ABSTRACTS FOR ORAL PRESENATATIONS

Plenaries

Chasing birds and shiny squirrels: Challenging unchallenged assumptions and asking unasked questions

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Many eminent ornithologists spend their careers devoted to a single question or taxa. Their passion and devotion provide remarkable insights and a comprehensive understanding of their focus. And then, there are folks like me. Some of us are fascinated by all sorts of species and behaviours, and many have relocated frequently, making committing to a single topic or group of birds challenging. Here I'll present an alternative approach to the dedicated single-minded focus – one that builds on my natural curiosity, suspicion of entrenched assumptions and perpetual distractibility. I'll discuss how following your gut, testing untested assumptions and asking unasked questions can be a rich and rewarding pathway. Topics include behaviour, colour, hormones, vocal learning, microbiomes and sleep in birds. The answers are often unexpected or fly in the face of conventional wisdom – birds always find a way to surprise us!

Crossing continents, confronting change: Australia's migratory birds

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From shorebirds that link Australia to Siberia and Alaska through the East Asian–Australasian Flyway, to surreptitious night-time migrants revealed by acoustic recorders and weather radar, the story of bird migration here is far richer and more widespread than most of us realise. Recent work suggests that more than 300 Australian species migrate. Even the familiar birds in our backyards and local parks often travel vast distances, tracking food, water, and climate cues. Yet for all this movement, we know surprisingly little about the journeys these birds take. Which routes do they follow, and how repeatable are their movements? What hazards do they face along the way? Where can we site developments like wind farms without putting them at risk? Citizen science has opened new windows into these mysteries, but the gaps remain daunting. Meanwhile, the threats are immediate and global: habitat loss at stopover sites, intensifying climate extremes, and regulatory fragmentation both at home and overseas are putting migratory birds at risk. In this talk I will share some of what we know so far—through field studies, new technologies, and the power of public observations—and highlight what remains to be done. The evidence is mounting that migration is the rule rather than the exception in Australian birds. The challenge now is to study it, understand it, and act decisively to conserve the restless travellers of this great continent.

Avifauna of Palau: Protecting birds, preserving heritage, and inspiring hope

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Palau, a small island nation in the western Pacific and the most biologically diverse country in Micronesia, is home to over 150 bird species, comprising of 13 breeding endemics, several endemic subspecies, native resident species, and a high diversity of migratory birds. Its birds play essential ecological functions across a range of habitats and serve as important indicators of ecosystem health and environmental change. Equally important, avifauna are deeply woven into Palauan culture—reflected in personal identity, place names, stories, and others. This presentation explores the current status of Palau's avifauna, highlighting species richness and cultural values. It also examines pressures such as habitat degradation, invasive species, poaching, and climate change, which continue to impact bird populations. Yet, amid these challenges, Palau offers a hopeful model for conservation rooted in the integration of traditional knowledge, scientific research, and collective stewardship. From customary bans on hunting to island restoration projects and community-led protected areas, efforts from all levels of society to protect birds in Palau also serve to preserve cultural identity and inspire future generations. This talk will highlight how the protection of birds is not only a matter of biodiversity, but also a commitment to sustaining heritage and fostering hope.

A decade of Orange-bellied Parrots

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In conservation, recovery of imperilled species depends on accurately diagnosing threats and implementing effective strategies to counter them. In practice, this can be extraordinarily difficult to achieve, especially when focal species are rare, hard to study, or challenging to manage. The orange-bellied parrot exemplifies these challenges. By 2016, the species had collapsed to just three wild females. Since then, an intensive program of science, management, and collaboration has driven population growth. At the heart of this effort has been a systematic unpacking of the species' life history, which has revealed both the opportunities and pitfalls of emergency conservation. This talk reflects on a decade of new science on the orange-bellied parrot and highlights key lessons for future conservation programs targeting critically endangered species, in both captivity and the wild.

Applications of and advances in EcoAcoustics and bioacoustics

Harvesting note annotations: A hybrid feature extraction and unsupervised clustering pipeline for improved bioacoustic detection

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Passive acoustic monitoring and machine learning are increasingly being used to survey threatened species. When automated detection models are applied to large novel datasets, false-positive detections are likely even for high-performing models. Manual validation of outputs can be time consuming, and additional fine-scale annotation of individual notes is impractical for large datasets and difficult to automate when using noisy field data. This research presents an acoustic monitoring pipeline which employs a multi-stage hybrid approach: initial detection using a transfer learning classifier, followed by segmentation and iterative unsupervised clustering of extracted acoustic features using UMAP and HDBSCAN to remove label noise. This process essentially allows for rapid 'harvesting' of individual note annotations from large field datasets. Our method begins by identifying potential vocalisations in environmental recordings using a neural network classifier. Segmentation and feature extraction are then applied to the outputs and refined using iterative unsupervised clustering methods. The unsupervised approach significantly improved detection accuracy, successfully separating true detections from false positives and substantially reducing label noise. Additionally, this approach generated detailed note-level annotations, offering insights into vocal individuality, song structure, and geographic variations within and between species. The clustering step also facilitated semi-supervised learning by rapidly highlighting uncertain cases to further enhance model accuracy. This scalable pipeline addresses key bioacoustic monitoring challenges: minimising manual validation efforts and ensuring accurate annotations in noisy field data. We demonstrate the utility of this approach on large datasets and calls of several cryptic species, including the Powerful Owl (*Ninox strenua*).

Automating identification at the ecosystem scale: a custom recogniser for Australian woodland birds

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Passive Acoustic Monitoring (PAM) is transforming wildlife research, but automated identification of bird calls remains a major hurdle—particularly for Australian species underrepresented in global archives. To address this, we developed a customised version of BirdNET tailored to 150 bird species from woodland habitats in south-eastern Australia, including Tasmania. Using recordings from the Australian Acoustic Observatory (A2O), we applied the existing BirdNET model combined with nearest neighbour and clustering methods to construct datasets for training new recognisers, outperforming the existing BirdNET model. We determine that custom AI models provide an efficient and scalable approach to detecting species, however, researchers must align their use with clearly defined ecological questions. Our custom BirdNET model will continue to be refined and will be released for standalone use as well as via a public platform towards the end of 2025, enabling PAM researchers to upload and analyse their own audio recordings. We discuss how the ability to process large volumes of acoustic data opens new possibilities for understanding avian ecology at the landscape scale, including seasonal calling patterns, species movement, and potential indicators of breeding or habitat condition. This work provides a foundation for consistent, long-term monitoring and creates a pathway for extending automated acoustic analysis to diverse taxa and ecosystems.

Advancing acoustic detection of the Western Ground Parrot: From cluster analysis to deep learning

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The Western Ground Parrot (*Pezoporus flaviventris*) is one of Australia's most cryptic and endangered bird species, requiring accurate and scalable detection methods for effective monitoring. This thesis evaluates two complementary approaches to automate the detection of WGP calls from field recordings, collected via an array of Autonomous Recording Units (ARUs). First, unsupervised cluster analysis was applied to identify acoustically similar events, with results manually vetted to assess detection precision and characterise false positives. While effective for exploratory analysis, cluster-based methods showed limitations in discriminating WGP calls from acoustically similar species. To address this, a supervised Convolutional Neural Network (CNN) was trained on a curated dataset of spectrograms. The CNN demonstrated improved classification accuracy, with significantly reduced false positives and greater robustness to environmental noise. By comparing the strengths and weaknesses of both methods, this study proposes a hybrid workflow combining cluster analysis for data triage and CNNs for high-precision detection. The findings contribute to improved acoustic monitoring of cryptic species and offer a scalable template for threatened species surveillance across complex soundscapes.

Rebound from restoration: Assessing the diversity of bird assemblages in revegetated and remnant patches of Critically Endangered lowland subtropical rainforest

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Ecological restoration has become a common practice worldwide, however monitoring is essential to ensure that biodiversity is returning to pre-disturbance levels, particularly in highly fragmented landscapes. The aim of this study was to examine differences in avian biodiversity in restored and remnant patches of critically endangered Australian lowland subtropical rainforest (LSR) using passive acoustic monitoring. The study investigated the relationship between age of restoration (old, new, remnant), site-based vegetation, and landscape attributes with four diversity metrics: Chao2 species richness estimators (SR), rainforest-dependent species richness (RD), functional diversity (FD) and phylogenetic diversity (PD). Diversity metrics were typically highest in connected remnant patches, however young restoration had unexpectedly high SR and FD. Generalised linear modelling identified canopy cover as a significant predictor of RD, while the percentage of vegetated vs cleared land within a 200m and 500m radius of the recording location was a significant predictor of SR, RD and FD (p <0.05). Non-metric multidimensional scaling showed rainforest-dependent species were strongly associated to highly connected remnant vegetation, while generalist species were more often associated with young and highly fragmented sites. The results of our study indicate that ecological restoration assists in the recovery of LSR bird assemblages, however insufficient landscape connectivity and canopy cover negatively impact SR, RD, FD and PD even within remnant patches. Future restoration efforts should prioritise improving landscape connectivity and re-establishing canopy cover to support diverse bird populations in this critically endangered ecosystem.

Automated sound localisation to estimate spatial positions of the endangered Australasian Bittern

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Bioacoustic monitoring has created new opportunities for the management and conservation of threatened species worldwide, but the ability to spatially locate individuals using this method has not yet been fully realised. Acoustic localisation, whereby one can estimate the position of a sound using the time of arrival difference among an array of sound recorders, may become a viable method for counting vocalising individuals within a population. This approach may be particularly useful for species that are cryptic, vocal, and found within defined habitat areas (e.g., within a

wetland). We tested the accuracy and precision of spatial position estimates of a new software application for acoustic localisation by broadcasting calls of the endangered Australasian Bittern (*Botaurus poiciloptilus*), within two wetlands in Victoria. We played male Australasian Bittern booms at randomised locations both within and outside of two different array shapes – square and curved. In both arrays, we were able to spatially localise the bittern booms within 20m of their broadcast location. Greater boom localisation precision was achieved using the square array, though precision tended to be higher for booms located inside the square array, and for booms located outside the curved array. These novel, automated localisation methods could accompany traditional bittern surveys to improve the collection of positional data for this endangered species, enabling researchers to more accurately count individuals in wetlands and form estimations of local population densities.

Sexual dimorphism and vocal tract morphology in the North Island Brown Kiwi (*Apteryx mantelli*)

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The vocal behaviour of the North Island Brown Kiwi (*Apteryx mantelli*) is markedly sexually dimorphic, but the anatomical basis for this divergence has remained largely unexplored. This study presents the first comprehensive examination of the entire vocal tract in this species, focusing on structural features and differences between males and females that may underlie their distinctive calls. Several novel characteristics were identified in the kiwi vocal tract that differentiate it from other paleognaths, including a spoon-shaped tongue with a cartilaginous tip, two sets of pharyngeal folds, and the absence of key features such as the intrabronchial ligament, extrinsic syringeal muscles, and the cartilaginous pessulus. The trachea was composed of interlocking cartilaginous rings lined with both circular and longitudinal striated muscle, which likely facilitates dynamic control during vocalisation. Notably, there were differences between males and females. The syrinx in both sexes was of the tracheobronchial type, but males possessed relatively larger lateral labia, whereas females had a larger overall syrinx structure. These dimorphisms correspond with the known differences in call structure between the sexes, suggesting a strong link between vocal tract morphology and acoustic output. Overall, this work highlights the functional relevance of vocal tract anatomy in shaping sex-specific vocal behaviour in kiwi and contributes to a broader understanding of the evolutionary drivers of vocal dimorphism in birds, particularly within basal avian lineages.

Improving survey design and distribution estimates for Powerful Owl (*Ninox strenua*) using passive acoustic monitoring and integrated modelling

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Biodiversity decline and climate change impacts on species are among the most acute environmental challenges facing society today. Passive acoustic monitoring is starting to enable the collection of biodiversity data at previously unimaginable scales, particularly in remote and hard to access locations. Due to the combined advances in automated bird call recognition models and large-scale data platforms such as Ecosounds, bird monitoring is set to be transformed with more representative, systematic, high-quality, and verifiable data. As part of the BirdLife Powerful Owl Project, Audiomoth recorders were deployed at 115 forested locations across southeast Queensland between 2020 and 2023. Twenty-seven of these deployments followed a repeated, stratified roadside design in the poorly surveyed Conondale National Park, while the remainder were deployed opportunistically along roads and trails in other forested areas. We used these data to estimate detection probabilities and provide resulting recommendations on when, how long, and how widely to deploy sensors in future surveys. To assess how these data improve understanding of the Powerful Owl distribution, we compare models constructed from three data sources: (1) opportunistic citizen science observations, (2) verified breeding site records, and (3) integrated species distribution models that combine observation, breeding and acoustic data. We then examine how changes in model predictions relate to sampling representativeness across environmental and geographic space. These results inform spatially explicit survey recommendations to guide future acoustic monitoring efforts. Finally, we report on other nocturnal bird species detected in the recordings, identified using default BirdNET classifiers and Google Perch recognisers.

Counting the chorus: Call density from classifiers

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We present on new methods for processing raw classifier outputs into useful conservation indicators. Call density estimation provides a confidence interval for total vocal activity in a dataset using a fixed amount of validation effort. This involves no selection of threshold on the model, avoiding variations in false positive and negative rates across a study area. Confidence intervals can then be narrowed either by improving model quality or applying more validation effort. We will also present progress on minimising total validation effort through incorporation of covariate analysis.

Seasonality and roost site fidelity of a Night Parrot, *Pezoporus occidentalis*, in the western Great Sandy Desert

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The Night Parrot remains one of Australia's most elusive and enigmatic birds, but the discovery of a persistent population in Queensland in 2013 and the release of habitat information as well as recordings and detailed descriptions of its call types have unlocked important tools for its detection. This information has been critical in enabling traditional owners and environmental impact assessment practitioners to identify potentially suitable habitat, and search for Night Parrots by deploying autonomous recording units (ARUs). Such passive acoustic surveys have markedly increased the knowledge of the Night Parrot's range and status and confirmed several new locations, particularly in the Great Sandy Desert Region of Western Australia. Our discovery of a novel population of Night Parrots, including an individual with a distinctive call, allowed tracking of that individual across an acoustic monitoring array spread over a wide area of the western Great Sandy Desert, including an overnight movement of over 50 kilometres between roosts. We present details on the distinctive call structure of the individual Night Parrot, its seasonal movements, particularly in response to rainfall, the habitats it has used and its roost site fidelity through time. We also reflect on the current best practice guidelines for Night Parrot detection and monitoring in the context of our results.

Acoustic monitoring to measure nesting success of the nomadic south-eastern Red-tailed Black Cockatoo

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The south-eastern Red-tailed Black Cockatoo is nomadic within its small range in south-eastern Australia, with its movements being driven by the availability of new seed crops of one of the two species of stringybark it largely relies on. Traditional nesting monitoring methods are impractical given the birds' remoteness and wide distribution, as well as the potentially low nest re-use rate. Since 2019, acoustic devices have been deployed to about 100 potential nests each year from which about 20-30 are typically used and provide our core nest success data. Recordings are analysed for daily nest survival for each nest. This method has allowed us to generate robust nest success measures for the first time. This allows us to reliably measure nest use (across natural and artificial hollows) and fledging rates, and differences between localities. We are now using this data to identify the key drivers of nest success.

Describing the vocal culture of the critically endangered Western Ground Parrot

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Vocal culture in songbirds refers to the repertoire of vocalisations individuals learn as juveniles to communicate with and differentiate conspecifics. The vocal culture of the Kyloriny, like many threatened and cryptic bird species, is incompletely documented and poorly understood. An understanding of vocal culture can be applied usefully when assessing the current and past viability of populations, and when conducting advanced acoustical analyses, such as identifying individual birds and the number of calling birds in audio recordings. Our study in progress is documenting the vocal culture of the Kyloriny and how it has changed over the last 20 years of decline to determine the vulnerability of the species to culture loss, and to widen the scope of acoustic analyses researchers can use to study the species' ecology and demography in their natural range. We compiled and quantified a vocalisation repertoire for the Kyloriny by analysing 380 hours of current and historic audio recordings of wild and captive populations. With a set of linear and non-linear dimensionality reduction algorithms we quantified variation between vocalisation types and determined the set of acoustical features on which vocalisations can be quantitatively compared. We present an initial compilation and description of the vocal culture of the Kyloriny over the last two decades. Additional research is necessary to quantify the cost to fitness incurred by loss of vocal culture in the species.

Optimising bioacoustic surveys: A novel methodology for validating automated signal detection in targeted bird monitoring

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Automated signal detection tools are increasingly used to scale up bird monitoring efforts, yet few studies offer practical guidance on how to validate these tools for specific species, environments, or project goals. This presentation outlines a novel methodology developed to optimise automated acoustic monitoring for targeted species surveys, using the grey fantail (*Rhipidura albiscapa*) as a model. Drawing on a large paired survey dataset from road-adjacent habitats in south-east Queensland, we constructed and validated a species-specific call recogniser using the monitoR package in R. Signal templates were extracted from high-quality field recordings, tested against independent control datasets, and refined iteratively to maximise detection sensitivity while minimising false positives. Field trials quantified the acoustic catchment of the broadcast vocalisation under varying environmental conditions and established a detection threshold based on signal-to-noise ratio (SNR). Results highlighted the importance of species call structure, ambient noise, recorder configuration, and survey timing in recogniser performance. By integrating ecological knowledge, acoustic theory, and practical field constraints, this framework supports the development of robust, repeatable survey protocols. The approach offers a valuable tool for ecologists seeking to incorporate bioacoustic data into long-term monitoring and conservation planning, particularly in complex or noisy environments.

The Large Forest Owl Project – Using acoustic data to monitor and manage the recovery of three owl species and their prey from the impacts of the 2019-2020 Black Summer bushfires

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In 2019, the NSW Nature Conservation Council (NCC) established The Large Forest Owls Project with an initial 28 nocturnal acoustic monitoring sites across private property on the Lower Richmond River floodplain of Northern NSW. The aim was to determine occupation and identify high-use areas for Barking, Masked and Powerful Owl within the priority area and provide on-ground advice to landholders on best practice to manage key threatening processes for these threatened species. However, that plan changed dramatically when most of our project area was burnt that same year. Multiple fires impacted the study area over several months. Lives and homes were lost, rural business, plantations and major infrastructure damaged and approximately 170,000 ha. of forest and mixed woodland burnt.

This included from our project work the documented loss of two Barking Owl nest trees, a quarter of the large-hollow bearing tree stock and loss of acoustic equipment. The project was now in a state of triage and a post fire-recovery phase. The acoustic network was reestablished. The six months of pre-fire acoustic data of the fauna soundscape was an invaluable baseline to compare with the now 5 years of post-fire acoustics. In parallel, a crowd funded nestbox program was launched by the NCC as the best way to sure-up the massive loss of hollows specifically targeting the owls' prey base. The acoustic data was crucial to understanding the immediate and longer-term impacts of the fires and ascertaining the recovery (or not) of the owls and their prey.

