keystone species. It is expected that a positive response to urbanisation will be observed for avian specialist feeders, species nesting on cliffs and using nest boxes and visual hunters, whilst a negative response will be seen for mammalian specialist feeders, tree nesting species and acoustic hunters. This research will provide interesting insight into the factors driving urban adaptability amongst Australia's raptors and owls.

*Taylor Headland is a current PhD student at Flinders University, South Australia. Taylor is interested in raptor ecology, particularly raptors inhabiting urban environments and how key breeding and foraging habitat can be conserved in a rapidly urbanising world.*

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# 67. Geographic isolation and sex-biased dispersal impact gene flow among multiple populations of the Noisy Miner: implications for population control

Barati A[1], Ferdosi M[2], Etzadifar E[1], Major R[3], Andrew R[4], McDonald P[1]
*[1]Animal Behaviour and Ecology Laboratory, Zoology, University of New England, [2]Animal Breeding and Genetic Unit, University of New England, [3]Australian Museum Research Institute, Australian Museum, [4]School of Environmental and Rural Science, University of New England, Armidale, NSW.*

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Habitat fragmentation generally increases genetic drift and reduces connectivity between remnant populations, however in species that benefit from increased availability of edge habitats, such as the Noisy Miner (*Manorina melanocephala*), fragmentation can also facilitate movement. This is particularly important for this despotic species, as it is one of the main ecological threats to native biodiversity throughout its range, and has been the subject of culling intervention to reduce numbers. Despite this, rapid recolonisation has limited the success of these actions, so we studied genetic connectivity and gene flow between colonies across fragmented landscapes to better understand these processes. We sampled 312 Noisy Miners obtained from culling activities across seven different colonies in the Northern Tablelands region, NSW, Australia, using a total of 25,113 SNPs (single nucleotide polymorphisms). Six of the sites were located up to a maximum distance of 30 km (range: 4.5-30 km) apart, with an additional outlying site located ~ 80 km away. Gene flow and connectivity among populations declined significantly as geographic distance increased, however the Bundarra colonies within 30kms of each other had a higher rate of genetic connectivity and gene flow than observed with the more distant Hillgrove colony. Sex significantly impacted the degree of allele sharing between colonies, reflecting female-biased dispersal in this species. Together, these results suggest that both geographic distance and sex-biased dispersal impact gene flow and connectivity, and have implications for selecting the most appropriate colonies to cull in future amelioration work for effective management and control strategies.

*My name is Ahmad Barati and I am a postdoctoral researcher at the Avian Behavioural Ecology Laboratory, University of New England. My research have largely been focused on social behaviour and population generics of the Noisy Miner.*

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# 52. "True" individual recognition and its potential role in the complex social system of the Noisy Miner (Manorina melanocephala).

Farrow L[1], Barati A[1], McDonald P[1]
[1]*University Of New England*

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The ongoing pandemic and rise in mask use has highlighted to humans how important cues of identity are in communication, however this facet is relatively poorly studied in Australia's famously cooperative social birds. This is surprising, as it has long been hypothesised that individual recognition is just as important in the maintenance of cooperative systems in non-human species. However, despite the potential benefits associated with recognising conspecifics, "true" individual recognition has yet to be demonstrated in the vocal system of an avian species. Here, we studied the ability of the highly despotic Noisy Miner (*Manorina melanocephala*) to truly recognise unfamiliar conspecifics across contexts. We identified that regardless of whether the focal subjects were exposed to terrestrial or aerial vocalisations during habituation phases during an adaptation of the habituation-discrimination paradigm, noisy miners proved capable of maintaining habituation to unreliable signallers across the other context. That is, once miners had habituated to one type of alarm call from an individual, they continued to ignore another, previously unheard call type from the same individual. This definitively demonstrates that the birds were able to identify individuals from their voice alone, and transfer a learnt social property of a given individual across to a different social context. This ability would be highly beneficial in facilitating cooperative events such as mobbing in miner society, allowing miners in complex social systems to direct aid to the most "helpful" amongst them to maximise their evolutionary benefits.