Tailoring automated call processing for waterbirds in south-eastern Australia

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Researchers globally are increasingly demonstrating the value of Passive Acoustic Monitoring (PAM) for avian populations. Automated artificial intelligence frameworks are providing profound reductions in time (and therefore costs) required to detect species compared with manual analysis of sound recordings or traditional in-person surveys. With land managers reliant on accurate information about waterbird distribution and habitat use for evaluating and improving management (e.g. environmental watering regimes), there are clear applications for PAM in understanding use of managed habitats by waterbirds. However, while automated PAM represents exciting opportunities to investigate questions with fewer 'human hours' than manual analysis or in-person surveys, recording equipment and storage systems can be costly and recordings can be limited by in-field battery and memory space. We present the early stages of a comprehensive waterbird model for south-eastern Australia, currently focusing on cryptic and threatened species. This project uses ARISA - a system of deep learning Convolutional Neural Network (CNN) models developed by the Arthur Rylah Institute's EcoAcoustics team - to detect waterbird calls in field recordings. We demonstrate the value of one-dimensional CNNs, in-house field recordings, and short-duration training data. Using species such as the Australasian Bittern (*Botaurus poiciloptilus*) and Australian Little Bittern (*Ixobrychus dubius*), we present the ARISA framework, its outputs, and practical applications. We also present a comparison with in-person wetland surveys and an investigation into tailoring recorder patterns (e.g. time of day and duration of recording) to maximise capture of focal calls for each species while optimising battery and memory space**.**

Effects of fire and structural habitat gradients on nocturnal bird occupancy in Victorian forests

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Increasingly unpredictable fire regimes threaten native species across Victoria. Frequent fire disturbances force animals to adapt to dynamic habitats in novel ways we don't yet fully understand. Despite their ecological significance, nocturnal species are commonly underrepresented in conservation and fire ecology research as many conventional observation techniques (e.g., point counts) are unsuitable to detect their presence. Instead, vocal nocturnal species, including birds, may be more readily detected with passive audio recorders. We tested the relationship between the presence of nocturnal bird species and the impact of time since fire across multiple ecological fire groups (fire-affected habitat classes) in Victoria. We collected audio data across a gradient of fire-affected sites and used call classifiers to identify the presence of nocturnal birds. We also collected data on habitat structure, vegetation diversity and the presence of mammals using wildlife cameras. We used occupancy modelling to evaluate how bird species respond to fire and explored what environmental characteristics were associated with these responses. We also explored whether species' responses to fire differed across ecological fire groups, how nocturnal bird species' responses compared to diurnal birds and the potential implications of prescribed burning regimes on nocturnal birds included in our study. Our project provides a new way to monitor and new data on the presence of nocturnal bird species within Victoria and aims to improve our ability to predict how species will respond to increasingly fire-impacted landscapes across south eastern Australia.

Automated acoustic recognition of a rare species with extremely limited training data: Can training data from other regions improve recogniser performance in the field?

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Passive acoustic monitoring is an efficient and cost-effective method for surveying elusive yet vocal species, such as the Endangered White-bellied Whipbird (aka Mallee Whipbird, *Psophodes nigrogularis leucogaster*). Whilst processing the large amounts of data generated by this method has traditionally been time-consuming, automated machine learning is becoming a popular technique for species call detection. Using a species call recogniser, ecologists can now process many hours of audio in a fraction of the time. However, to build these recognisers we need example calls to 'teach' the software what the species of interest sounds like. The challenge for ecologists is we are often interested in looking for rare or threatened species with inherently low numbers, and therefore often species with few example recordings for training a recogniser. This problem arose when constructing a recogniser to survey for the White-bellied Whipbird in the Murray-mallee region of Victoria/South Australia. Limited recordings of this rare bird exist, and the birds exhibit an extensive call repertoire – adding yet further difficulty to the task. Using BirdNET we experimentally explored whether using calls from other populations, sub-species and species with varying degrees of similarity, may increase available training data and therefore improve a call recogniser. In this presentation I discuss the development of the first usable recogniser for the White-bellied Whipbird, and the improvement in recogniser performance afforded by augmenting training data with acoustic data from other populations, sub-species or species.

Spatial Mark-Resight models with acoustic data

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Statistical estimates of animal abundance from passive acoustic recordings are potentially extremely useful for conservation management and ecological monitoring. However, they require ways to transform estimates of call density (calls per unit area per unit time) into animal density, taking into account both silent individuals and those that call multiple times. Spatial Mark-Resight models combine observations of a marked subset and the general population to provide improved estimates of animal densities. We describe how to apply such methods to acoustic data where individual identification and thus acoustic Spatially Explicit Capture–Recapture– is not available. Instead, we rely on community vocal activity data detected by passive acoustic recorders, supplemented by knowledge of which of those calls come from a few individuals, to estimate abundance. We demonstrate the method on a case study of North Island Brown Kiwi (*Apteryx mantelli*) where a subset of the population was fitted with animal-borne acoustic recorders that enabled us to identify their individual vocalisations with a high degree of certainty. Our method provided a median estimate of 16 birds (cumulative 95% high density interval: 14–19) where the expected number was 18 (based on a dog survey) compared to an unmarked model that gave a median estimate of six birds (cumulative 95% HDI: 4–7), highlighting the method's ability to yield more realistic population estimates. Combining data from a few animal-borne acoustic recorders (ABARs) with passive recorders can deliver more consistent, realistic abundance estimates, and the data from the ABARs may be used to inform estimates for other populations.

Extending condition metric applications to acoustic data

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Australian ornithologists and ecologists are developing standard metrics that describe the condition of bird communities to facilitate measurement of health over time and in response to management actions. Such metrics are typically derived from data collected using standardised area search surveys, such as the BirdLife Australia 20-minute 2-hectare method. Given many end-users of condition metrics are exploring acoustic monitoring opportunities to extend temporal and spatial coverage of data collection and/or reduce field related costs, we want to ensure condition metrics can also be accurately derived from acoustic data. While there is evidence to suggest acoustic monitoring

yields broadly similar patterns to standard on-ground bird surveys, we don't yet have a grasp of how minor discrepancies in species information based on the method of data collection may influence our assessment of community condition. In this presentation we will provide recommendations for calibration measures required for condition metric calculations using acoustic data, as summarised in a case study undertaken on Bush Heritage Australia's Reedy Creek Reserve on Bailai, Gooreng Gooreng, Gurang & Taribelang Bunda Country. Using the same observer to reduce biases where possible, we compare compositional information, condition metrics, and common diversity measures between on-ground survey data and those derived from acoustic monitoring. We also consider additional adjustments that may need to be made for condition metric calculations using data derived from emerging automation tools such as BirdNET and explore the correlation between the condition metrics and existing acoustic indices, to further contextualise realistic acoustic applications.

Recapturing the past: Applying modern multi-species classifiers to historical acoustic data in the Grampians National Park/Gariwerd

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Ecoacoustic technology has provided remarkable opportunities to expand capacity and spatial coverage of monitoring across Australia. Until recently, the potential of acoustic data to document bird species diversity at scale has been limited by the availability of analysis tools and computing resources. In many cases, efforts have prioritised documenting single species rather than whole communities. The wide-spread availability of multi-species classifiers (e.g., BirdNET) creates the potential to efficiently analyse large volumes of historical data, providing benchmarks for future ecoacoustic surveys. Since 2012, we collected acoustic data from across Grampians National Park/Gariwerd targeting multiple ecological vegetation groups. We used BirdNET (v 2.4) to identify species presences from recordings collected during 2012 – 2014 (n = 100) and again in 2023 (n = 111). We discuss our results comparing how species communities have shifted over time as well as highlighting opportunities and challenges with analysing historical and contemporary datasets using BirdNET. We also discuss how these benchmark data are helping us understand the impacts of the 2024-2025 summer fires in the Grampians/Gariwerd as we begin revisiting sites across the park in 2025-2026.

Understanding bird resilience to fire in Victoria: A landscape-scale ecoacoustic approach

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While bushfire forms an integral part of the Australian landscape, the duration, size and timing of recent fires, including the 2019-2020 'megafires', is unprecedented. In this context, understanding the resilience of birds to fire is urgent and requires a landscape-scale approach. In 2021, we initiated the collection of ecoacoustic data in conjunction with standard survey protocols for birds (point-count transects) at more than 1400 sites within eight Ecological Fire Groups (EFGs) in Victoria. Within EFGs, sampling sites were stratified across post-fire growth stages and last fire intervals. Previous work indicated that 'listening surveys' of a small sample (<1%) of the collected audio data identified more species in more sites when compared with similar duration point-counts, but some species were only detected by one method or another. In 2025, we implemented the use of BirdNET (v2.4) to identify birds within all recordings at a site, detecting 71% more species in less time than our listening survey approach, improving reporting rates to enable modelling of 47% more species, and with fewer species detected by only one method. The combination of ecoacoustic data collection with multi-species classifier analysis allows a scalable and efficient approach to occupancy modelling of bird responses to fire within Victoria.

Integrated species distribution modelling of Australian Babblers in the semi-arid Mulga Lands of south-west Queensland

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Land use change and habitat loss are key drivers of biodiversity loss in Australia. One bioregion in particular, the Mulga Lands, has been heavily cleared (108,000 ha in Queensland in 2015-16 alone), and yet provides critical habitat for a range of semi-arid zone species. Small woodland birds are particularly sensitive to the effects of vegetation clearing, and impacts may be exacerbated with predictions that semi-arid environments may experience more extreme and unpredictable weather cycles. The goal of this study was to improve our understanding of the ecological niche overlap of three species of small, iconic woodland birds to evaluate future risk of distributional cross-overs in a changing climate. In this presentation, we will provide integrated species distribution models for three babbler species (Halls Babbler, Chestnut-crowned Babbler and the Grey-crowned Babbler) at Bowra Wildlife Sanctuary in the Mulga Lands of south-west Queensland. Babblers are highly social birds that frequently use acoustic communication for intraspecific interactions. This makes them particularly suitable for surveying using passive acoustic monitoring. In this study we analysed recordings from 26 sites using species recognisers developed using BirdNet. We combined detections from acoustic surveys with observational survey data collected using standardised bird surveys and mist netting surveys. We incorporated these data with site-based vegetation and remotely-sensed environmental data (greenness and rainfall) into integrated species distribution models. This allowed us to determine the overlap in ecological niches of the three species at Bowra and predict potential range shifts under future climate scenarios.

Using bioacoustics to locate an elusive and endangered bird; the search for the SA Bassian Thrush in the southern Flinders Ranges

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The South Australian Bassian Thrush (*Zoothera lunulata halmaturina*) is well known as a cryptic and elusive bird across its range. Nowhere has the species proved more challenging to find than in the southern Flinders Ranges, the Bassian Thrush's northernmost distribution in South Australia. Less than 10 historic records exist in the whole region with only two of these occurring this century. With environmental changes and bushfires impacting populations of this endangered subspecies elsewhere, it was considered of high importance to determine the conservation status of the subspecies here. Acoustic monitoring methods had proved essential in better detecting and developing monitoring programs for populations further south. Using these methods, over 150 acoustic recorders were deployed in areas across the Wirrabara Range and Mount Remarkable regions of the Southern Flinders Ranges during the bird's winter breeding season in 2024 and 2025. As a result, Bassian Thrush were detected at multiple sites, greatly improving our knowledge of their current distribution and abundance. Differences in habitat preferences for these birds were noted in comparison to Kangaroo Island and Mount Lofty Ranges populations as well as vocal variations. Confirming the continued presence of the species in the southern Flinders Ranges is a significant finding and will likely have direct implications for conservation management in the region.

Building a bioacoustics dataset for research and conservation in the Australasian region

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Recent innovations in sound recording and machine learning are revolutionising research on, and conservation of, birds across the globe, yet significant challenges remain. In particular, training machine learning algorithms requires (1) an adequate number of recordings per species, and (2) expert annotation of those recordings. The Cornell Lab of Ornithology has developed an approach that addresses these challenges by involving local citizen scientists in two critical ways. First, birders are engaged to collect sound recordings and upload those to an appropriate database. Second, regional experts familiar with the sounds of birds in a particular area annotate the recordings to train machine

learning algorithms. Development of these approaches with partners in Australia and Asia can make bioacoustic tools available for use in these regions, which in turn holds considerable potential for slowing or even reversing global declines in avian populations there.

Avian ecotoxicology & disease preparedness

Exposure of Australian raptors to lead (Pb) in a global context

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Harmful chemical pollutants are a growing anthropogenic threat to wildlife populations globally. Lead (Pb) poisoning is an important global conservation problem for many species of wildlife, especially raptors. Recent research has shown that seemingly low-level lead exposure is sufficient to suppress populations of scavenging raptors across the continents of North America and Europe. Here, we summarise the state of knowledge of lead poisoning of Australian raptors in light of international developments. We review four studies that have assessed lead exposure in our continent's largest raptor, the Wedge-tailed Eagle (*Aquila audax*). A 2021 study from far-eastern Victoria found elevated levels (> 10 mg/kg in bone) in 60% of 92 birds. A 2023 study assessed the same species across south-eastern mainland Australia (Victoria, South Australia and New South Wales) and found that 18% of birds showed similarly elevated levels of lead exposure. Comparable results were reported for 109 Tasmanian wedge-tailed eagles (*A. a. fleayi*) in 2021. These results suggests that lead exposure is a significant threat to the conservation of this ecologically important species. These results illustrate the growing awareness and understanding of lead exposure of raptors in Australasia. However, despite five years of research into this topic, moves to transition away from use of lead-based ammunition in Australia are still in their infancy.

AviFluMap: An interactive tool to assess H5N1 Avian Influenza incursion risk in Australia via migratory birds

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The current panzootic of clade 2.3.4.4b H5Nx high pathogenicity avian influenza (H5 bird flu) has resulted in unprecedented global impacts on both wild bird populations and poultry industries. Despite the virus' near-global circulation, Australia remains free of this strain. In response to the need for proactive biosecurity and conservation planning, we developed AviFluMap, an interactive tool that integrates global outbreak data, migratory bird pathways, species susceptibility assessments, and bird aggregation maps to evaluate the incursion risk and establishment of H5 bird flu via wild birds, with special reference to Australia. AviFluMap (https://hpairisk.deakin.edu.au) provides a transparent, data-driven platform for use by wildlife managers, government agencies, researchers, and other stakeholders, in HPAI outbreak preparedness and response planning. This article outlines the structure and functionality of AviFluMap, its data sources and methodology, and its role in informing risk-based surveillance and preparedness strategies.

Emerging toxicological threats to Carnaby's Cockatoos (*Zanda latirostris*) in Western Australia

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Understanding how environmental contaminants affect wildlife health is essential for managing endangered bird populations, especially in urban or agricultural areas. We investigated several toxicological risks affecting the endangered Carnaby's Cockatoo (*Zanda latirostris*) across its southwestern range in Western Australia. Outbreaks of acute poisoning near Perth were attributed to carbamate pesticide exposure, supported by clinical signs, tissue residue analysis, and spatial association with agricultural activities. In breeding areas, there was evidence of sublethal exposure to anti-cholinesterase compounds, raising concerns about long-term impacts on reproductive health. We further examined Carnaby's hindlimb paralysis syndrome, a recurring neuromuscular condition observed in wild birds, which emerged in 2012. Pathological findings suggest a probable link to neurotoxic agrochemical exposure, presenting as a delayed neuropathy. Additionally, we report a published case study of second-generation anticoagulant rodenticide (SGAR) poisoning in a Carnaby's Cockatoo, the first confirmed report of SGAR toxicosis in a psittacine species in Australia. Toxin analysis confirmed the presence of brodifacoum and difenacoum in the liver, highlighting the widespread threats of anticoagulant rodenticides for wildlife. We describe planned research to assess sublethal chemical exposure in Carnaby's Cockatoos admitted to wildlife rehabilitation centres. This approach will enable opportunistic monitoring of individuals from a range of habitats and exposure contexts, providing insight into the prevalence and health implications of environmental contaminants in this endangered species. These findings underscore the importance of integrating ecotoxicology into disease preparedness and conservation management strategies for Carnaby's Cockatoos and other endangered avian populations. Our research highlights the vulnerability of long-lived, wide-ranging birds to widespread chemical exposure in landscapes affected by human activity.

Rodenticides in two Southwest owl species: What factors drive exposure?

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Anticoagulant rodenticides have been detected in a wide variety of non-target Australian wildlife including threatened species. While the detrimental impacts of exposure on predatory birds have been documented worldwide at the individual and population levels, questions still remain about the mechanisms driving exposure risk across species. We tested rodenticide concentrations in the livers of two congeneric species of owls in the southwest of Western Australia; Australian Masked Owls (*Tyto novaehollandiae*) and Eastern Barn Owls (*Tyto alba delicatula*). Differences in exposure patterns lend support to previously published hypotheses implicating home range size, trophic level, and life history strategy as factors contributing to rodenticide exposure risk in predatory birds. Our findings have implications for assessing the risk of rodenticide exposure in species which have not yet been directly tested and may provide insights into exposure patterns in threatened species that are seldom available for testing.

Going owl-friendly: How grassroots advocacy is protecting native birds from dangerous rodenticides

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Second-generation Anticoagulant Rodenticides (SGARs) are powerful bird conservation tools in specific contexts, like offshore island rat eradication. A lack of adequate retail controls in Australia is exposing native wildlife to these dangerous poisons, especially in urbanised environments. Predators like owls are particularly vulnerable to SGAR exposure given their diets. Owls are also beloved, iconic birds, which makes them a suitable flagship to empowering behaviour change in communities. We explore how coordinated grassroots advocacy tied to flagship species, supported by conservation organisations and scientists, is delivering behaviour change that can protect wildlife in our local ecosystems. Dr Boyd Wykes, founder of Owl-friendly Margaret River, and Poppy Mahon, a Year 9 student and founder of Youth Action for Wildlife, are West Australian locals who passionately campaign about the impacts of SGARs in south-west WA. Through their efforts, countless locals have been informed on how to make safer choices for local bird species, and local councils have started to change their policies. Nearly half of the fifty Australian

councils to go ‘owl-friendly’ are located in WA, showing just how powerful a local, science-backed approach can be. This grassroots advocacy also help staff at BirdLife Australia and leading experts working on a national campaign, by helping increase the awareness for decision makers and engaging major retailers, showing that change is required. With our campaign backed by science, we are optimistic that we can deliver lasting, owl-friendly changes nationally, which can reduce uncontrolled SGARs in Australian environments, and keep native wildlife safe from these poisons.

Exposure to mercury and polychlorinated biphenyls affects the thyroid function of an Australian seabird

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As top predators in the marine environment, seabirds can be exposed to high levels of persistent pollutants that can bioaccumulate and biomagnify, making these predators excellent indicators of ecosystem health. Commonly found in the marine environment, mercury (Hg) and polychlorinated biphenyls (PCBs) are known to interfere with the thyroid system in wildlife. This study quantified PCBs and Hg concentrations and investigated the relationship with thyroxine (T4) and triiodothyronine (T3) levels in fledgling and adult sable shearwaters (*Ardenna carneipes*). Hg and PCBs were measured in feathers and red blood cells, respectively. The results indicate that Hg and PCBs were more abundant in adult shearwaters than in fledglings. Negative associations were found between Hg/PCB body burdens and circulating thyroid hormone concentrations in both age categories. However, some of these correlations were not statistically significant. This study presents an empirical dataset of these contaminants and the thyroid function of adult and juvenile birds. This is an important step towards better understanding the threat posed by Hg and PCBs to the health of seabirds

Exposure to persistent organic pollutants in Australian waterbirds

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There is growing worldwide recognition of the threat posed by persistent organic pollutants (POPs) to wildlife populations. We aimed to measure exposure levels to POPs in a Southern Hemisphere aquatic waterbird species, the nomadic Gray Teal (*Anas gracilis*), which is found across Australia. We collected wings from 39 ducks harvested by recreational hunters at two sites (one coastal, one inland) in Victoria, southeastern Australia, in 2021. We examined three groups of POPs: nine congeners of polychlorinated biphenyls (PCBs), 13 organochlorine pesticides (OCPs), and 12 polycyclic aromatic hydrocarbons (PAHs). The PCBs, OCPs, and PAHs were detected at quantifiable levels in 13%, 72%, and 100% of birds, respectively. Of the congeners we tested for in PCBs, OCPs, and PAHs, 33%, 38%, and 100% were detected at quantifiable levels, respectively. The highest levels of exposure to POPs that we found were to the PAH benzo[b]fluoranthene, occurring at a concentration range of 1.78 to 161.05 ng/g wet weight. There were some trends detected relating to differences between geographical sites, with higher levels of several PAHs at the coastal versus inland site. There were several strong, positive associations among PAHs found. We discuss potential sources for the POPs detected, including industrial and agricultural sources, and the likely role of large-scale forest fires in PAH levels. Our results confirm that while Australian waterbirds are exposed to a variety of POPs, exposure levels are currently relatively low. Additional future investigations are required to further characterise POPs within Australian waterbird species.

What can feathers tell us about the metal concentrations in internal bird tissues: an analysis of the global literature

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Global bird declines necessitate close monitoring of metal contaminants in birds to understand further potential impacts. Traditionally, this monitoring requires the lethal sampling of liver or kidney so consideration of non-lethal alternatives, such as sampling feathers, is imperative. However, species-level analyses have previously found conflicting results regarding the relationship between metal concentrations in feathers and in internal tissues. In this study, we conducted an empirical analysis of the global literature with the aims of determining whether feathers provide a reasonable indicator of the metal concentrations of internal tissues and how feather metals vary with life history traits. We collated metal data on feathers and tissues for mercury (Hg), cadmium (Cd), lead (Pb), copper (Cu) and zinc (Zn) from more than 90 papers covering more than 120 bird species, focussing on the tissues of liver, kidney and muscle. First, we analysed the relationships between feather metal concentration and tissue metal concentration using a phylogenetically controlled generalised least-squares regression to control for common ancestry. Our findings suggest that feathers can be suitable indicators of the non-essential metals, Hg, Pb and Cd, but less reliable indicators of the essential metals, Zn and Cu. Secondly, we added life history traits to our analyses of feather vs. liver, using liver as a covariate to account for exposure level. Feather concentrations of four out of five metals were influenced by at least one of our three traits. These results highlight the importance of considering life history traits when assessing metal exposure risk from feather values.

Behavioural Ecology

Shake it: performative manipulation of the environment by displaying Albert's Lyrebirds

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Where dramatic sexual displays are involved in attracting a mate, individuals can enhance their performances by manipulating their physical environment. Typically, individuals alter their environment either in preparation for a performance by creating a 'stage' or during the display itself by using discrete objects as 'props'. We examined an unusual case of performative manipulation of an entire stage by male Albert's Lyrebirds (*Menura alberti*). Males of this species perform a complex song and dance display on a platform composed of vines, sticks, or other fallen vegetation, which they have been observed to shake as part of the display. We examined the form, occurrence, and stereotypy of this behaviour and found that males across the entire species' range shake the entangled forest vegetation of their display platforms during a specific phase of the display, creating a highly conspicuous and stereotyped movement. This 'stage shaking' is performed in two different rhythms, with the second rhythm an isochronous beat that matches the beat of the coinciding vocalisations. Furthermore, the tempo of this beat was consistent among males. Our results provide evidence that stage shaking is an integral, and thus likely functional, component of male Albert's lyrebird sexual displays and so highlight an intriguing but poorly understood facet of complex communication.

Effect of individual quality on parental coordination during incubation and chick rearing in a passerine

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Parental coordination is quantified by two metrics: (1) alternation: the level of turn-taking between partners, and (2) synchrony, the temporal organisation of each parent's behaviour with the other. High coordination levels may enhance nest success by reducing the risk of nest predation and ensuring that offspring consistently receive warmth and food from their parents. Coordination requires both parents to invest in the clutch. Birds might be more motivated to increase investment in the clutch and to coordinate with their partner if they are paired with a high-quality partner. As a case study, we examined parental coordination in the Spotted Pardalote (*Pardalotus punctatus*), a socially monogamous passerine with biparental care throughout breeding. We investigated whether pairs coordinate their activities more than expected by chance, whether higher coordination correlates with greater nest success, and the effect of individual quality on pair coordination. We placed cameras at 87 nests during incubation and chick rearing and tested if partners coordinate their visits more than what would be expected by chance with a randomisation approach. Individual quality was quantified using scaled body mass index. This study will provide insights into coordination during incubation and chick rearing in a passerine bird with biparental care at all breeding stages, a rare focus given that male passerines in the Northern Hemisphere typically do not incubate, and into the interaction between individual quality and coordination in a socially monogamous species.

Global distribution and evolution of mixed-species flocking in birds

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Mixed-species flocks are considered to be a widespread phenomenon across avian species, but just how common is it? They represent social groups—where individuals move and forage together—that consist of individuals from two or more species. Studies to date have focused on understanding the drivers and ecological significance of mixed-species flocks. However, to date we still do not know how many species join mixed-species flocks, how common mixed-species flocking is both geographically and phylogenetically, and whether present studies have been biased towards studying a subset of possible flocking systems. Here, we extracted the propensity for different bird species to participate in mixed-species flocking, allowing us to quantify the proportion of all bird species that participate in this behaviour. Further, by combining mixed-species flocking behaviour dataset with the spatial and phylogenetic data, we aim to address the question of how widespread mixed-species flocking is and highlight that mixed-species grouping is a majorly underappreciated form of social behaviour. In doing so, our study reveals both important gaps for research and begins to address the urgent need for taking a large-scale perspective on the question of mixed-species flocking.

Shade availability, but not water or social group size, buffers foraging-thermoregulation trade-offs in an arid zone bird

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During hot weather, birds trade-off thermoregulatory behaviour with activities such as foraging. The fitness costs associated with such trade-offs are increasing with advancing climate change. In terrestrial habitats, shade and water may buffer individuals from the negative effects of heat exposure, as may load-lightening in group-living species. We tested the hypothesis that shade and water availability in birds' home ranges, and social group size, may influence costs associated with hot weather, using white-browed sparrow-weavers (*Plocepasser mahali*) in the southern Kalahari Desert (n = 2280 observations of 64 birds from 15 groups, ranging in size from 2 – 10 individuals). Across all sparrow-weaver groups, heat avoidance (shade-seeking) and dissipation (panting) behaviours increased with increasing air temperature (Tair), whereas foraging declined. Birds occupying shadier home ranges delayed the onset of panting to higher Tair and foraged less while maintaining overall peck rates. Birds with access to water foraged more, maintained higher peck rates and sought shade at higher Tair compared to birds without. However, they did not pant more, making the mechanism underpinning their increased foraging effort unclear. Birds in larger groups both panted more overall and sought shade at lower Tair than birds in smaller groups, but maintained similar overall peck rates. Taken together, these results suggest birds in shadier home ranges can forage more efficiently, buffering foraging-thermoregulation trade-offs at high Tair. Our data therefore suggests some impacts of increasing Tair under climate change can be buffered by shade availability, but the impacts of water availability and social factors are less clear.

Pollination bird strategies across continents: a long travel from the Eastern Colombian Andes mountains to the forests of Sydney, Australia

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Pollination is a key process for the reproduction of angiosperms, ensuring the production of fruits and seeds and ultimately enabling the regeneration of new plants. It plays a crucial role in ecosystem restoration efforts. Globally, approximately 75% of angiosperms are pollinated by animals, however, just between 3.5% and 11% of all species are pollinated by birds. Bird pollination is an important ecological interaction in many tropical and subtropical ecosystems. In Colombia, for instance, hummingbirds are highly specialised and form part of complex coevolutionary systems with neotropical plants. In contrast, in Australia, honeyeaters and lorikeets tend to be more generalist in their foraging behaviour, interacting with a broader range of floral species. In this talk, I will present a comparative perspective on nectarivores birds from the Eastern Colombian Andes mountains and forested areas around Sydney, focusing on the behavioural ecology of hummingbirds (Trochilidae) and flowerpiercers (Thraupidae) in Colombia and honeyeaters (Meliphagidae) and lorikeets (Loriinae) in Australia. Based on 4 years of field experience in Colombia and informal observations over the past year in Sydney, I will explore how different lineages have evolved distinct foraging behaviours, morphological adaptations and plant interactions to perform similar ecological roles. This presentation highlights convergent strategies in nectar foraging and flower preferences, emphasising how habitat characteristics shape bird-plant dynamics. Comparing these systems offers valuable insight into behavioural adaptations in pollination and supports a broader understanding of habitat conservation and ecological resilience in the face of climate change.

The complex courtship display of the male Superb Lyrebird – the female perspective

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Some of the most complex animal displays are produced immediately before, during and after copulation, forming a continuous sequence of elaborate sexual behaviours. Theory predicts that the functional significance of such courtship behaviour is likely at least in-part dependent on how prospective mates perceive the courtship performance in its entirety. However, individual components within the courtship display may perform distinct functions. Therefore, to identify the specific features of courtship display under selection, the structures of courtship displays need to be understood at multiple temporal scales. In this talk, we examine quantitatively the macrostructure of the courtship sequence of the Superb Lyrebird, a large polygynous oscine passerine with a spectacular, multimodal sexual display. Specifically, we investigate the structural and functional relationships among discrete courtship components, building on previous studies that have thus far focused on the discrete individual components in isolation. Importantly, we quantify how the courted female's behaviour influences the trajectory of male displays during courtship interactions. We discuss what this integrated, female-centric perspective of male lyrebird displays reveal about the evolution of complex sexual displays more broadly and what important questions remain.

How to impress when the lights are dimmed; the male Albert's Lyrebird maximises display visibility and theatrical presence in low-light habitat

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Albert's Lyrebird *Menura alberti* recently separated from the Superb Lyrebird by parapatric speciation and the males of both species perform multimodal displays on the forest floor for female assessment of fitness; the Superb Lyrebird on an unsophisticated mound of bare soil, and the Albert's Lyrebird on a display platform of vegetative structures. The subtropical rainforest habitat-type is only inhabited by Albert's Lyrebird and not its congener, and in contrast to other

forest-types inhabited by both Lyrebird species, subtropical rainforest is floristically diverse with little direct sunlight penetrating to the forest floor. As detailed assessment of dance quality requires easy visualisation of a well-illuminated performer, we wondered if male Albert's Lyrebird reproductive behaviour had altered to accommodate the diverse floristic features and low illumination of subtropical rainforest. We investigated display platform features that aided viewing of the male in wet sclerophyll and cool-subtropical rainforest at a single study site spanning seven male territories. In lowly-lit subtropical rainforest, we found modification of surrounding vegetative screening, preparation of elevated platforms, the use of "theatrical props" and selection of sites with focussed lighting during the early-morning peak of display behaviour; all of which enhanced visualisation of performance. Platform elevation was the only feature common to both wet sclerophyll and cool subtropical rainforest, and in one territory that spanned both habitats the male varied his preparatory behaviour, platform structures and site selection accordingly.

Finding the relevant units of cultural transmission in Albert's Lyrebird vocalisations with a little help from Zipfian statistics

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In the Australian vocal mimic, the Albert's Lyrebird, males culturally transmit long, complex, and stereotyped sequences of vocal mimicry. However, it is unclear how lyrebirds perceive these sequences and whether they are learned as whole sequences, as smaller clusters of sounds, or as individual mimicked vocalisations. Recent advances in the animal communication literature have shown that culturally transmitted vocal units follow a specific "Zipfian" distribution (Arnon 2025), a hallmark of human languages. Furthermore, this distribution may be clearest when the "correct" unit of analysis is chosen. We tested the goodness-of-fit to a Zipfian distribution in three plausible levels of analysis in the mimicry of male Albert's Lyrebirds: 1) fine-grained categories of vocalisation type, 2) coarse-grained categories of the species mimicked, and 3) categories of sub-sequences of mimicked vocalisations, inferred using speech segmentation methods from computational linguistics (following Arnon 2025). We found that the species categories and the sub-sequences were more "Zipf-like" than the fine-grained vocalisation types, suggesting that species categories and sub-sequences are both relevant to cultural learning processes in Albert's Lyrebirds. This gives us further insight into how long and complex vocal sequences may be culturally transmitted in birds and other non-human animals.

The mitigating effect of the presence of water on non-drinking Zebra Finches during exposure to heat

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Thermoregulatory behavioural adjustments, such as increased water consumption, are expected to mitigate detrimental physiological consequences for desert animals exposed to high ambient temperatures. Here, we exposed Zebra Finches to an air temperature of 40°C for two hours in two treatments, one with drinking water available and one without it. When water was available, 31% of individuals did not drink, while the other conspecifics increased water consumption in these conditions. We measured individuals' body temperature and recorded panting, wing spreading, and movement to understand the causes and consequences of water avoidance. Our Generalised Additive Mixed Models (GAMMS) showed that for the non-drinking birds, the sole water presence was enough to lower body temperature and movement, even though water consumption did not occur. In the presence of water, the non-drinkers panted significantly more and maintained a similar body temperature to the drinkers. This suggests that water presence alone had a mitigating effect on non-drinkers, enabling them to lower their body temperature to the same level as drinkers, who used water consumption to assist in thermoregulation. Conversely, in the absence of water, the non-drinkers had a lower body temperature than the drinkers (who could not drink in that trial), suggesting that non-drinking birds were better suited to withstand high ambient temperatures to start with. The variation in body temperature, thermoregulatory behaviours, and the identification of zebra finches as drinkers and non-drinkers highlights the underappreciated ecological importance of psychobiological mechanisms in driving physiology under challenging environmental conditions, like the increasingly hot global climate.

Evidence of a heat-moderated link between associative learning performance and anti-predator behaviour in a wild bird

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While numerous studies have identified a link between cognitive performance and proxies of fitness, the mechanisms underpinning these associations are poorly understood. Addressing this requires examining how specific cognitive traits underpin fitness-linked behaviours. One such trait is associative learning, which allows animals to learn adaptive responses to sensory stimuli and is thought to play a key role in anti-predator behaviour. Associative learning performance can be influenced by environmental factors, such as heat stress. Accordingly, an understanding of the cognition-fitness relationship also requires consideration of changing environmental conditions, particularly in the context of rising global temperatures. In this study, we tested whether associative learning performance is linked to anti-predator behaviours, and whether this relationship is disrupted by heat stress in wild Western Australian Magpies (*Gymnorhina tibicen dorsalis*). We found that individuals with higher associative learning performance were more vigilant, produced more alarm calls, and took longer to return to normal behaviour following exposure to a simulated predator threat. Contrary to our predictions, the relationship between associative learning performance and anti-predator behaviours was either unaffected or strengthened by heat stress. These findings provide some of the first empirical support for the hypothesised link between associative learning and anti-predator behaviour in a wild population. Furthermore, they suggest that associative learning may facilitate behavioural adaptation to novel or challenging environmental conditions, underscoring the importance of cognitive traits in shaping fitness-linked behaviours under climate change.

Quantifying moult and breeding phenology at a continental scale in the Zebra Finch

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Opportunistically breeding bird species use environmental cues to synchronise their reproductive timing with resource availability in order to increase their survival. The Zebra Finch (*Taeniopygia castanotis*) is a native Australian species which is abundant across arid and semi-arid areas and breeds opportunistically, with flexible reproductive phenology. Unlike seasonally breeding birds with non-overlapping annual life history events, the patterns of annual life history stages including moult and reproduction are not well documented for opportunistic breeders. To address this, we translocated wild populations of Zebra Finches from the northern and southern edges of their range and compared the breeding phenology and reproductive success in their first year of captivity at a common latitude. Specifically, we predict that there will be variation in reproductive timings according to latitudinal origin. In addition, we also predict a trade-off between reproductive phenology, success, and the rate of moult. Our results provide insights into the flexibility of reproductive phenology in arid-adapted Australian birds and the potential life history constraints. Unravelling the flexibility in life history strategies will elucidate the extent to which bird species can adapt to the rapidly changing environment, particularly driven by climate change.

Temperature variation across habitats and consequences for Superb Fairy-wren (*Malurus cyaneus*) foraging behaviour

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Microhabitat conditions can differ from those of their broader surroundings, enabling animals to seek out suitable environments even at suboptimal ambient temperatures. For example, cool, shaded areas enable many plants and animals to cope with daytime heat, while sunny areas can provide a warmer environment in winter. Both theory and empirical studies suggest that animals should, and can, use microhabitats to effectively minimise the impact of adverse conditions. However, thermal conditions can vary at different spatial scales, and it is unclear whether fine-

scale variation maps onto variation at larger scales. Here, we quantify temperature variation across different spatial scales and substrates and highlight the importance of this variation for ground-foraging birds. Among substrates, roads were warmer and less variable than natural substrates. Grassy areas tended to be coolest, and leaves and mulch were the most variable. Sunny areas were consistently warmer than shaded ones, and temperature variation was higher on sunny days and around midday. We further found that Superb Fairy-wrens are sensitive to this variation across scales, selecting for colder, shaded foraging spots in spring and summer, while preferring warmer ones in autumn and winter. Our results highlight the importance of scale when assessing microhabitat variability and show how small animals navigate such variation owing to changing thermoregulatory needs. Moreover, our results can inform land management to improve habitat suitability for ground-foraging birds.

Mimicry under pressure: Investigating accuracy variations in Brown Thornbill alarm call mimicry

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Vocal mimicry represents a critical yet underexplored communication mechanism with significant ecological implications that remain largely unknown. Despite occurring in nearly 20% of songbird species, substantial knowledge gaps exist in understanding this acoustic strategy, particularly in alarm calling and predator deterrence contexts. This research focuses on the Brown Thornbill (*Acanthiza pusilla*), a native Australian bird weighing ~7 g that demonstrates extraordinary acoustic defence by strategically mimicking multiple alarm calls to deter nest predators. Its ability to mimic a range of sympatric species, some of which are 20 times larger in body size, makes it an ideal model for studying intricate relationships between morphological limitations and communication effectiveness. We investigate how anatomical constraints affect vocal mimetic accuracy by examining relationships between model-mimic body size differences and mimetic precision through comparative trait analyses. Current findings indicate sexual dimorphism in thornbill mimicry and accuracy variations when mimicking different model species, with higher precision observed with similar-sized models and comparatively lower accuracy shown when replicating lower-frequency alarm calls of larger models. Future investigations will evaluate the impact of mimetic accuracy variations in predator deterrence through controlled playback experiments targeting common nest predators. Our findings will reveal how physical limitations challenge small birds' ability to accurately reproduce complex vocalisations of larger species, particularly under distressing conditions such as nest predation threats. This study promises to advance our understanding of predator-prey interactions, bioacoustic adaptations, and evolutionary mechanisms underlying vocal communication, with broader implications for animal behaviour research and adaptive survival strategies in small bird species.