*My name is Lucy Farrow and I am approaching completion of my PhD project in which I have used a range of field- and laboratory- based experiments to understand the behaviours and neuroanatomy of the noisy miner.*

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# 27. Relatedness, adaptation and population structure in the invasive Avian Vampire Fly parasitising Darwin's Finches

Common L[1], Colombelli-Negrel D[1], Dudaniec R[2], Kleindorfer S[3]
*[1]Flinders University, [2]Macquarie University, [3]Konrad Lorenz Research Center*

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Introduced species represent an increasing threat to bird populations globally. On the Galapagos Islands, the greatest threat to all land birds is the Avian Vampire Fly (*Philornis downsi*), a parasite that causes high mortality and deformation in its nestling hosts. Despite growing research, there is little known about the ecology of this highly virulent parasite and how it has changed since introduction. It is critical to understand an introduced population to target control methods and conserve threatened host populations. We use single nucleotide polymorphisms (SNPs) genotyped using restriction site-associated DNA sequencing (RADseq) to investigate the changes in Avian Vampire Fly relatedness, population structure and selection signatures across a 14-year period. Mating and oviposition behaviour will be inferred from parentage and sib-ship structure of parasites collected from nests of two Darwin's finch species, Small Ground Finch (*Geospiza fuliginosa*) and Small Tree Finch (*Camarhynchus parvulus*). Changes in population structure and effective population size will be assessed in adult flies collected across four time periods. Using $F_{ST}$ outlier tests, candidate SNPs under putative selection will be identified and annotated to the *P. downsi* genome to ascertain gene functions. Changes in genetic structure, and in the allele frequencies of candidate loci will be across years to examine for shifts in evolutionary processes during the invasion of the Avian Vampire Fly. Previous studies have found shifts in both host and parasite behaviour and ecology within this system. Our results can help to understand how parasites adapt following invasion to both their environment and avian hosts.

*Lauren K. Common is a 3rd year PhD candidate at Flinders University currently investigating changes in the accidentally introduced Avian Vampire Fly and its effects on its hosts, the Darwin's Finches of the Galapagos Islands.*

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# 84. Miniature animal-borne acoustic recording units as aids to investigate vocal behaviour and derive population density estimations

de Rosa A, Castro I[1], Olsen D, Marsland S
[1]*Massey University,* [2]*Victoria University of Wellington,,* [3]*Kiwitrack Ltd*

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Passive acoustic monitoring involves the deployment of acoustic recording units (ARUs) able to automatically collect data over a prolonged period, providing a wealth of data that can be used to investigate species behaviour, richness, occupancy, and distribution among others. Applying passive acoustic monitoring in a quantitative fashion, such as estimating abundance rather than diversity, would require some multiplying factor to relate the detected vocal activity rate to the number of individuals in the area. This would be possible by either having an idea of how many different individuals were found in a particular recording, or by understanding how much individuals vocalise on average, and then relating this to the real number of individuals in the target area. We developed animal-borne acoustic recording units embedded in radio transmitters (micro-recording transmitters) and equipped a representative portion of known population of North Island Brown Kiwi (Apteryx mantelli) individuals with them. We conjointly deployed environmental ARUs to compare vocal activities between individuals and their community. In this presentation we will present recent data showing how these micro-recorders can be used to develop and improve passive acoustic monitoring protocols and vocal communication for species of interest.

*I am a wildlife biologist with broad interests including animal behavior, parasite-host interactions, anatomy, morphology, sensory biology, and conservation. I have a passion for solving conservation problems, making new biological findings, and working with technology.*

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# 28. Variation in nest dimensions of common blackbird population in New Zealand

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The design, shape and dimension of nests are specific in many bird species, from small elaborate nest cups constructed by passerines to the large mound nests built by megapods. However, we have little understanding of the key characteristics of nests that influence breeding success and how nest dimensions vary between individuals. Here I looked at the nest characteristics of a population of common blackbird in New Zealand. I measured nest dimensions of blackbird nests across three breeding seasons (2017 to 2019) in three phases (building, incubation, and post-fledging). I assessed how nest dimensions changed over time. and I investigated whether females build nests based on the number of eggs subsequently laid. I found that the nest diameter increased across the breeding phases (from built to fledged chicks). In contrast, the nest thickness, internal nest depth, and external nest depth decreased. In addition, there was a positive correlation between the nest thickness/external nest depth and the number of eggs per clutch. My results obtained show that variation in nest dimensions aligns with nest use - nests become stretched with use but retain their overall shape – indicating flexibility. I also confirm that females build thicker and stronger nests for anticipated larger clutches.

*I am studying a Ph.D. degree at Massey University. My research focuses on the impact of human-environmental modifications on a focal bird population. I have also investigated behavioural variation and its fitness consequences for birds.*

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# 53. Cause for concern – evidence of a recent dramatic range retraction in the Western Partridge Pigeon (Geophaps smithii blauwii).

Williams P[1]
[1]*Edith Cowan University*

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The northern savannas of Australia have been exposed to a wide range of new impacts since European settlement, including altered fire regimes, introduced herbivores, introduced predators, cane toads and invasive grasses. This has been highly detrimental towards granivorous birds which have been facing widespread declines alongside the well documented mammal declines in the same region. The Partridge Pigeon (*Geophaps smithii*) is a granivorous bird species endemic to the northern savannas of Australia, that has faced major declines in recent times and has disappeared from half of its pre-European distribution. The Western Partridge Pigeon (WPP; G. smithii blauwii), is endemic to the North Kimberley region of Western Australia and is poorly known. Work on the nominate sub-species in the Northern Territory found birds were impacted by extensive late season fires, grazing and predation. To investigate the current conservation status of the WPP, we used alpha hulls to determine extent of occurrence (EOO). We split all known records of the subspecies into two time periods; prior to 1999 and post 1999. By comparing the EOO for the two time periods we have estimated a decline of 75%. Key causes of decline will be discussed and future conservation research priorities highlighted.

*Patrick Williams, currently studying Masters of Science (by research) at Edith Cowan University in Perth, Australia. He is also a trainee bird bander and has recently completed his bachelor's degree at Edith Cowan University double majoring in Conservation and Wildlife Biology and Marine and Freshwater Biology.*

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# 88. Mitochondrial DNA captures: Traps and Opportunities

Joseph L[1]
[1]*Australian National Wildlife Collection, CSIRO*

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The paper reviews a number of recent ANWC studies that have revealed situations where the mitochondrial DNA of one taxon or population has completely introgressed and taken over that of another. I will review the signals that may indicate this phenomenon, how it can be pursued and tested, and the ramifications for taxonomy and conservation that can arise.

*Leo has been Director of CSIRO's Australian National Wildlife Collection at CSIRO, Canberra since returning from the US in late 2005. He works on the evolutionary biology of Australo-Papuan birds and is particularly interested in linking birds and their genomes to their ecology and evolutionary history.*

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# 94. Season and sugar concentration affect bird behaviour at urban sugar water feeders

Erastova D[1], Cain K[1], Galbraith J[2], van Heezik Y[3], Stanley M[1]
[1]*University Of Auckland,* [2]*Auckland War Memorial Museum,* [3]*University of Otago*

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Sugar water bird feeding in residential backyards is an increasingly popular practice, but it has poorly understood effects on wildlife. One concern is whether it results in maladaptive behaviour, such as reliance on artificial food or increased aggression due to increased density of visiting individuals. We studied sugar water feeder-associated bird behaviour in two cities with different climates and across the seasons, as well as the effects of sugar concentration on bird foraging activity, aggressiveness and abundance in four bird species. Results show that residential sugar water feeders are most used by urban nectarivorous birds in the coldest months. A city comparison showed climatic and seasonal differences in sugar water feeder usage and an associated increase in aggression in relation to sugar water concentration. Furthermore, there were species-specific patterns in sugar water feeding strategies and aggression. In particular, aggressive behaviour in the largest honeyeater (tūī – *Prosthemadera novaeseelandiae*) increased proportionally with an increase in sugar concentration. Furthermore, tūī spent more time foraging at low sugar concentration feeders. Neither feeder presence nor sugar concentration had an effect on garden bird species richness or abundance. We discuss the effects of sugar water feeding on bird behaviour at the global and local scale and suggest future study directions to address gaps in understanding the effects of this practice on urban birds.