The non-breeding movement ecology of Cape Barren Geese in southern Victoria

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Cape Barren Geese (*Cereopsis novaehollandiae*) represent a remarkable conservation story in Australia. Once threatened with extinction, successful protection of this species has resulted in their numbers increasing and range expanding, particularly in southern Victoria. However, an increase in numbers has resulted in conflict with agriculture in part of its range most notably on Millowl (Phillip Island) and French Island, Victoria. Despite being conspicuous and common in these areas, no detailed study has been conducted to investigate the movements, behaviour and breeding of this population. Understanding this population’s basic ecology is essential to inform future management to reduce geese impact on agricultural practices, while still maintaining a viable population of Cape Barren Geese in southern Victoria. To fill knowledge gaps on Cape Barren Geese movement ecology in Victoria, we deployed 100 biologgers onto geese on Millowl in spring 2024. We then tracked these tagged individuals during the non-breeding summer period from December 2024-May 2025 to determine their non-breeding movement ecology. We revealed for the first time a wide range of movement types and significant variation in distances moved by geese from the Millowl population. Individual geese have been tracked moving more than 100km to Yanakie in southern Victoria from their Millowl breeding territory in December, before returning to the same territory in March, showing for the first-time long-distance movement of geese from the Millowl population. This data provides new insights into this unique species movement ecology that will be crucial information for future management of this population.

Together apart: variability in the cohesion of paired Black Swans revealed by proximity tracking

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Many birds classified as 'monogamous' show considerable variation in pair cohesion. The causes and consequences of this variation remain poorly understood. We investigated pair cohesion in Black Swans (*Cygnus atratus*) by fitting both members of a pair (*n*=10 pairs) with GNSS (Global Navigation Satellite System)-enabled data loggers that allowed us to track how the strength of association (estimated as the proximity of the male to the female) and the movements of the members of a pair varied over time. Over a 12-month period, we obtained an average of 5,790 proximity estimates for each pair (corresponding to on average 14.4 estimates per day). Proximity between partners differed between and within pairs. 'Continuously coupled' pairs remained close together (on average <200m apart) throughout the year, whereas 'seasonally uncoupled' pairs spent up to two months of the year separated by as much as 37km before reuniting. We found no evidence that pairing pattern, proximity or partnership age was a predictor either of breeding success or the likelihood of divorce. Females had larger home ranges than males. Home ranges and home range overlap between males and females were largest during breeding and smallest during the non-breeding season. Both males and females mostly undertook stationary (0-0.5km) or local (0.5-5km) daily movements, with fewer stationary and more local movements during the breeding season. Long-distance (>5km) movements were rare and were undertaken solely by individuals in seasonally uncoupled pairs. Our study reveals surprising spatial and temporal variation in pair cohesion in monogamous partnerships.

A meta-study to investigate whether common bird species of the Asia-Pacific region, that have high cognitive abilities and social development, can buffer the effects of climate change

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Australia is in the throes of a bird biodiversity crisis, yet expertise is mostly directed to threatened species. This trend matches a global one. Globally, bird species face extraordinary declines. Driving this is loss of habitat, now largely influenced by a rapidly changing climate. However, it is not just threatened species at risk. Our common species are retracting in range and declining in abundance. The consequence of not directing more research to common species and gaining a better understanding of their survival mechanisms, is that we can expect some of the common species will also no longer persist. In efforts to be proactive rather than reactive, understanding how common species modify behaviour in the face of changing conditions is critical for our ability to conserve a broad range of bird species. We have created an Asia-Pacific collaboration, to create a meta-study that combines knowledge on bird behaviour. Academics from Federation University, two Chinese universities and one from South Korea, are working together to create a framework quantifying behavioural flexibility. By combining our Australian knowledge on how bird species respond and persist in landscapes subjected to a changing climate (increases in wildfire), with Asian knowledge on bird behavioural flexibility (cognitive traits and social behaviours) in the face of landscape disturbance, we are creating a new metric for landscape management. Through the linking of bird cognitive traits (such as problem-solving) and social behaviours (such as mating systems) to climate adaptation, we will provide novel metrics for ecological risk assessment.

Dance behaviour in cockatoos: implications for cognitive processes and welfare

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Parrots (Aves, Psittaciformes) in captivity have been reported to show dance behaviour in response to music, which may involve complex cognitive processes. Dance behaviour in parrots may be indicative of a positive welfare state, raising the possibility of using music as a form of environmental enrichment. In this study, dance behaviour was analysed in cockatoos (*Cacatuidae*) through online videos and a playback experiment. First, we identified and defined cockatoo dance movements to music from videos posted on social media, to reveal the extent of dancing in different species. Second, to test whether music elicited dance behaviour we conducted a preliminary playback experiment on captive cockatoos, whereby birds were presented with periods of music playback, no audio playback and a podcast. From the online videos, we identified and described 17 new dance movements. We also found 17 rare movements observed in only one bird and not previously reported in the literature, which in many cases consisted of combinations of different movements. A cluster analysis indicated that inter-species similarities in dance movements were not related to phylogenetic relatedness. In the playback study, which involved zoo-housed birds of three cockatoo species, all birds in all treatments showed dance behaviour but there was no significant effect of treatment on the probability of showing dancing behaviour. We conclude that dance behaviour in cockatoos is composed of a wide range of different movements. Further research would be beneficial to determine if music can trigger dance in captive birds and serve as a form of environmental enrichment.

Satellite tracking the movement behaviours of egrets, spoonbills and ibis: informing water and wetland management at multiple scales

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Waterbirds, such as egrets, spoonbills and ibis, nest in their thousands to tens of thousands when conditions are right, but breeding can fail if water levels change suddenly or flooding doesn't last long enough. Water and wetland managers need information on the movements of these species to make decisions on how best to support their needs. We've tracked these species from a range of important breeding wetlands in the Murray-Darling Basin, including Barmah-Millewa Forest, Booligal Wetlands, Gayini Wetlands, Kerang Lakes, Kow Swamp, Lake Cowal, Macquarie Marshes, and Narran Lakes. We now have >50,000 days of tracking data from >200 individuals (2016-2025), representing millions of GPS location fixes. This rich dataset gives us new insights into the movements of Australia's waterbirds. It includes over 7 years of tracking for some individuals, and juveniles tracked from their hatching site to their first breeding event years later. In 2023, for the first time ever, we GPS-tracked a juvenile Plumed Egret flying from the Macquarie Marshes (northern NSW) to Papua New Guinea. This bird crossed the ocean flying non-stop in just 38 hours from coast to coast when it was only a few months old. We've found clear common movement routes used by ibis, spoonbills and egrets that span the Murray-Darling Basin from SW to NE. We've named the biggest of these the Murray-Darling Basin Flyway. This inland flyway connects important breeding sites and is west of the Great Dividing Range (GDR), which appears to act as a low-permeability barrier. We've also tracked birds while nesting, showing us where and when adults are getting food for their chicks and themselves, and when and how often they attend the nest. These results help us understand where we might get the biggest 'bang for our buck' when allocating resources to support these and similar species. They show that flexibility is key – these species use mixed movement strategies, with many individuals able to switch between strategies over time, doing different things in different years or seasons. To cope with Australia's dynamic environment the movements of Australia's inland waterbirds are themselves very dynamic.

Neural mechanisms underlying the heat calling behaviour in Zebra Finches

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Avian vocalisations have the potential to convey key information about an individual's internal physiological state. In Zebra Finches (*Taeniopygia castanotis*), a low-amplitude, high-pitched "heat call" is produced during panting at elevated ambient temperatures that provides thermoregulatory benefits to the caller. Remarkably, embryonic exposure to these calls has been shown to influence developmental trajectories, tuning offspring for life in hotter environments. In order to understand the ecological and evolutionary implications of exposure to this sound, it is important to understand how the sound is both controlled and processed. These insights will allow interpretation of when and how

heat call is perceived, as well as by whom. Exploiting wireless bioacoustics and electrophysiology in freely behaving, wild-derived adult zebra finches, we provide evidence that heat calls can be perceived in the auditory cortex (Field L) by adult conspecifics. We also show that their production might be controlled by HVC, a song control nuclei within the same brain circuitry used for learned and innate vocalisations. These findings suggest that heat calls may involve a distinct form of breathing-related sound control, unlike the typical mechanism birds use to produce songs. This work offers novel insights into thermoregulatory communication, and high-frequency sound production as well perception in birds. By linking behavioural, physiological, and neural approaches of vocal signals, our finding highlights how birds use acoustic signals to cope with rising environmental challenges revealing mechanisms that may support fitness and survival.

Effects of light and noise at night on sleep and vocal output of Common Mynas

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With the continuous expansion of urban areas, anthropogenic nocturnal disruptors, such as light and noise pollution, are increasingly common. Such disturbances are likely to affect sleep in free-living birds. Lack of sleep can hinder the performance of many waking behaviours, including vocal communication. For many birds, vocal communication is essential for territory acquisition, mate attraction and other social interactions. However, few studies have investigated the direct effects of sleep disturbances on bird vocal performance during the day. We tested the effects of sleep disturbances on Common Mynas (*Acridotheres tristis*) sleep behaviour and vocal output. Each sleep disturbance experiment consisted of one night of normal sleep (Baseline) followed by one night of disturbance (Light or Noise). We analysed the sleep behaviour of each bird during the experiments and their vocal output the day after. Both light and noise at night decreased Common Mynas' probability of exhibiting sleep behaviour by approximately 50%. After the light and noise treatment, birds sang approximately 20% less when compared to baseline. Our results indicate that even short periods of sleep disturbances can affect how much birds vocalise. However, free-living birds often have prolonged periods of light and noise pollution at night. Therefore, it is likely that the effects on their vocalisation and behaviour are even more profound.

Letter-winged Kites and Long-haired Rats: How much does one depend on the other?

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Ecologically unique among Australian birds of prey, the Letter-winged Kite (*Elanus scriptus*) is one of our most rarely recorded birds. Natural history literature has long associated the distribution and breeding of the Letter-winged Kite with an irruptive native mammal, the Long-haired Rat (*Rattus villosissimus*). However, remarkably, no dietary studies have ever been undertaken in the species' core range to explore their reliance on *R. villosissimus* as prey. In addition, some studies have suggested that rats are too large to be taken as prey regularly. A better understanding is needed to inform protection of prey refuges, which has been identified as a conservation objective. Here we present results from the first multi-year diet study conducted in the species' core range, including periods of both rat abundance and scarcity. Snapshot diet sampling was conducted once annually over six consecutive years through analysis of regurgitated pellet material. 576 prey items were identified. Overall, *R. villosissimus* contributed approximately 50% of individual prey items, but interannual variation was high. In its scarcest year, *R. villosissimus* constituted <1.5% of individuals, while in another year >92%. We discuss trends in temporal variation and present data on kite breeding activity at the time of sampling. We also demonstrate the importance of some smaller mammals, as well as the absence of other suitably-sized prey species from samples. Our study suggests that Letter-winged Kites will attempt to breed when Long-haired Rat intake is low, but further research is required to determine how diet composition impacts breeding success.

Trading off reproduction and moult across the year in an arid-adapted species

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Birds undertake annual cycles in breeding, moulting, moving to find food and, in many cases, migration. Each of these events has high energetic demands, so the annual cycle must be staged to maximise fitness. The accepted paradigm is that, among seasonally breeding birds, changes in photoperiod trigger physiological changes, such as hormonal adjustments, which initiate events of the annual cycle. In seasonally breeding birds, breeding, moult and migration do not overlap. However, Australia has many opportunistically breeding species, which are typically found in arid, unpredictable environments, with stochastically variable rainfall and consequently food. To quantify how opportunistically breeding species manage their annual schedules, we sought to investigate the annual cycle of breeding and moult in wild-caught Zebra Finches (*Taeniopygia guttata*) held in captivity. For a 12-month window, primary feather moult was assessed at 8-week intervals. Individual breeding data (clutch size, fledging rates, number of clutches) was also collected. Here, we present data to demonstrate how breeding activity impacts moult in this opportunistic breeder for the first time across an annual cycle. My research may help in anticipating how vulnerable arid-adapted Australian bird species may change their behaviours in response to environmental uncertainty, and which conservation actions may be best targeted to support them.

Black Swans as indicators of estuarine health: seasonal movements and the role of seagrass beds

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Seasonal shifts in habitat quality and resource availability drive complex movement patterns in waterbirds, yet these dynamics remain poorly understood in many coastal-wetland systems. In this study, we used GPS tracking to investigate the foraging behaviour and seasonal movements of Black Swans (*Cygnus atratus*) in Western Port, Victoria. During the seagrass growing season, Black Swans exhibited strong individual-specific site fidelity, consistently returning to distinct seagrass beds for foraging. These areas supported near-continuous activity, with individuals feeding both during the day and at night—highlighting the importance of these productive estuarine habitats in meeting energetic demands. However, as seagrass availability declined with the onset of winter, most individuals moved to inland freshwater wetlands, where their activity shifted to being predominantly diurnal. This seasonal transition suggests a high degree of behavioural flexibility and emphasises the need to consider both coastal and inland wetland systems in conservation planning for waterbirds. In addition, the reliance on specific seagrass patches during periods of peak productivity suggests that Black Swans may serve as effective indicators for monitoring the condition and availability of these critical estuarine habitats. These findings provide new insight into the fine-scale habitat use and temporal patterns of a key Australian waterbird species, demonstrating how high-resolution tracking can reveal individual strategies within broader population trends. As environmental pressures on wetlands increase, particularly from climate change and land-use shifts, a landscape-scale approach that incorporates seasonal habitat dynamics will be critical for sustaining Black Swan populations and the broader waterbird communities they represent.

Non-breeding social stability mitigates conflicts when re-establishing territories in the Superb Fairy-wren (*Malurus cyaneus*)

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Seasonal breeders concentrate their breeding efforts in a short life-history stage, during which they can show high territoriality. Conversely, many species become more tolerant of conspecifics during the non-breeding season and form social groups. Such seasonal differences in behaviours are thought to be a strategy to reduce the costs arising from year-round territoriality, but it is also possible that sociality can reduce future reproductive conflict. Here, we propose that social behaviours outside of the territorial period can increase survival of neighbours and reduce conflict

with these neighbours by re-establishing previous territorial boundaries in the subsequent breeding period, ultimately also increasing the chance of successfully keeping the territory. Here, we combine over 30 years of data on Superb Fairy-wren (*Malurus cyaneus*) demography, group membership, and breeding success to quantify how over-winter social stability translates to territory stability (from one season to the next) and future reproductive performance. Our results show that birds that maintained more neighbours from one breeding season to the next had more similar territory areas than birds that maintained fewer neighbours. This suggests that sociality during winter can have carry-over effects on the following breeding season and that preferential association during the non-breeding season could play a role in offsetting the costs of territory establishment and allow birds to focus on expending energy on reproduction rather than costly territorial maintenance during this critical period. These benefits could explain the emergence of the complex multilevel society recently described in sedentary seasonal breeders, such as the Superb Fairy-wren.

Female Barn owl behaviour following human nest-box disturbance

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Barn owls are widely utilized as biological control agents and human-made nest-boxes are typically installed to encourage breeding in agricultural areas. This study was carried out to investigate the behaviour of female barn owls (*Tyto javanica javanica*) towards human disturbance at their nest-boxes. The study was conducted in palm oil plantations in Malaysia over a three-year study period. We investigated the distance owl travelled to and height of trees perched at when flushed from nest-boxes, and when possible, the amount of time owls took to return to nest-boxes. We also studied the impact of time away from the nest-box on hatching and brooding success. We recorded 532 observations throughout the study period. Non-breeding owls all perched to sites more than 15km away from nest-boxes upon being flushed. Incubating and brooding females initially travelled shorter distances (range: <1m-3m) from the nest-box though after a few minutes, owls flew further away (range: 5m->10km). Non-breeding owls that flushed from nest boxes returned after sunset (range 8-10 h after being flushed from nest boxes) while the return time for incubating and brooding females ranged from 10 min to 7 h after humans left nest-box area. Perch heights of owls ranged from 2m to 5m. Time females spent away from the nest-box did not affect hatching and brooding success ($p>0.05$), however females that were away till sunset left the eggs and/or owlets open to predation, particularly from crows. The study shows that care needs to be taken when monitoring nest-boxes, especially in the incubating and brooding stage

Exploring the ontogeny of personality in Little Penguin chicks

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Personality in adult animals is often consistent across time and contexts, and linked to behaviours affecting survival. However, less is known regarding the ontogeny of personality, particularly the age at which it first emerges. The development of personality traits may influence which individuals survive to maturity, as certain behavioural characteristics may be favoured by natural selection. Traits related to predator responses and affinity towards novelty, in particular, may be highly influential in determining survival outcomes. In this study, we measured two personality traits (boldness and exploration) in Australian Little Penguin (*Eudyptula novaehollandiae*) chicks in a population that is experiencing high post-fledging mortality. We assessed (1) boldness towards a simulated human nest intrusion and (2) neophilia (exploration) towards a novel object every week from three weeks of age until fledging (at 8 weeks of age). Personality traits first emerged around the age of 5 weeks old and were moderately consistent within this life stage. Our results suggest that inter-individual variation in personality is already present in chicks, however, it exhibits less consistency compared to what is observed in adults. In addition, our results indicate that the development of personality may be linked to developmental stages (i.e. rapid periods of growth) associated with increasing independence.

Investigating the relationship between heat-mediated cognitive impairment and antipredator response in a wild bird

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Cognition enables animals to process environmental information and adjust their behaviour adaptively. Recent studies show that cognitive performance can decline under high temperatures, but how heat-mediated cognitive impairment may lead to altered behavioural responses remains unknown. We addressed this research gap in wild southern Pied Babblers (*Turdoides bicolor*) by measuring both antipredator behaviour and cognitive performance of individuals under normal and naturally occurring high temperatures (≥ 35.5 °C, critical temperature threshold for increased heat dissipation behaviours and reduced foraging efficiency in this species). Antipredator behaviour was assessed by measuring response to a taxidermied local predator (Common Genet, *Genetta genetta*) versus a control box. To measure cognitive performance, we used a task designed to quantify associative learning, a cognitive trait involved in associating predator cues with a threat. As predicted, individuals exhibited a stronger response to the predator than the control under normal temperatures, but the antipredator response declined with increasing air temperatures. Individual associative learning performance also declined with increasing air temperatures. However, associative learning performance, either measured under normal or high temperatures, did not explain variation in the antipredator response. Our findings provide novel evidence for a reduced antipredator response in the heat and suggest that physiological constraints related to the risk of overheating, rather than learning impairment, might explain this change.

Social interactions are related to cognitive development in Western Australian Magpie fledglings

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Social interactions during development can have a significant and lasting impact on adult phenotypes and fitness. Indeed, a growing body of evidence suggests the early social environment plays an important role in cognitive development. However, existing studies largely focus on the impact of social group size, which does not necessarily capture all the cognitive demands associated with group-living. Social network analysis can provide detailed insight into variation in social interactions between group members, and thus the information-processing challenges associated with group-living at the individual level. Here we explore whether social interactions during development are related to cognitive performance in juvenile Western Australian Magpies (*Gymnorhina tibicen dorsalis*). Specifically, we investigated the relationship between social network measures of connectedness (physical proximity, play, agonistic and vocal interactions) and individual cognitive performance, tested at three developmentally-sensitive time points during the first year of life. We found that social measures were related to cognitive performance: individuals in larger groups solve an associative learning task in fewer trials at 300 days post-fledging. Additionally, individuals that responded to vocalisations from more conspecifics and those that received aggressive interactions from more conspecifics perform better at an associative learning task at 300 days post-fledging. Our study highlights the value of considering individual-based social network measures, which capture the differences in specific social connections between individuals within groups, when investigating the relationship between the social environment and cognitive development.

The bold and the fearful: Effects of human interactions on escape behaviour and breeding success in a protected threatened bird, the Hooded Plover

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Escape responses in birds are critical to avoid predators and tend to vary with individual experience, breeding status, and local environmental pressures. Habituation towards humans by wildlife living in human-dominated landscapes (i.e. urban areas) resulting in a decreased tendency to escape early has been well documented. However, such responses can pose a particular problem for threatened species living in these landscapes, increasing vulnerability to predation. We investigated individual variation in Flight Initiation Distance (FID) in the threatened Hooded Plover, *Thinornis cucullatus cucullatus*, which is actively managed and highly responsive to humans. Hooded Plovers utilise camouflage as the main nest/chick defence, they follow the Leave Early and Avoid Detection (LEAD) strategy and employ tactics such as distraction displays and 'leading'. Unfortunately, as they are beach-nesting birds they are subjected to high levels of disturbance by humans during their breeding season. We anticipate the LEAD strategy decreases their opportunity to provide parental care and increases the vulnerability of chicks and eggs, ultimately contributing to the extremely low fledgling success seen in the species. Therefore, we predicted that FID would (1) be shorter at sites with more frequent human-plover interactions, (2) be longer and more variable in the breeding season, (3) increase with reproductive investment, and (4) be linked to individual reproductive success. We collect over 230 FIDs across the southeast Australian coastline. Our results show clear support of predictions 1-3 however, other ecological factors appear to be more influential of the variation in FID and breeding success seen across locations.

Behaviour, spatial ecology and survivorship in four common duck species in southeast Australia

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Improving our understanding of the movement of nomadic duck species in Australia in response to drivers such as water in the landscape and meteorological conditions is essential to inform a wide range of management decisions related to e.g. game management, spread of disease, water management, wind farming, aeronautics and agriculture. We recently embarked on a three-year project to track 400 ducks aiming at building an improved understanding of their large- and small-scale movements as well as their population dynamics (i.e. mortality and reproduction). Across Victoria, we will deploy four common duck species with trackers, including Pacific Black Duck (*Anas superciliosa*), Grey Teal (*Anas gracilis*), Chestnut Teal (*Anas castanea*) and Australian Wood Duck (*Chenonetta jubata*). Trackers used are Druid GPS-4G trackers, which, through on-board accelerometers, allow us to also study the bird's activity patterns in addition to their fine-scale, spatio-temporal behaviour. In our contribution we will present movement and behaviour data collated from the first batch of trackers deployed over the period 2023-2025, and how we aim to ultimately develop predictive models for duck movements based on water in the landscape and other important environmental factors.

Birds on Country: Indigenous knowledge and conservation of birds

Wings of Renewal - combining cultural pride and customary practices to combat the effects of climate change in the Central Great Southern Region of WA

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The Badgebup Aboriginal Corporation (BAC) members have strong family and cultural connections to the Goreng, Ngadju, Wadjeri, and Yued people of WA. BAC is situated in the Shire of Katanning in the Central Great Southern region. Their mission is to strengthen connection to Country through sustainable economic and social opportunities for Noongar people living on Goreng Country. BAC's focus is to simultaneously heal their people and Country through planting trees and educating their people about the impact of climate change on native species and local ecosystems. Since 2018, Badgebup's Ngoolyark Rangers have planted around two million seedlings throughout the South West and Mid West regions of WA, in an effort to restore degraded land and renew natural habitats, to ensure food sources in the region are adequate for the local Carnaby's Cockatoo populations. The Ngoolyarks (Noongar word for

Carnaby's Black Cockatoo) are an endangered species and are the emblem of the Badgebup Aboriginal Corporation. They symbolise survival, resilience, and cultural pride. The Ngoolyark Rangers' conservation work includes installing artificial nesting hollows, mapping nesting sites, and monitoring breeding numbers in collaboration with our partners: BirdLife, South West NRM, and the Department of Biodiversity, Conservation and Attractions.

Restoration of estuarine conditions transforms tropical wetland bird communities in North Queensland

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The Nywaigi people of the Queensland's southern Wet Tropics have owned and managed part of their ancestral lands, Mungalla station, since 2000. Changes in hydrology in the mid-20th century to maximise grazable land have decreased estuarine connectivity and increased the prevalence of environmental weeds on wetlands. Infestations of species including Olive Hymenachne not only suppress native flora but structurally alter shallow wetlands, resulting in grassland monocultures of little functional value to waterbirds. To fulfill environmental, cultural and economic ambitions the Nywaigi people are seeking to restore wetland condition on Country. Mungalla Aboriginal Business Corporation have partnered with Greening Australia, to restore approximately 10 hectares of "lost floodplains" through the innovative use of saline water from solar powered bores. Birdlife Australia have monitored habitat and waterbird responses to the intervention since 2017, documenting significant, seasonal reductions in invasive weed cover and subsequent increases in waterbird diversity and abundance, including increased presence of several EPBC listed species including Australian Painted-Snipe, Latham's Snipe, Sharp-tailed Sandpiper and Little Tern. A complementary program to reinstate estuarine connectivity is currently underway. These approaches provide important case studies into how passive, sustainable restoration methods may be implemented throughout large swathes of degraded wetlands along north Queensland's coast thus representing major opportunities to promptly improve and increase habitat for threatened migratory and resident shorebirds. Many of North Queensland's "lost floodplains" are on private land and restoring them will require partnerships between Traditional Owners, landholders and natural resource managers.

A tern for the better: First Nation collaborations to protect Fairy Terns

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Populations of Fairy Terns are experiencing major declines across south-eastern Australia. Human activities, habitat loss and introduced predators are driving declines. Large coastal breeding colonies are now scarce and many historical breeding sites deserted. Fairy Terns are listed nationally as Vulnerable. Management interventions are critical to mitigating threats, particularly from human recreation in their coastal beach, estuarine and island habitats. In South Australia, a critically important site is at the Murray Mouth spit, Coorong National Park. Due to the logistical challenges of working offshore, the need to engage a variety of stakeholders is required to successfully monitor and manage these sites. Training of local participants to monitor breeding success outcomes is critical to understanding the health of sites. Working with Traditional Owners on Sea Country has led to amazing initiatives with Ngarrindjeri monitoring and on-ground protection of the colony from off-road vehicles and other key threats. Management actions have included temporary fencing/signage, education events and focused intensive monitoring throughout the breeding season. Ngarrindjeri community together with BirdLife Australia have jointly advocated for improved regulations at the site, including greater restrictions on vehicle access, and increased investment in threat abatement works by local parks staff. Regular monitoring visits and events have increased opportunities for community of all ages to spend more time on country. This collaboration has strengthened conservation outcomes for Fairy Terns and more broadly, the suite of birds relying on these coastal habitats.

Looking for and Looking after Kulkurru (Night Parrot)

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Since launching their ranger program in 2020, Ngururrpa Rangers have led efforts to find and protect night parrots in Western Australia. In close collaboration with neighbouring ranger groups and partners, we have successfully combined our Traditional knowledge of spinifex, seed resources and waterholes with satellite imagery, firescar maps and geology data to choose survey sites to deploy acoustic recorders. So far we have found Night Parrots at 17 of 31 sites across an area 160km x 90km and estimate that there are at least 50 Night Parrots on the Ngururrpa IPA, making it the largest known population of Night Parrots in the world. We are learning more about Night Parrots all the time. Last year we found our first Night Parrot nests and eggs on Ngururrpa. We found Night Parrot feathers in Zebra Finch nests. We have acoustic data confirming regular visits to waterholes. We are now partnering with scientists to develop a species-specific assay for Night Parrots so we can trial eDNA as a new survey technique to detect them. Hot summer wildfires are a major threat to Night Parrot habitat in the Great Sandy Desert, and the extent of mature habitat has diminished over the past two years. We are monitoring the impact of these fires on Night Parrot persistence. Our management has focused on cool-season burning in the areas surrounding roosting habitat. We use both helicopter burning and ground burning to reduce the fuel loads. We are trialling Felixers to control cats in the unburnt remnant patches of roosting after fire.

Protecting Kurrual Kurrual (Night Parrot) using Martu traditional knowledge and collaborative conservation

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Kurrual Kurrual (Night Parrot or *Pezoporus occidentalis*) is one of Australia's most elusive birds. For Martu people, the Traditional Owners of over 14 million hectares in the Great Sandy Desert, the rare species also has cultural significance. The recent discovery of the species at Rio Tinto's prospective copper mine Winu has led to a unique collaboration between the Martu Traditional Owners and Rio Tinto. Together, they are ensuring the mine development protects the culturally and environmentally important bird. With a two-way knowledge approach, Martu rangers and ecologists combine traditional knowledge with Western science to identify, monitor and protect Kurrual Kurrual and its habitat. The partnership is strengthening understanding of Kurrual Kurrual's presence on Martu ngurra (country) and guiding management strategies that reflect Martu cultural values. The project demonstrates how Indigenous leadership and genuine co-management can shape conservation outcomes across Australia.

Fire and Feathers: Managing Country for threatened species outcomes

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Members of the South East Tasmanian Aboriginal Corporation's Working on Country Rangers will share how we manage Country on lunawanna alonnah (Bruny Island), home of the nuenone people. On Country we use a blend of traditional knowledge and contemporary techniques to protect threatened birds and their habitats, including cultural burning and Indigenous knowledge, alongside tools such as camera traps, nest boxes and feral species control. Our approach is based on cultural connection, adaptive methods and partnerships that respect both traditional knowledge and science. Re-introducing traditional fire practices is vital for the physical and spiritual health of the bush, many of the plants and animals present have genetic memory of this traditional fire practice and rely on it to thrive and grow. We are redelivering a medicine to these ecosystems, which they have been deprived of since colonisation. This presentation will highlight how we work on the ground, to support integrated land management, healthy animal populations and strong cultural connections.

Evolution of birds in Australasia

Waves of colonization and gene flow in a great speciator

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Secondary contact between previously allopatric lineages offers a test of reproductive isolating mechanisms that may have accrued in isolation. Such instances of contact can produce stable hybrid zones—where reproductive isolation can further develop via reinforcement or phenotypic displacement—or result in the lineages merging. Ongoing secondary contact is most visible in continental systems, where steady input from parental taxa can occur readily. In oceanic island systems, however, secondary contact between closely related species of birds is relatively rare. When observed on sufficiently small islands, relative to population size, secondary contact likely represents a recent phenomenon. Here, we examine the dynamics of a group of birds whose apparent widespread hybridization influenced Ernst Mayr's foundational work on allopatric speciation: the whistlers of Fiji (Aves: Pachycephala). We demonstrate two clear instances of secondary contact within the Fijian archipelago, one resulting in a hybrid zone on a larger island, and the other resulting in a wholly admixed population on a smaller island. We leveraged low genome-wide divergence in the hybrid zone to pinpoint a single genomic region associated with observed phenotypic differences. We use genomic data to present a new hypothesis that emphasises rapid plumage evolution and post-divergence gene flow.

Interrupted evolution: hybridisation and secondary allopatry

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We readily visualise the speciation process as occurring between populations isolated by an environmental barrier in allopatry; it can take place also in parapatry across an environmental gradient. A hybrid zone will develop separating diverging parapatric populations and if separated populations come into secondary contact e.g. with an amelioration in climate. Subsequent climatic oscillations may result in further periods of separation and contact. Secondary allopatry may disrupt the hybrid zone in one of several ways. It may be divided in its midst, each end portion retaining contact with the parental forms, or it may persist as a hybrid population disjunct from one or both. Further variation is provided by any genetic introgression that has occurred during periods of contact. There are many examples of disjunct hybrid populations among southern Australian birds. Recognition of this entity may assist our interpretation of diversity in these groups.

Lyrebirds in the pipeline: how SNP-calling choices shape inferences of evolution, admixture, and genetic diversity in *Menura novaehollandiae* and *M. alberti*

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Conservation management of declining species depends critically on the correct delineation of conservation units, such as subspecies. In birds, subspecies are often treated as independent units under federal and state legislation, making accurate delineation and understanding of within-unit genetic diversity essential. These data also support the identification of populations that contribute disproportionately to overall diversity or require targeted conservation actions. However, such inferences can be strongly influenced by bioinformatic decisions during SNP discovery,

particularly whether SNPs are called across populations jointly or separately, and whether sample sizes are balanced among populations. These choices can bias estimates of population structure, admixture, and genetic diversity, potentially leading to misleading conclusions about conservation units and relative conservation value. Here, I use lyrebirds (*Menura novaehollandiae* and *M. alberti*) as a case study to explore how SNP calling decisions influence evolutionary and conservation inferences. These species span a biogeographically complex region of eastern Australia, with prior evidence of population structure, divergence, and possible secondary contact. By comparing different SNP calling strategies in this system, I highlight how common analytical choices can alter our understanding of population distinctiveness and admixture, with direct consequences for conservation planning.

More Moa than ever before? New insights from the sparse pre-Quaternary fossil record of Dinornithiformes

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The recently extinct Moa (Dinornithiformes) of New Zealand represent an unusual tangent in bird evolution; not only did they grow to some of the largest body sizes in all of avian history (and get to those sizes at an unexpectedly slow rate), they are unique among archosaurs for having evolved the complete absence of forelimbs. Other than abundant Holocene specimens, the moa fossil record is very poor. To date, the sole ancient moa specimens come from the Miocene St Bathans fauna, New Zealand's only substantial pre-Quaternary terrestrial fauna. The evidence of Moa presence at this locality is tantalising; despite plentiful eggshell with moa characteristics, there are only a handful of fragments from larger bones which can be assigned to the clade. Here we conduct the first thorough investigation into the Moa of St Bathans, utilising the relatively scant fossil evidence to investigate their diversity and biology. Drawing comparisons with the better understood waterfowl fossil assemblage from the locality, we suggest that there existed multiple cryptic Moa species at St Bathans and that the species composition varied between fossil sites. Additionally, we describe the two most substantial dinornithiform bone fragments known from the site and conduct their first histological analysis, revealing that these ancient Moa had already evolved the clade's unusually slow growth patterns. Our investigation shows the power of a relatively poor fossil record to provide novel insight into the untold history of a truly unique lineage of birds.

The application of population genomic methods for the conservation of Western Australia's iconic white-tailed black cockatoos

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The Carnaby's and Baudin's cockatoos are two species of white-tailed black cockatoos (WTBCs) endemic to south-west Western Australia (SWWA). Both species are threatened and have experienced substantial range contractions and population declines since European settlement, largely due to extensive land clearing. Further range contractions and habitat loss are predicted due to climate change - factors that are expected to increase isolation and lead to the erosion of genetic variation in remnant populations. Assessing how these processes impact WTBC populations is critical for ensuring their persistence in a rapidly changing environment. Furthermore, the lack of high-quality genetic data for WTBCs limits our understanding of the taxonomic relationship between Carnaby's and Baudin's cockatoos, and the number of conservation management units within each species. In this project, which forms part of the Parrot Genomics Consortium of Australian Researchers, we aim to undertake a two-part study. Firstly, to generate high-quality genomic data for both WTBC species and explore the genetic basis for their diversification. Secondly, to investigate spatial and temporal changes in genetic diversity and population connectivity by comparing genetic data retrieved from a comprehensive resource of contemporary and archived tissue samples from decades-long monitoring. Findings from this study will inform direct conservation actions including protecting at-risk colonies, guiding the release of rehabilitated birds, and augmenting populations, to ensure the long-term survival of these flagship species in SWWA.

Masks revealed: historical DNA and whole-genome sequencing clarify Masked Owl evolution

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Understanding evolutionary relationships within widespread species complexes is essential for conservation, particularly where cryptic or isolated lineages may remain unrecognised under current taxonomy. We present the first whole-genome study of the Australian Masked Owl (*Tyto novaehollandiae*) complex, undertaken to clarify species and subspecies limits and reconstruct the evolutionary history of this morphologically variable group. Using genome-wide SNPs generated from both toepad samples of historical museum specimens and contemporary frozen tissues, we analysed all major populations across mainland Australia, Tasmania, the Trans-Fly region of New Guinea, and the Bismarck Archipelago islands of New Britain and Manus. STRUCTURE and principal component analyses revealed strong population structure associated with established mesic refugia, with four major Australian lineages corresponding to Tasmania, the south-west, the Tiwi Islands, and the eastern/northern mainland. The south-western population, currently considered consubspecific with birds from the south-east, formed a clearly divergent lineage consistent with long-term isolation. The shared ancestry of eastern and northern populations suggests recent gene flow or incomplete lineage sorting. We detected mito-nuclear discordance in several populations, helping reconcile inconsistencies in earlier studies based solely on mitochondrial DNA. Our inclusion of samples from the Nullarbor and Manus, populations not definitively recorded since the 1930s, demonstrates the value of historical DNA in resolving the evolutionary relationships of poorly known or possibly extinct lineages.

Hidden evolutionary histories and ancient connectivity in birds of north-western Australia

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Climate change has shaped the evolution of the world's biota, driving changes in species distributions, promoting diversification and causing extinctions. The Pleistocene's turbulent climatic fluctuations, which caused repeated periods of isolation and secondary contact, have left lasting genetic signatures in species worldwide. Some of these genomic signatures offer unique insights into past population histories, which would otherwise have remained undetected. In this talk, I will explore one such case where hidden footprints in the genomes of Silver-backed Butcherbirds (*Cracticus argenteus*) from north-western Australia revealed unexpected ancient connectivity and gene flow, not only with Grey Butcherbirds (*C. torquatus*) from southern Australia but also with Black-backed Butcherbirds (*C. mentalis*) from New Guinea. Although these three species are currently allopatric, transient connectivity was possible during the Pleistocene (~11 kya – 2.5 mya) when the Arafura Shelf, a savannah-dominated land-bridge between Australia and New Guinea, was intermittently exposed, and when large-tracts of suitable habitat in inland Australia expanded during glacial maxima. Time permitting, I will also touch on other ongoing research with further insights into the evolutionary history and genetic connectivity of birds in Western Australia. Our findings enhance our understanding of genetic connectivity within and among Australia's bird species, including how climate-driven secondary contact could affect species in the future.