*Daria Erastova, PhD student with the University of Auckland, research interests: avian behaviour, urban ecology, ornithology, biodiversity.*

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# 13. Plastic ingestion - a sensory ecology approach

Patel K[1], Gaskett A[1], Heswall A[1]
[1]*The University Of Auckland*

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Following the mass industrialisation of plastic, several studies have revealed adverse impacts on animals, such as stomach blockages and penetrations. It has been predicted that 99% of seabird species will have ingested plastic by 2050. Birds usually interact with plastics through consumption or incorporation into their nests. Shags feed through dives, while albatross are surface feeders. Gannets feed on the surface and by plunge diving. There is a research gap connecting the relationship between sensory ecology and plastic ingestion. This study explores the relationship between foraging modes, sensory ecology, and the characteristics of ingested plastics by gannets, albatross, and shags. Ingestion patterns will be determined through gut dissections and faecal analyses of specimen obtained from across New Zealand. This study will also look at how the odours and colours of plastic change over time by placing plastics contained in mesh bags into the Hauraki gulf and observing changes via spectrophotometry and gas chromatography/mass spectrophotometry. Different foraging strategies may require various investments in sensory organs; therefore, patterns of plastic selection may arise when comparing species with different foraging strategies. Furthermore, the visual and odour properties of plastics may change over time, affecting perception. This study provides novel insights with potential management implications that may be used for plastic production or the conservation of taonga species.

*The presenting author is Kamya Patel, a postgraduate student at the University of Auckland studying biosecurity and conservation. She has many research interests in ecology, particularly concerning aspects of conservation.*

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# 23. Does backyard rat trapping improve bird nesting success?

Gerolemou R[1], Russell J[1], Stanley M[1]
[1]*School Of Biological Sciences, University Of Auckland*

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Pest mammals are well-documented predators of native species in New Zealand. This has increased people's concern for conservation and fuelled the social shift towards community engagement. Since New Zealand announced its ambitious plan to be 'Predator Free' by 2050, the number of community conservation groups in Auckland has increased to over 100, many of which were formed in response to the 'Pest Free Auckland' initiative. To help manage pest mammals, these groups carry out rat trapping at their properties and around local reserves. However, the effectiveness of these initiatives for native birds is largely unknown, particularly in urban backyards. This research recorded the outcomes of nests in suburban Auckland residential backyards and identified factors that affected fledging success. We used cameras to monitor nests of native and introduced bird species in backyards with and without rat trapping activities. Environmental data, such as nest attributes, weather, vegetation types, presence of mammalian predators, and distance to urban forest fragments, were also collected. To examine the effect of mammalian predator control, we also used citizen science data on mammalian predator trap catches as a proxy. We discuss whether backyard rat trapping is having the positive outcomes on native birds that have been predicted, and make recommendations to improve its effectiveness.

*Rosie Gerolemou is a PhD candidate at the University of Auckland. Her research explores the effectiveness of community pest management for native birds and the importance of urban forest fragments for nesting. She is also interested in the outcomes of participating in community conservation, particularly the concept of social capital.*

## 6. How well does that penguin see?

Hadden P[1], Vorobyev M[2], Turuwhenua J[3], Buckley K[4], Zhang J[1], McGhee C[1]
*[1]Department of Ophthalmology, University of Auckland, [2]Department of Optometry, University of Auckland, [3]Auckland Bioengineering Institute, [4]SEALIFE Kelly Tarlton's Aquarium*