Using fossils from cave deposits to understand past avifaunal changes in eastern Australia

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Fossil assemblages are a key source of data on the evolution of Australian avifauna, yet the late Quaternary (last ~500,000 years) fossil record of Australian birds is poorly understood compared to that of mammals. To address this shortfall, we report preliminary data on the fossil avifauna from Victoria Fossil Cave (Naracoorte Caves, South Australia) and Cathedral Cave (Wellington Caves, New South Wales). Initial examination of over 2000 bird bones from

both past expeditions and a recent excavation in Cathedral Cave indicates that avian fossil assemblages from Wellington and Naracoorte are some of the most diverse in Australia. Old World quails (Coturnicini) and buttonquails (*Turnix*) dominate both assemblages, but at least 13 avian orders are collectively represented. These fossils show that several geographically restricted birds were more widespread in the past, including the Plains-wanderer (*Pedionomus torquatus*), a critically endangered bird now restricted to open grassland environments. The occurrence of Plains-wanderers in fossil deposits at Wellington and Naracoorte—where it was highly abundant—demonstrates the formerly widespread nature of this enigmatic bird and highlights how fossil data can be applied to understand the distribution and ecology of living birds. Continued analysis of the fossil avifauna of Wellington and Naracoorte is expected to markedly increase the avian diversity recognised from these fossil assemblages. This will provide insights into how climate change over the last 500,000 years influenced the evolving biogeography of birds across the Australian continent.

Unraveling the Paradox of the 'Great Speciators': evolutionary dynamics of a geographic radiation of island kingfishers (*Todiramphus*)

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The fauna of the Indo-Pacific is renowned for high rates of diversification and outsized contributions to evolutionary theories, such as Ernst Mayr's work on allopatric speciation and the Paradox of the 'Great Speciators'. The latter describes a pattern in which geographically widespread lineages disperse well over water yet exhibit genetic and phenotypic divergence between islands, suggesting limited dispersal and gene flow. Here, we leverage a large whole genome resequencing dataset and two trait datasets—dispersal ability and plumage colouration—for all described Todiramphus kingfishers, a rapid radiation of largely island endemic 'Great Speciators.' We find that whole genome data does not resolve relationships in this clade: four types of molecular markers and tree building methods did not find a single well-supported, concordant species-level topology. We detect widespread Incomplete Lineage Sorting and both ancient and recent gene flow, which explain the discordant histories. Direct measures of dispersal ability, the Hand-wing Index, show that Todiramphus lineages that accomplished long-distance colonisation of remote South Pacific islands exhibit the least dispersive wing morphologies, suggesting evolutionary trends towards flightlessness in flighted, island endemic birds (i.e., island syndrome). With spectral reflectance measurements, we show a positive relationship between diversification rate and the rate of plumage color evolution. Lineages with lower genetic diversity have faster rates of colour evolution, highlighting genetic drift as a main driver of rapid phenotypic evolution in these small island populations. These results highlight incomplete genetic isolation between species and declining dispersal ability with increasing phenotypic variation in island systems.

Estimating the timing of passerine evolution using Bayesian tip dating and fossil occurrences

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Passerines are the largest group of birds, making up over half of all living bird species (>6,500 species). About 80% of passerine species are songbirds, which can trace their ancestry to the Australian continent. However, the timing of passerine evolution has been difficult to resolve with confidence. The fossil record of early passerines is relatively poor and molecular estimates of the age of modern passerines have varied widely, with many studies relying on secondary calibrations or assumptions relating to the continental breakup of Gondwana. In this study, we estimated the evolutionary timescale of passerines using a Bayesian tip-dating approach with the unresolved fossilized birth-death model. This method uses genetic data from extant taxa and incorporates time information from a set of fossil occurrences. We used 43 passerine fossils that were selected through a detailed assessment, which represent the largest set of fossil taxa that has been incorporated into a molecular dating analysis of passerines. Our analyses dated the origin of modern passerines to the Eocene (43–53 million years ago), which largely closes the gap between molecular and palaeontological estimates of the passerine evolutionary timescale. This study highlights the benefits of

a carefully curated, comprehensive set of fossils for estimating the timing of passerine evolution, as well as potential ways to refine these date estimates.

A New Pelagornithid from the Selandian of the Waipara Greensand, North Canterbury, New Zealand: Implications for Early Cenozoic Avian Diversification

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The Pelagornithidae, often referred to as "bony-toothed birds" represent an unusual and extinct family of very large, gliding marine birds. These birds are characterised by unique bony, tooth-like projections on their rostrum and mandible, which are distinct from true teeth. Pelagornithids were among the largest volant birds, with some species reaching wingspans of up to 6.4 metres. Their fossil record spans most of the Cenozoic Era, with remains found on all continents, including Antarctica. Previous work by our research team described *Protodontopteryx ruthae* from the late Danian, Waipara Greensand of Canterbury, New Zealand. This taxon is currently the oldest and smallest known species of bony-toothed bird, and the first pre-Eocene record from the Southern Hemisphere. Here we describe a second larger taxon of Pelagornithid from a higher stratum within the Waipara Greensand that we assign to the Selandian. The specimen consists of a partial humerus and a complete tarsometatarsus which we assign to the Paleogene genus Dasornis. This new discovery pushes back the temporal record of large, specialized Pelagornithids into the immediate aftermath of the Cretaceous-Paleogene extinction event, demonstrating an exceptionally rapid evolutionary trajectory towards gigantism and highly adapted soaring capabilities in the Southern Hemisphere. Its co-occurrence with smaller, more generalised forms from the same locality suggests early and rapid niche partitioning within the Pelagornithidae, reinforcing the critical role of the Zealandia region as a hotspot for post-extinction avian diversification and provides crucial evidence for understanding rapid adaptive radiation of volant birds in the early Cenozoic.

Spatial trends in morphology do not predict individual species responses to climatic warming in Australian birds

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Allen’s and Bergmann’s rules describe trends towards larger appendage size and smaller body size, respectively, in warmer environments in endothermic animals. Though conceived on a spatial scale, a key prediction from these ecogeographical rules is that they can be extrapolated to temporal trends. Accordingly, appendage size has been observed to increase, and body size decrease, in response to climatic warming across many taxa. However, these responses vary across species, and the cause of such variation is not yet clear. In this study, we use data from Australian birds to examine whether changes in morphology through time is predicted by whether the species show follow Allen’s and Bergmann’s rule gradients across space. We collected body size (wing length) and bill surface area from 2014 museum skins from 17 species and modelled variation in these traits across space and time. Overall, we found decreases in wing length across the latitudinal range (from south to north), as predicted by Bergmann’s rule, but these were not matched by changes in body size through time. Conversely, we found no significant spatial trend in bill surface area, but did find evidence for increases in relative bill surface area through time, as suggested by Allen’s rule in response to the climatic warming. When comparing the relationship between spatial and temporal morphological trends for each species, we found no association between the size of their morphological gradients across latitude with those over time. Our findings suggest that thermoregulatory adaptation throughout spatial ranges do not directly predict temporal changes in morphology, nor do they explain the cross-species variation seen in temporal trends.

Introgressed variants obscure phylogenetic relationships but are not subject to positive selection in Australasian Long-tailed Parrots

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Gene flow often obscures phylogenetic relationships, but the evolutionary significance of introgressed variants is unclear. Here we examine the Australasian Long-tailed Parrots (Psittaculinae: Polytelini), in which an unexpected sister relationship between *Polytelis alexandrae* and the genus *Aprosmictus*, and not the other *Polytelis* species, has been observed. We tested whether this relationship was due to ancient introgression in whole genomes and found that the majority of gene trees had *A. erythropterus* and *P. alexandrae* as sister taxa, whereas network analysis indicated monophyly of *Polytelis*, and 48% of gene trees were in phylogenetic conflict due to introgression from *A. erythropterus* into *P. alexandrae*. Further analyses confirmed that 4–8% of the genome of *P. alexandrae* was confidently introgressed from *Ap. erythropterus*, with signals of gene flow occurring throughout the genome. These findings indicate that topologies with *P. alexandrae* and the genus *A. erythropterus* as sister taxa were biased by gene flow and affirm that *Polytelis* is monophyletic. Next, we assessed the evolutionary outcomes for introgressed variants and found that, among introgressed protein-coding genes, only two (0.8%) were under positive selection, in comparison to 99 (1.7%) of non-introgressed genes. Our results indicate that, despite the ubiquity of genetic introgression across a given phylogeny, many genetic variants flowing between species may play a small role in molecular adaptations, with selection most frequently acting on existing variation.

Sexual selection drives introgression of alleles affecting sexual signals

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Male ornamentation, such as plumage coloration in birds, often differs conspicuously among closely related species, supporting a role for sexual selection in the process of speciation. However, recent studies have shown that genetic differentiation between sister taxa often is not geographically concordant with plumage differentiation. For example, the Red-backed Fairywren (*Malurus melanocephalus*) consists of two genetically distinct subspecies distinguishable by carotenoid-based male plumage coloration, but the cline in male plumage colouration is not concordant with the genetic cline differentiating the subspecies. Moreover, females of one subspecies prefer males having plumage coloration of the other. These patterns strongly suggest that alleles affecting plumage colour have introgressed across the genetic boundary dividing the two subspecies. To test this, we sequenced whole genomes of 36 individuals to identify several genomic regions associated with variation in male plumage colouration. We then sequenced these top candidate genetic variants in 285 individuals from 16 distinct populations across the species range. We found that 15% of these variants were concordant with the plumage cline, some of the variants were in or near genes with putative carotenoid processing functions, and some regions containing those variants showed strong evidence of selection. These findings suggest that geographic variation in the sexually selected plumage colour of male Red-backed Fairywrens is explained in part by adaptive introgression of genes affecting these signals. Although sexual selection is thought of as an evolutionary force that promotes speciation, these results demonstrate that it can also reduce the distinctiveness of sister taxa by driving adaptive introgression.

From Plans to Action: Overcoming Barriers in Species Recovery

Conserving Kyloriny – Structured decision making to plan the next steps for conservation of a Critically Endangered parrot

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Kyloriny, the cryptic Western Ground Parrot (*Pezoporus flaviventris*), is teetering on the edge of extinction. Kyloriny occurs in a single wild population thought to be less than 150 birds on the south coast of Western Australia. Because this population is at risk from bushfires and feral cat predation, establishing a second population is a priority. The ecology of the species is not well understood, and with no guarantee of success, the decision to implement a wild-wild conservation translocation between 2021 and 2023 was challenging, involving the removal of birds from a small source population. With the first stage of this project completed, there is optimism that the risk was worthwhile, although ongoing interventions will be required to maximise the chance of persistence. For Kyloriny, the future remains precarious but is now more promising through the collaborative efforts of many partners. At the completion of the first three years of translocation efforts, these partners came together to work through a Structured Decision-Making process that captured diverse perspectives from conservation professionals, First Nations peoples and project partners. We used the internationally recognised framework developed by the IUCN Conservation Translocation Specialist Group (CTSG), with the assistance of experienced facilitators. This work has mapped a clear path for the next steps in conservation efforts for Kyloriny, which can now be approached with some confidence. Here we share some of the outcomes of the SDM work and our collaborative approach to prioritising the next steps in our efforts to conserve this enigmatic parrot.

Achieving incremental positive outcomes for Far Eastern Curlew in Australia amid increasing human demands on coastal environments and climate change squeeze

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Conservation of migratory species that rely on multiple countries, requires international cooperation and action at every step of the migration path. Far Eastern Curlew (*Numenius madagascariensis*) is the largest migratory shorebird in the world and is listed as critically endangered. Australia is a final destination for 75% of the global population during the non-breeding season, and provides year-round nursery sites for thousands of young birds until they are mature enough to migrate. Far Eastern Curlew are territorial benthic feeders, foraging across tidal flats on yabbies, shrimps and crabs, and roosting nearby at high tide. Loss of roosting and foraging habitats in Australia and/or decline in their quality, is compromising Far Eastern Curlew survival. Far Eastern Curlew are also extremely sensitive to disturbance, with frequent and/or high impact disturbances affecting individual capacity to migrate. Australia's coast is a complex and fragmented landscape of policy and jurisdiction across three levels of government. It is impacted by onshore and catchment processes and squeezed by climate change and development. Through development of an Australian action plan for Far Eastern Curlew, with site-based partnerships, stronger cross-jurisdictional coordination, and embedding of adaptive management and monitoring, BirdLife is identifying how incremental changes in Australia can support positive global outcomes.

Coordinating recovery: Strengthening national recovery efforts for Australia's most threatened birds

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Effective threatened species recovery requires more than good science—it relies on well-supported Recovery Teams with the governance, coordination, and capacity to implement action. BirdLife Australia's Recovery Action Coordination Project funded by the Australian Government's Saving Native Species initiative, responds to this need by embedding dedicated Recovery Coordinators within several priority bird Recovery Teams and providing support to a number of other Recovery Teams. The program supports 17 nationally threatened birds and one threatened ecological community. It includes supporting established Recovery Teams and aims to lead the formation of three new Recovery Teams. This presentation will outline BirdLife's approach to identifying support needs through our health check methodology, building coordination capacity across Recovery Teams and share early insights from implementation,

including common barriers and gaps to effective recovery action. The model demonstrates how coordinated investment in recovery infrastructure can improve transparency, resourcing opportunities, and conservation impact across priority species.

BirdLife Australia's exciting strategy to overcome the 'implementation crisis' in bird conservation and put birds on the path to recovery

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BirdLife Australia's ten-year (2023-2032) Bird Conservation Strategy (BCS) is radical and not short of ambition: stop bird extinctions, improve populations of 30% of threatened birds and keep common birds common. So far – so predictable; the radical bit is the how. BirdLife recognized that often the knowledge and the experience to improve bird population exists, but we lack ways to implement them at scale. No longer satisfied with delivering only on our core strengths in science, community engagement and direct action, BirdLife is spreading its wings: we are building networks and partnerships to make society more bird friendly; learn from, support and share knowledge with First Nations; work with industry to demonstrate that nature positive systems are possible and advocate behind the scenes and wherever else necessary for meaningful conservation action. Multi-stakeholder Partnerships that benefit all parties and the birds are central to this endeavour and a proud tradition for BirdLife. The BCS makes it transparent where BirdLife puts the emphasis in its work, where we most rely on support from partners and where we can add most value. Details and examples of how this strategy works in practice and how it can support conservation plans for species recovery in surprising ways are the focus of this presentation. With the BCS BirdLife affirms its unique role and capacity in Australian conservation as a science-based change maker with an immense reach and the desire to share this capacity with our network and partners to lead bird conservation out of the implementation crisis.

Deconstructing the ecology of data-deficient species: a multidisciplinary toolbox for Eastern Ground Parrots

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The ability to document life history strategies, population metrics, and occupancy of a species is integral for understanding biology, ecology and conservation. Limitations arise when attempting to accurately document these characteristics for species described as either data deficient or difficult to observe in their natural environment. The adaptations that make elusive species difficult to study, can show differences behaviourally from closely related species that could otherwise be observed as a reference. In these cases, there is often a reliance on extended research efforts or the inclusion of experts to assist in directing research. However, the wide variation in fields of expertise can introduce bias into the prior knowledge that shapes research perspectives. We present this research through a case study on Eastern Ground Parrots, merging remote sensing techniques from various fields for management and conservation. A framework for integrating multidisciplinary data to investigate this species was made using examples from drones, acoustics and environmental DNA techniques. During this process, we identify key challenges in translating methodologies across disciplines and highlight barriers that may constrain the inferences drawn from our findings. We have adapted the techniques to enhance their compatibility with multidisciplinary approaches and provide an example of a scenario using this which has advanced our understanding of the species. We hope our findings offer valuable insights for improving current research methodologies for species with limited information on life history strategies, population dynamics, and habitat occupancy.

Long-term Monitoring

Balancing recreation and conservation: Protecting shorebird habitat on the Sunshine Coast

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The Sunshine Coast in south-east Queensland supports critical habitat for migratory and resident shorebirds, including several threatened species. The lower Maroochy River estuary, encompassing approximately 87 hectares of tidal flats, is one of the region's two primary shorebird areas. Despite its ecological value, the estuary is subject to intense recreational use, particularly around the rapidly urbanising Maroochydore area. Long-term monitoring by the Queensland Wader Study Group (1997–2023) and recent surveys commissioned by Sunshine Coast Council (2020–2024) have documented significant changes in shorebird populations and habitat use. While five migratory and two resident species dominate low tide counts, long-term data reveal a significant decline in high tide roosting numbers for three migratory and one resident species. Conversely, two species have shown increases. Historically, shorebirds used up to four roost sites within the estuary. However, recent data indicate that roosting is now largely confined to a single small site and a mangrove tree roost. The abandonment of former roosts, including the previously most important site, is attributed primarily to anthropogenic disturbance, including off-leash dogs. In response, the Sunshine Coast Council's draft Shorebird Conservation Plan 2025–2030 and the draft Dog Exercise Area Regional Plan propose integrated strategies to mitigate disturbance. These include community engagement and education, habitat protection, and spatial planning to balance recreational access with conservation priorities. This presentation highlights the importance of long-term monitoring and adaptive management in safeguarding shorebird populations in urban coastal environments.

Climate influences productivity but not breeding density of Wedge-tailed Eagles *Aquila audax* in arid and mesic Western Australia

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Long-term studies are required to reveal responses by long-lived, top-order predator populations to ongoing seasonal fluctuations. However, such investigations are rare in the Australian context. Between 2009 and 2019, the breeding density and productivity of an arid and a mesic Wedge-tailed Eagle *Aquila audax* population, each occupying an area of 2800 km^2, were compared. Breeding pairs spaced themselves evenly in both study areas, with no significant difference between the average arid zone nearest-neighbour distance of 5.32 km (n = 44) and that determined for the mesic zone (4.88 km, n = 54). This similarity in spacing suggests a maximum average density is tolerated by these territorial raptors. By contrast, annual breeding success and productivity differed significantly between the two populations, with rainfall influencing reproduction. In the arid zone, the proportion of successful pairs per occupied breeding home range was consistently low each year (mean = 12±7% fledged broods per pair, range 0–26%) and positively correlated with annual rainfall. In the mesic zone, it was consistently high each year (mean = 69±9%, range 57– 91%) and not significantly correlated with annual rainfall. Overall productivity figures showed similar differences, with 0.13 and 0.77 fledglings per pair per year for arid (n = 9 years) and mesic (n = 11 years) eagles, respectively. Such low arid zone productivity, the lowest ever recorded for the species, could have long-term implications in the face of the increased frequency of extreme weather events. That breeding density can be independent of climatic factors provides new insight into the way a large Aquila species integrates with Australia's predominantly arid environment. This study provides an important baseline data set for continued research on long-term occupancy and productivity trends.

From bare ground to birdsong: tracking bird responses to restoration in southern Queensland through 7 years of citizen science

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This presentation shares the findings of a 7-year bird monitoring project conducted at a revegetation site near Texas, southern Queensland. Undertaken through a collaborative partnership between CO2 Australia, BirdLife Southern Queensland and volunteers, the study aimed to assess avian community responses to environmental plantings established in 2017. Using the standardised 2-hectare, 20-minute survey technique, bird surveys were conducted quarterly at six planting sites and seven nearby reference sites embedded within intact remnant vegetation. With 188 species of birds recorded throughout the greater property area, 136 of those species were recorded across the 26 seasonal survey periods comprising this study. Comparative analyses revealed considerable differences in species richness, abundance, diversity and community composition/condition metrics between planting and reference sites over time. The results highlight dynamic patterns of colonisation and habitat use by different foraging guilds, including a shift from open-country species to edge-dwelling and woodland species as vegetation structure developed. These findings underscore the ecological value of restoration plantings in enhancing avian biodiversity within fragmented landscapes. The project also demonstrates the critical role of citizen science in long-term ecological monitoring. Volunteer involvement enabled consistent, large-scale data collection that would have otherwise been unfeasible. However, the study also underscores the importance of appropriate guidance and quality assurance to ensure data reliability. This case study provides valuable insights into bird community development in restoration contexts and offers practical recommendations for future collaborative monitoring initiatives.

Drivers of nest survival in Hooded Plovers: analysis of a long-term citizen science data set

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Struggling to raise their young in a habitat loved by all Australians for recreation, beach-nesting shorebirds are at a major disadvantage. They are widely dispersed, have a long breeding period and experience a myriad of threats. Their conservation relies on having enough eyes on the ground to monitor the birds, their threats, and responses to management investment. The BirdLife Australia's Beach-Nesting Bird project has invested close to two decades in developing and implementing a citizen science based Hooded Plover conservation program. A combination of coordinated population counts, intensive breeding success monitoring, coupled with site threat assessments and recorded management actions, is allowing us to delve more deeply into the impacts of human beach use on these vulnerable birds. This presentation will provide insight into early analysis of this extensive data base, which will help to guide future conservation of Hooded Plovers and other beach-nesting bird species.

Developing suitable methods for ongoing Waterbird and Shorebird monitoring on the Fortescue Marsh- A collaborative alliance between Fortescue and Murdoch University's Harry Butler Institute

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Understanding the drivers influencing waterbird and wader abundance and community composition is essential to improving conservation management of their populations. This is especially true for ephemeral wetlands, where the landscape and ecology can be radically transformed in response to rainfall. The Fortescue Marsh in the Pilbara,

Western Australia, is an enormous ephemeral wetland (1,300 km^2). It is one of the largest and most important inland water features of central Australia, supporting significant breeding populations of waterbirds and waders. Despite its important role in the region, the ephemeral nature of the Fortescue Marsh compounds substantial logistical access issues, which has meant that systematic monitoring of birdlife in the marsh has not been achieved to date. Fortescue has been working with the Harry Butler Institute to trial and develop a repeatable field survey methodology suitable for counting migratory waterbirds and shorebirds on the Fortescue Marsh, and comparing the results of these studies with surveys carried out over the last 40 years, to determine patterns in bird populations over time and inform future survey design. The presentation will discuss the key methodology the HBI and Fortescue have developed, some preliminary results from the two years of studies we have completed, and a discussion on potential sources of error for the aerial surveys and recommendations for further development of our methodology and how it can be used for other migratory and waterbird studies for other large ephemeral waterbodies.

Into the frying pan – long term citizen science project reveals the impacts of a changing climate on semi-arid zone bird assemblages

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Arid and semi-arid zones are under increasing pressure from a changing climate, as rainfall becomes less reliable, and heatwaves increase in frequency. While avifauna in these regions are known to be impacted by these pressures, the ecological consequences of such events remain poorly quantified. Since 2013, a citizen science led banding project has been undertaken at AWC's Bowra Wildlife Sanctuary, in the Mulga Lands bioregion, Western Queensland. During this time, a three-year drought impacted the property, thus allowing for the opportunity to study the impacts of severe weather events on avian populations and diversity. Using ten years of standardized bird capture data and generalized additive mixed models (GAMMs), we modelled the impacts of climate variables (rainfall, days exceeding the 90th percentile of maximum temperature), and remote sensed vegetation metrics, on metrics of avian diversity (e.g. biomass, productivity, and functional diversity). The interaction between rainfall in the previous 12 months and extreme heat days were significant predictors in biomass and capture rates of resident species. This pattern was particularly pronounced for young bird capture rates, indicating reduced breeding success or juvenile recruitment under extreme weather conditions. Additionally, capture rates of different foraging guilds showed varying patterns in response to drought conditions, with insectivores being more resilient than granivores. Our findings provide strong support that semi-arid zone bird assemblages are negatively impacted by extremes in weather and highlight the important role that citizen science led surveys can play in monitoring avian populations.

Long term bird monitoring demonstrates impact of restoring biodiverse habitat on bird communities in the southwest Australian biodiversity hotspot

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One of the main drivers of the global biodiversity crisis is the loss and degradation of native vegetation and associated impact on fauna communities due to loss of habitat. Conservation management in the southwest region of Australia requires protecting remnants and using restoration to expand the extent of native vegetation and re-build connectivity lost due to extensive clearing and fragmentation of the exceptional floristic diversity in the region. Effective ecosystem restoration is particularly challenging due to the high diversity of plant species and legacies on soil from previous land uses, and long-term monitoring is vital to evaluate and improve the outcomes of ecosystem restoration projects. Bush Heritage is a conservation non-profit organisation that protects and restores ecosystems across Australia. Since 2002, Bush Heritage has worked with partners to conduct landscape-scale biodiverse restoration of native vegetation to enhance connectivity in the southwest region of Australia. Bird communities were surveyed regularly for almost two decades in both restored and intact remnants of mallee heath, contrasting changes over time in earlier, less diverse restoration with later, more diverse restoration. We compared changes in the total number of bird species detected over time, evaluated changes in different bird functional groups, and compared community composition between intact mallee heath and simple and more complex restoration to identify changes associated with restoration age and

complexity, and assess the effectiveness of ecosystem restoration.

From shorebird counts to critical tools for protecting shorebird habitats: revising the Directory of Important Migratory Shorebird habitat in Australia

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Thirty-seven species of migratory shorebird regularly visit Australia during their non-breeding season (Austral Spring to Autumn). Of these, 16 are listed as threatened, including the Critically Endangered Far Eastern Curlew and Curlew Sandpiper. Mapping of important habitat for migratory shorebirds is critical for scientifically-robust conservation decision making. Australia has some of the most comprehensive shorebird monitoring data available in the East Asian-Australasian Flyway. Standardised population monitoring of shorebirds has occurred since the 1980's, supported by special-interest groups such as the Australasian Wader Studies Group. Birdlife Australia's National Shorebird Monitoring Program now houses decades of continent-wide shorebird count data. In this project, we use these data to update the Flyway Population Estimates that reflect the total number of individuals of each species across the East Asian–Australasian Flyway. We also revise the Directory of Important Migratory Shorebird Habitat in Australia, which identifies all sites that meet national and international significance criteria (a site is considered internationally important if it regularly supports 1.0% of the Flyway population of a single species or subspecies; or a total of at least 20,000 shorebirds). Data spanning 15 years (September 2009 to April 2024) reveals 108 internationally important sites, and an additional 166 sites that meet national importance criteria. The Directory will be available online, with easy accessibility for shorebird data from both nationally and internationally important shorebirds sites. This project highlights how standardised, long term data collection can guide conservation decision making for threatened species. We encourage attendance from researchers, land managers, and anyone with an interest in migratory shorebirds at their local wetlands to attend as we showcase this project.

Multidimensional biodiversity changes in global waterbird communities over three decades reveal complex conservation challenges

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Waterbirds serve as key indicators of wetland health, yet their changing community patterns reveal a global conservation crisis requiring attention. We analyzed three decades (1990-2018) of waterbird monitoring data from over 11,000 wetlands worldwide, tracking changes in community structure, evolutionary relationships, and ecological functions across 600+ species. Our findings reveal that common waterbird species are disappearing faster than rare ones, while rare species face higher risks of local extinction. Although wetlands gained more species than they lost, communities are becoming increasingly dominated by uncommon species, signaling ecosystem degradation. Simultaneously, wetlands are supporting more evolutionarily diverse bird communities, but this apparent positive trend actually reflects ongoing habitat disruption and change rather than conservation success. Another area of concern involves changes in functional diversity—the variety of ecological roles that waterbirds play in wetland ecosystems. We found shifts in functional richness, evenness, and dispersion, indicating that the mix of bird species and their ecological functions is changing in ways that could affect ecosystem services. These changes involve alterations in key traits like feeding behaviours, habitat preferences, and body sizes that directly influence wetland functioning. These complex changes demonstrate that traditional conservation approaches focusing on species counts and richness are insufficient. Wetland degradation is driving fundamental reorganization of bird communities worldwide, threatening biodiversity and the ecosystem services millions of people depend on. Effective conservation requires integrated management strategies that simultaneously address habitat quality, species abundance patterns, and functional diversity to maintain healthy, resilient wetland ecosystems for wildlife and human communities.

Scalable metrics to track the condition of Australia's terrestrial bird communities

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Tracking the condition of sites using habitat metrics as proxies is useful, but does not reveal the whole picture. To understand the health and condition of fauna communities, we need to measure them directly. We are engaged in a collaboration with ornithologists and ecologists across Australia to develop a set of bird community condition metrics that can be calculated using standard bird survey data, including acoustic recordings. In this presentation, we will provide an update on our progress, including presenting a new typology of terrestrial bird communities for Australia, and outlining how we have developed draft condition metrics for each one. The condition metrics are sample-based, and thus, fully scalable to allow for tracking and reporting of community condition at sites and properties, and, through aggregation, at regional and national scales. We will present 20-year national trends in community condition for a subset of bird community types, and outline our next steps in refinement and expansion of the community condition metrics, as well as the development of user-friendly guidelines to enable them to be employed in a wide variety of applications. Ultimately, we aim to calibrate the metrics with acoustic monitoring data, as well as enable automatic metric calculation and visualisation of trends via BirdLife Australia's Birdata portal.

Long-term monitoring of South Australian woodland birds

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I will describe long-term monitoring programs, past, present and future, using the BirdLife Australia 20min 2ha survey method, in the eucalypt woodlands of the Limestone Coast, and Mount Lofty Ranges, of South Australia. Both regions have lost about 85% of their natural habitat. Issues of survey design, site selection and replication, and results will be discussed. The work shows the value of committing to long-term monitoring, the challenges of getting funding and consistent support, and the impact of the work on policy and management. There are some significant similarities and differences between the two regions - in both the survey approach and the trends in woodland birds. Notably, it is much easier to attract citizen science surveys within two hours of a major Australian city. Second, the bird fauna of the Mount Lofty Ranges has suffered more substantial declines, possibly because of its isolation, and the more selective nature of habitat clearing. Both areas are "coal mine canary landscapes" which tell us a lot about the trajectory of declines in other regions, plus opportunities for landscape-scale management and restoration.

Adaptive response and breeding success for two noddy species in a time of climate-driven phase shift in the eastern Indian Ocean: A 33-year study

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In this study spanning 33 years, the differences in adaptive breeding response to oceanographic variability associated with large-scale climate oscillations are contrasted between the resident Lesser Noddy (Endangered/Vulnerable) and the migratory Brown Noddy at Pelsaert Island, Houtman Abrolhos (HA). We found that timing of breeding and reproductive performance of these species were related to climate variability, mediated by oceanographic conditions within the eastern boundary Leeuwin Current (LC). The Brown Noddy was less able to adapt and respond to climate variability, with poorer reproductive outcomes over successive years in comparison to the resident Lesser Noddy. The Lesser Noddy may have had an adaptive advantage due to its ability to respond to localised environmental cues during the pre-breeding phase, when Brown Noddies are still absent, which potentially correlates with prey availability in the waters surrounding the HA. The long-term viability of these populations depends on the oceanographic trends

influencing the LC and the subsequent effect on larval prey recruitment in key foraging grounds. Climate driven Inter-decadal Pacific Oscillation/Pacific Decadal Oscillation (IPO/PDO) phase-shifts have been associated with a strengthening trend of the LC, inducing extreme oceanographic conditions along the WA coastline including marine heatwaves and disruptions to prey distribution. Based on our long-term dataset, we postulate that variability of the LC has resulted in a regime shift in offshore and oceanic planktonic food chains off central Western Australia.

Windfarms and birdlife

Mapping the sensitivity of Australia's Avifauna to renewable energy infrastructure: A vital first step in achieving a nature-safe energy transition

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Australia aims to achieve 82% of its electricity generation from renewable sources by 2030. This will require a considerable expansion of utility-scale wind and solar, as well as an associated increase in powerlines. This is infrastructure that could have a significant impact on Australian Avifauna if sited inappropriately. It is therefore vital that the country's renewable energy transition is based on a clear understanding of where sensitive bird populations occur. BirdLife International and its national partner, BirdLife Australia, have developed a series of detailed spatial assessments of avian sensitivity in relation to onshore wind, offshore wind, photovoltaic solar, overhead transmission lines and overhead distribution lines. These maps are intended to help guide the selection of sites where the impact on birds are likely to be minimal and ensure that highly sensitive areas are avoided. The maps will be made available publicly for the first time at this year's Australasian Ornithological Conference through an online platform called AVISTEP – the Avian Sensitivity Tool for Energy Planning (https://avistep.birdlife.org).This presentation will discuss the importance of spatial information to achieve a nature-safe energy transition in Australia, examine the datasets and methodologies used in the analysis and outline how the maps can be integrated into national and regional planning decisions.

Twenty years of raptor collisions in southeast Australia – Options for biodiversity-friendly wind energy

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Raptors are particularly vulnerable to collisions with wind turbines. In southeast Australia, Brown Falcons, Nankeen Kestrels, and Wedge-tailed Eagles (WTE) account for a significant proportion of all recorded bird fatalities. For WTEs, the impact is substantial—estimated at one death per year for every 2–5 turbines. While post-construction fatality monitoring methods are generally effective at detecting large carcasses such as eagles, smaller raptors often go undetected, and monitoring does not cover all turbines. Emerging evidence suggests that turbine development across western Victoria overlaps with a traditional WTE songline, indicating that high eagle fatality rates are likely to persist without meaningful mitigation. Yet, current mitigation requirements apply only to species protected under the EPBC Act or state legislation—leaving some vulnerable species unprotected. The Wedge-tailed Eagle, known as Bunjil to the Wadawurrung where I am from, holds deep cultural significance as a creator being. In Tasmania, where WTEs are listed as a subspecies and protected under the EPBC Act, turbine operators have installed mitigation technologies such as Identiflight—an automated detection and curtailment system that identifies WTEs, predicts flight paths, and initiates turbine shutdowns to avoid collisions. Globally, there is also increasing interest in blade marking as a strategy to enhance turbine visibility to raptors, with promising results for reducing avian collisions without compromising energy output. This presentation will examine two decades of raptor mortality data from southeastern Australia, highlighting the species most at risk. It will also review current and emerging strategies to reduce turbine-related

fatalities and discuss the potential for more biodiversity- and culturally informed wind energy development in Australia.

Towards a green-green future – mitigating wind turbine impacts on bird populations

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Wind energy represents Australia's main renewable energy source towards meeting net zero emission commitments by 2050. Wind energy currently provides ~13% of Australia's total energy demands (previous 12 months), but this value is increasing rapidly. In 2023, 121 wind farms were operating or under construction around the country, but an additional 188 had been proposed, representing a 12-fold increase over current wind energy generation. Over the last 20 years, turbine hub height has near-doubled (1.8-fold increase), while blade length has increased by 2.3-fold and rotor swept area by 5.3-fold. These larger turbines also have greater momentum. All these factors are significant considerations for mitigating turbine strike. We review evidence for potential methods to mitigate turbine strike in birds – including curtailment, informed shut-down, and deterrent approaches. We discuss detection distance required for smart curtailment approaches (using radar, camera, and acoustic detection methods) compared with flight speeds of Australian bird species, and discuss these in the context of turbine size. We also examine the effectiveness of visual deterrents for birds, given the turbine blade speeds for modern turbines. This review proposes options to mitigate biodiversity impacts for the dynamic and rapidly changing Australian wind industry.

Colony-specific at-sea distribution of Short-tailed Shearwaters: Implications for offshore renewable energy risk assessments

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As offshore wind energy developments advance in south-eastern Australia, robust data on seabird movements are essential for understanding potential risks during critical life stages. The Short-tailed Shearwater (*Ardenna tenuirostris*), Australia's most abundant seabirds, is a focal species due to its extensive offshore foraging during the breeding season. In this study, we used GPS tracking to investigate the at-sea distribution of breeding individuals from a colony in western Bass Strait, a region for which little contemporary movement data has been available. The tracking data revealed foraging patterns that differed from those predicted by previous studies conducted elsewhere in south-eastern Australia, with individuals primarily using areas farther west and south than expected. Notably, there was no spatial overlap between the tracked foraging areas and proposed offshore wind farm zones in Bass Strait. This finding highlights the value of colony-specific tracking data for improving the accuracy of risk assessments. Short-tailed Shearwaters are known to exhibit colony-specific foraging strategies, and this study reinforces the importance of capturing ecological variation across multiple breeding sites. Reliance on data from a limited number of colonies risks overlooking key spatial patterns and could lead to either over- or underestimating potential risks from offshore developments. Our results demonstrate that while current wind energy proposals may pose limited direct risk to this colony, broader regional assessments require coordinated tracking efforts across the species' range. Integrating fine-scale movement data into marine spatial planning will be essential to ensure that renewable energy initiatives proceed with minimal impact on sensitive seabird population

How high do they fly? Bird radar reveals important data on bird flight heights

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A major challenge for predicting the potential impacts of wind turbines is understanding bird flight height. This data is vital for identifying species that are at risk of collision strike and are a critical part of mathematical collision risk models. To date, most flight height data has come from estimates based on visual observations, which has principally only been done for large, obvious bird species, relies on the skills and experience of the observer(s), and is dependent on

logistical constraints such as road access (and therefore proximity to the bird observed). The accuracy of such data cannot be independently verified. A second approach has been to use high-resolution GPS-tracking data to identify height above the ground (subtracting bird height from digital elevation model data), which has animal welfare implications and also incurs a suite of potential errors. Bird radar offers an alternative approach. We have used two Robin Radar MAX® x-band radar systems to map bird activity and quantify flight heights for bird species present at a proposed wind farm in the Pilbara, Western Australia. This reveals important data on flight heights for birds of all size ranges. Comparison with visual observation and audio recording has allowed species identification for a subset of these radar traces. The radar reveals differences in flight behaviour, allowing 3D reconstruction of flight trajectories that will also inform collision risk modelling. These methods provide quantitation of flight height data, moving us towards a more scientific approach to predicting impacts of wind turbines on bird species.