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The aim of this study was to measure the visual acuity (spatial sensitivity) of gentoo penguins (*Pygoscelis papua*) and to determine if the acuity is higher when stimulating short and medium wavelength cones than when stimulating long wavelength cones, which would suggest a difference between the visual processing of colour and that of spatial resolution. A moving circular target (gabor) was projected onto the snow and wall of SEALIFE Kelly Tarlton's Aquarium (Auckland, New Zealand) and observed by the penguins in captivity there. Three targets were used, one consisting of alternating black and white stripes, one of alternating coloured stripes designed to stimulate only short and medium wavelength sensitive (SWS and MWS) cones and another designed to only stimulate long wavelength sensitive (LWS) cones. Two gentoo penguins were particularly interested observers, both male and aged 9 and 27 years. These two penguins were able to see both stimuli at 7.1 cycles per degree but repeatedly ceased following the stimulus at 7.7 cycles per degree when it was projected against the wall. When projected onto the snow, where the contrast was significantly less, they were only able to see both stimuli at 0.175 cycles per degree. This experiment demonstrated that gentoo penguins had at least 6/24 acuity but was unable to show a difference in spatial sensitivity in that area of the spectrum subserved by SWS and MWS cones and that subserved by LWS cones as has been postulated for other birds.

*Peter Hadden is a practicing ophthalmologist in Auckland and his research interests include both human and avian vision. He is working towards a PhD in penguin vision.*

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# 127. Occurrence and function of eyelashes across avian diversity

Victor K[1], Miller E[2], Rohwer V[3]
*[1]Cornell University, [2]Cornell Lab of Ornithology, [3]Cornell University Museum of Vertebrates, Department of Ecology and Evolutionary Biology*

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Avian eyelashes are one of the least studied groups of feathers. To better understand the occurrence and function of avian eyelashes, we examined a diversity of species from 207 bird families for the presence or absence of eyelashes. We defined eyelashes as a form of bristle feather, with a single, undivided rachis. Eyelashes were found in 28 of the 207 families (12 of which occur in Australia and New Zealand). The phylogenetic distribution of these families suggests that eyelashes are a labile trait. Species with eyelashes were, on average, larger and heavier-bodied than species without lashes, and this pattern is explained by the nearly universal presence of eyelashes in Palaeognathae. Several other patterns have emerged from this data: eyelashes appear most developed in sedentary and terrestrial species inhabiting hot regions, eyelashes are represented in cavity-nesting families, and eyelashes rarely, if ever, occur in families with species that have aquatic or semiaquatic lifestyles. Finally, comparing our data of eyelash length relative to eye size in birds with a similar dataset for mammals reveals striking similarities in lash length and eye size across these taxa. Taken together, these associations suggest that eyelashes protect the avian eye while also potentially decreasing particle deposition and evaporation across the ocular surface.

*Biography of presenting author: Kai Victor. Poster presentation. Undergraduate student. Interested in avian reintroduction and translocation research, especially as it applies to island-based conservation.*

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# 8. Fussy foragers: Which plastic colours are frequently ingested by seabirds

Heswall A[1], Friesen M, Cain K, Gaskett A
[1]*The University Of Auckland*

Poster Session, February 9, 2022, 2:10 PM - 2:40 PM

Sensory biases are common among species as they respond to certain cues and signals from a source which provides a fitness benefit. A sensory trap can form when different sources produce similar cues and signals, but the response is harmful. Plastic pollution is an ever-growing threat for seabirds. Plastics release dimethyl sulfide (DMS), a chemical also released by decomposing prey. The plastic's odour could be mistaken for prey. However, there is little research investigating whether seabirds prefer certain colours. Here, we investigate which colours of plastic is frequently ingested by seabirds. We performed a literature review exploring plastic colours ingested by seabirds around the world. We also analysed the colours of plastic found around New Zealand's coastlines using online databases. We are also dissecting the stomach and gizzards of seabird species found in New Zealand. So far, there is no significance in the occurrence of certain plastic colour in seabirds. However, clear-white plastics are the most abundant plastic colour, followed by red and blue along New Zealand's beaches ($<0.05$). The lack of literature regarding plastic colour in specific seabird species could explain the non-significant results. We will continue to explore whether the frequency of certain plastic colours being ingested by New Zealand seabirds correlates with the abundance of certain plastic colours along New Zealand's coastline. If not, and if seabirds are ingesting colours which are less frequently found along the coastline, then there could be a visual/sensory perspective influencing the colour of plastic seabirds are ingesting.

*Ariel-Micaiah Heswall recently published in Marine Biology in April 2021. She completed her Honours in November 2019 on seabird sensory ecology and bycatch. She commenced her PhD in August 2020 focusing on seabird attraction towards different colours of lights and plastic.*