Bridging the Data Gap: Seabird Flight Heights from Digital Aerial Surveys for Offshore Wind Assessment

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Offshore wind energy is set to play a pivotal role in Australia's pathway to net zero emissions by 2050. However, the risk of seabird collisions with turbines is a key environmental concern. Limited baseline data creates significant uncertainty in assessments, increasing consenting risks and presenting challenges for regulators and developers in demonstrating that potential impacts are adequately assessed and managed. This presentation introduces a novel method for estimating seabird flight heights using Digital Aerial Survey (DAS) footage. Ultra-high-definition video is collected from altitudes >500 m, minimising disturbance and enabling efficient capture of species abundance, distribution, and behaviour over large areas. Flight height is estimated using Advanced Photogrammetry, based on the principle that birds closer to the camera appear larger. By comparing body lengths of flying birds captured across multiple video frames to a reference dataset of individuals flying at the sea surface, identified by their reflections, flight height is calculated using simple geometry principles. To address variation in body size and sampling uncertainty, a bootstrap process generates sample-level flight height distributions suitable for collision risk modelling. The proportion of birds at collision risk height calculated using this method are within 2% of the LiDAR-confirmed estimates, even at small sample sizes. This method provides a cost-effective way to generate key flight height data at scale, without the need for additional sensors. For Australia, it offers a practical tool to fill critical knowledge gaps and support timely, evidence-based environmental approvals for offshore wind development.

Assessing the cumulative risk of offshore wind farm developments to Australian migratory bird species

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Offshore renewable energy generation is expanding rapidly globally. In Australia, the federal government has recently declared 6 priority areas for offshore wind development. Although offshore wind farms have the potential to support substantial new renewable generation capacity that will help achieve Australia's net zero targets, they create new risks to marine and migratory species that need to be considered in decision-making. To properly assess the impact of offshore wind farms on these species in the context of existing pressures, a cumulative risk assessment is required, however cumulative risk approaches have not yet been developed for Australian species. In this talk, I will outline a proposed approach to develop a cumulative, probabilistic risk assessment that is being delivered as part of the NESP Marine and Coastal Hub. During the talk, I will present the overall risk framework for the assessment, as well as the specific considerations for bird movement, the novel modelling challenges these present, and a proposed modelling solution. I will illustrate the proposed approach using examples of shorebird species that migrate across Bass Strait.

Skytrap: Surveying free flying birds using a motion based high speed camera trap

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Most camera traps are unable to capture birds flying past due to their slow trigger speed and reliance on infrared detection. There is a need for more readily accessible methods that record data from undisturbed free flying birds and that allow for unattended deployment. This study introduces an inexpensive high speed camera trap that detects birds faster than conventional passive infrared-based camera traps and then captures high frame-rate video of their passing motion. It captures more observations than conventional camera traps and generates less empty video than continuous recording. Cameras were deployed at multiple locations birds are known to reliably occur or have predictable flight behaviour. Long term installations and short 30-minute surveys were used. Depending on access and topography, the cameras were positioned for either a lateral or ventral view. Height, flight characteristics, species and other attributes were extracted from the videos using OpenCV based image processing. The camera system and data processing approach offers a new continuous machine-based observation method for surveying species and capturing flight observations. Skytrap has potential applications in species surveys, augmenting acoustic surveys and flight height surveys for wind energy projects. It is hoped that subsequent studies will include larger scale and longer-term deployments in support of conservation objectives.

Predicting flight speeds to mitigate potential wind turbine strike in an endangered bird using wing morphology and wind data

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In pursuit of the 2050 zero-emissions targets, wind power has emerged as an alternative to energy generation from fossil fuels. However, the rapid expansion of wind energy has increased mortality of flying vertebrates through turbine strike, and this is of particular concern for species that are endangered or have slow intrinsic rates of increase. Collision risk modelling can be used to predict turbine strike risks but requires species-specific information on flying speed and height. These are non-trivial measurements as in the absence of direct flight observation under varying environmental conditions, or indirect observation collated from fine scaled GPS tracking data, actual flight heights, flight speeds or flight speed distributions are rarely known. We have used a mechanistic model based on wing morphology to predict flight speed in Carnaby's Cockatoos (*Zanda latirostris*) and assessed the quality of these predictions using data from GPS tracking of these birds. The GPS records were also used to train a set of linear models predicting flight speed under a range of wind conditions. Recent studies have shown that flight speed, aerodynamic ability and therefore avoidance behaviour significantly affect turbine collision rates, underscoring the importance of improving flight speed estimations. This research deepens our understanding of Carnaby's cockatoo flight behaviour at a time when a significant part of the species range will be occupied by proposed future wind farm developments and provides a valuable contribution to the evolving understanding of avian flight models and their role in avian collision risk modelling.

Environmental impact assessments underestimate the presence of migratory birds at half of wind farm developments in eastern Australia

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Accurately determining the likelihood of occurrence of threatened species at development sites is critical for effective impact assessments and conservation planning. However, current survey guidelines often rely on overlaying development sites with species distribution maps with limited spatial and temporal resolution. For migratory species, which may only be present for brief periods each year, mistimed surveys can lead to underestimation of risks. We evaluated the temporal alignment of impact assessment surveys with migratory birds' seasonal patterns of presence across 70 wind farm developments in eastern Australia, and investigated how survey timing influenced reported

likelihood of occurrence in the impact assessments. Using seasonal relative abundance patterns modelled from citizen science (eBird) observations, we classified surveys as optimal, suboptimal, or poorly timed for four focal migratory species. We found that approximately half of the surveys were suboptimally or poorly timed for long-distance migrants, with a quarter overlooking species' potential presence almost entirely. Supporting the reliability of our approach, about three-quarters of all migratory bird observations fell within optimal window, or within suboptimal window when no survey in optimal window was conducted. Reported likelihood of occurrence were significantly lower at sites with suboptimal or poorly timed surveys compared to those with optimal timing, suggesting that poor survey timing can lead to systematic underestimation of species presence. These findings suggest that current approaches to surveying migratory birds at windfarm developments in Australia are insufficient, and underscore the importance of aligning survey timing with periods of peak species activity to ensure reliable biodiversity assessments.

Flying blind: gaps and opportunities in baseline avian collision data for Australian transmission infrastructure

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The expansion of transmission infrastructure is a critical component of Australia's renewable energy transition, yet its impact on avian populations remains poorly understood. Birds are at risk of collisions with transmission lines and other static infrastructure, but comprehensive baseline data on these interactions in Australia are scarce. This study reviews existing research on avian collision risks associated with transmission lines, identifying knowledge gaps and opportunities for improving risk assessments and mitigation strategies. While international studies highlight species-specific, environmental, and infrastructure-related factors influencing collision risk, the Australian context remains under-researched, with limited long-term studies and inconsistent monitoring methodologies. The absence of standardised data collection frameworks hinders robust impact assessments and evidence-based planning. Addressing these gaps requires systematic monitoring, the application of emerging technologies such as machine learning, AI, radar and GPS tracking, and an expansion of research into high-risk species and habitats. By improving baseline data availability and quality, the renewable energy sector can better integrate biodiversity considerations into infrastructure planning, ensuring that Australia's transition to renewable energy aligns with national nature positive objectives.

A global perspective on wind farms and bird interactions

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This talk will draw on our experience working on wind farms and birds globally to provide a review of issues, approaches and findings relevant to birds and the wind industry in Australia. We will cover both onshore and offshore environments, drawing on relevant project examples from Africa, Europe, Central and South-east Asia. We will particularly consider how different bird groups are being surveyed and impacts assessed, including the use (or not) of Collision Risk Modelling, the impacts on birds and how developers and jurisdictions are dealing with uncertainty. For onshore, where the suite of high-risk bird taxa in Australia is broadly similar to other parts of the world (e.g. raptors, large waterbirds, aerial foragers), this will focus on impact assessment methods, how predictions match reality and the options for effective mitigation. For offshore, we will particularly focus on our experiences in the North Sea, covering survey methods, predicted versus realised impacts and how this knowledge may inform impact assessment and mitigation approaches in Australia, where Procellarids, which are largely absent in the North Sea, dominate. We will end with a set of recommended areas for research and policy which could best support the sympathetic development of the wind industry in Australia.

Recent advances in Australasian shorebird science

High site fidelity in Australian Pied Oystercatchers – a story of tracking, tides and déjà vu

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Gaining insight into fine-scale foraging behaviour is key to understanding how coastal shorebirds interact with their environment and respond to changing conditions. This study used miniaturized GPS tracking devices to investigate the spatial and temporal foraging patterns of the Australian Pied Oystercatcher (*Haematopus longirostris*) in Western Port, Victoria. Devices were deployed on adult individuals during the non-breeding season of 2024–2025 to examine site fidelity, diel activity, and individual foraging strategies. Tracking data revealed strong individual-specific foraging site preferences, with birds repeatedly returning to the same intertidal locations over several weeks. This high degree of site fidelity and behavioural repeatability suggests that individuals maintain consistent foraging territories, both during the day and at night. The consistent nocturnal foraging and individualized space use highlight the behavioural flexibility and resilience of Australian Pied Oystercatchers at the population level. Because individuals use distinct and often non-overlapping foraging areas, small-scale habitat disruptions are less likely to affect the entire population simultaneously. These findings emphasize the value of high-resolution tracking for uncovering hidden aspects of shorebird ecology. By identifying both temporal and spatial dimensions of habitat use, this research provides critical context for conservation planning in Australia, where habitat pressures are intensifying. Protecting a diverse mosaic of intertidal areas will support the continued ecological resilience of this iconic resident species.

Continental scale spatial analyses reveal the landscape predictors of shorebird abundance, diversity and richness

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Many species of migratory shorebird within the East-Asian Australasian Flyway are declining in number. This is largely attributed to staging habitat loss near the Yellow Sea, however spatially heterogenous patterns of decline within Australia suggest that threats in non-breeding habitat are also important. Estuaries are complex, interconnected systems of habitat types and nutrient flows; it follows that characteristics of an entire estuary may limit shorebirds, not just features of the local roosting and foraging sites. The characteristics of good high-tide roosts and foraging grounds are well defined, however less is known about landscape scale spatial patterns, or why some estuaries exhibit greater shorebird diversity than others. This study combined shorebird counts and remotely sensed habitat data to evaluate spatial patterns of shorebird diversity across select coastal estuaries in Australia. Shorebird assemblages were quantified using 10 years of structured survey data from BirdLife Australia's Migratory Shorebird Program. Estuaries were characterised open-source, remotely sensed data, considering attributes including vegetation, geomorphology, climate, and spatial heterogeneity. Statistical modelling was used to evaluate the importance of these characteristics for shorebirds. This talk will highlight the spatial patterns of shorebird diversity and abundance across estuaries in Australia and disentangle which landscape scale characteristics are most relevant for shorebirds. Shorebirds rely on estuarine environments, hence estuarine-level conservation strategies may be more appropriate than focusing on single roosting or foraging sites. Understanding the landscape characteristics important for shorebirds is essential in informing the development of targeted management actions.

The Journey of Ponyo Snipe

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In order to adequately conserve species under international and local conservation agreements, and to ensure that appropriate management activities are being applied, a sound knowledge of bird behaviour and habitat use is paramount. It is often the case with migratory shorebirds that this information is unavailable or incomplete. Tracking is

a useful method to understand movement and migration, notwithstanding the challenges. We undertook tracking studies of Latham's Snipe (*Gallinago hardwickii*), a cryptic migratory wader that breeds in Japan and spends its non-breeding season in Australia. Although protected by Australian and International legislation, only eight of 60 important sites are offered some kind of protection in Australia and their breeding grounds in Japan are also under threat. Research on Latham's Snipe is therefore critical to better understand the species in order to protect them. They are still relatively little known in the published literature, particularly knowledge of migration routes, stopover sites and their characteristics especially in Australia. To help fill this knowledge gap, we affixed Druid GPS NANO devices at Jerrabomberra Wetlands in Canberra ACT over two seasons and received full migration data from four birds for the 2022-23 and 2023-24 seasons with an accuracy down to 5m. This provided us with the opportunity to investigate routes, stop-over sites, and breeding sites in both Russia and Japan and to gain an insight into habitat use including proximity to urban areas. We present the detailed journey of one of our tracked birds - Ponyo Snipe, from Australia to Japan and back.

Double-banded Plover migration patterns: embarking on a resighting project together

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Double-banded Plovers/Banded Dotterels (*Anarhynchus bicinctus*) exhibit a diverse range of seasonal migration habits, from remaining in their breeding area in New Zealand throughout the winter, to migrating across the Tasman Sea to Australia or New Caledonia. Widespread colour banding and resighting work in the 1980s by the Banded Dotterel Study Group (BDSG) and the Victoria Wader Study Group (VWSG) revealed varying patterns of movement by different breeding populations around New Zealand. This ground-breaking work still forms the basis of our understanding of migration in Double-banded Plovers. However, fifty years on, conditions faced by the species have changed, and evidence suggests that Banded Dotterel migration behaviour may also be changing. A collaboration between the Department of Conservation and the Department of Ornithology at the Max Planck Institute for Biological Intelligence now aims to extend the early research and investigate the current migration patterns of the species. The study combines large-scale colour-banding with state-of-the-art satellite tracking to map flyways and key wintering sites used by double-banded plovers throughout their annual cycle. The Banded Dotterel Flyways Project began colour banding in the 2020 breeding season and is now calling for public engagement in expanding re-sighting efforts. This presentation introduces the project, shares re-sighting data gathered so far, touches on the project's value in the context of the conservation of one of New Zealand's highly mobile terrestrial species, and explains how you can be involved

Stable isotopes reveal plasticity in plant basal nutrients of shorebird food chains across spatial scales

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Migratory shorebirds are heavily reliant upon coastal environments to meet their life history needs. It is well known that these birds often forage in mudflats consuming inter-tidal invertebrates, but from which habitats these invertebrates derive their own nutritional sources is less known. With increasing engineering interest in altering coastal environments to make them more resilient to erosion and economical interest in using them to store carbon, understanding how different inter-tidal habitats contribute to the shorebird food chain is essential to future proofing this highly threatened avian taxon. This study identified the primary producers underpinning shorebird food chains. We quantified among- and within-species variation in basal nutrition in two threatened migratory shorebird species, the Bar-tailed Godwit, *Limosa lapponica*, and the Curlew Sandpiper, *Calidris ferruginea*, at three sites of international significance – two sites on Australia's west coast, and a third on the east coast. We measured the δ15N and δ13C isotopic composition of each shorebird species and the dominant primary producers at each location. In some sites, benthic organic matter from mudflats was the top contributor to the birds' nutrition, highlighting the value of this poorly protected habitat type for protecting shorebirds. Other highly contributing primary producers to shorebird nutrition included mangroves at one west coast site, and saltmarsh and mangroves at the east coast site. This pattern of

results suggests that shorebirds and their invertebrate prey likely show dietary plasticity at differing spatial scales, indicating that local-scale analyses are critical to revealing the dominant habitats that support shorebird food chains.

Diet of the Western Hooded Plover (*Thinornis tregellasi*) in a coastal environment: insights from DNA metabarcoding

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Understanding the diet and prey resources of beach-nesting shorebirds is crucial for the long-term conservation and management of these species. Such baseline information supports seasonal management of breeding and foraging areas and helps build community awareness of shorebirds' dependence on beach habitats for survival. This study, conducted over two breeding seasons, is the first to confirm the diet of the Western Hooded Plover (*Thinornis cucullatus tregellasi*) in a coastal population, and the first to apply DNA metabarcoding of scat samples and digiscoping of foraging behaviour in this subspecies. Previously, dietary information was limited to salt lake populations, while data for the Eastern Hooded Plover (*T. c. cucullatus*) were derived from morphological scat analysis. DNA metabarcoding revealed a highly diverse diet, comprising 92 invertebrate species across 19 genera. Amphipods, dipteran flies, coleopteran beetles, and isopods were the most frequently consumed taxa, with one-third of prey items being marine species. While digiscoping offered lower taxonomic resolution, it provided valuable insights into foraging behaviour and prey acquisition. Some beach-collected scat samples contained only amphipods and dipteran flies, both closely associated with kelp wrack. These findings underscore the ecological importance of wrack retention on beaches and highlight the critical connection between coastal shorebirds and the health of adjacent marine environments.

Tracking the endangered Australian Painted-snipe to guide conservation

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The Australian Painted-snipe (APS) is our nation's most threatened resident shorebird, considered globally endangered, and among the most poorly known wetland bird species in the world. To gain ecological insights and guide conservation efforts, we established a crowd-funded tracking project. This has been successful in engaging the birdwatching and wetland management communities, through naming rights, a dedicated website, presentations, social and conventional media, and by eliciting sightings. To date, we have caught seven birds from two of the three sites of highest abundance nationally, and used satellite and GSM tags. The capture sites contained dawn and dusk foraging areas of receding floodwater on wheat stubble, and burnt, grazed mudflats. Three birds showed a distinct north-northwest movement pattern in summer and autumn, moving up to 2253 km from the Lowbidgee to near Birdsville and Daly Waters, while a Macquarie Marshes bird flew to north QLD. Numerous stopovers occurred, highlighting the value of wetland networks. The tracking emphasised the importance of previously known APS wetlands (e.g. Goyder Lagoon) but revealed many new sites (e.g. Yancannia Creek), with unexpected dryland roosting recorded, up to 400 metres from the wetland edge. Targeted conservation plans are being developed with landholders at key wetlands revealed by the tracking, including the Lowbidgee and Macquarie Marshes sites, which have supported up to 25 and 12 birds, respectively, for up to four months and across two years. Among the conservation actions are targeted environmental water delivery, a 7.6 km predator-proof fence, and burning trials to create open foraging habitat.

Movement Ecology of migratory shorebirds in the Exmouth Gulf: updates from satellite tracking of Bar-tailed Godwits

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The Exmouth Gulf supports internationally significant numbers of four migratory shorebird species and meets federal significance criteria for shorebird diversity. In addition, the Gulf supports nationally significant numbers of Endangered Bar-tailed Godwits. Despite its significance to migratory shorebirds, little is known about the movement ecology of migratory shorebirds within the Exmouth Gulf. There is a research gap as to whether the Exmouth Gulf is used as a staging area for shorebirds moving further south in Western Australia, or if Exmouth Gulf shorebird populations overlap with those in other key shorebird areas (such as Eighty Mile Beach). In this project we captured migratory shorebirds in the Exmouth Gulf, with the aim of comparing the population connectivity and site fidelity of Exmouth Gulf birds with shorebirds captured elsewhere in Western Australia. To better understand the movements of migratory shorebirds within the Exmouth Gulf, we fitted ten Bar-tailed Godwits with PTT satellite trackers, and 274 migratory shorebirds of mixed species with engraved leg flags. Preliminary results suggest that Bar-tailed Godwits have a high level of site fidelity within the Exmouth Gulf; they do not appear to be using the Exmouth Gulf as a stop-over site on the way to or from other areas of Western Australia. On their northward migration to their breeding grounds in the Arctic Tundra, Exmouth Gulf Bar-tailed Godwits use similar migratory routes through the Yellow Sea to those of godwits tagged in other parts of northwest Western Australia. We discuss the conservation implications for high site fidelity of migratory shorebirds within the Exmouth Gulf.

Motus automated telemetry reveals new insights into nocturnal and low tide habitat use is coastal shorebirds

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Estuaries provide vital social, cultural, economic, and environmental services to human societies worldwide, including 19 million coastal Australians, but are among the most heavily used and threatened ecosystems. Australia's coastal estuaries support around 50 shorebird species, many of which have declined sharply in recent decades. Conserving these species depends on protecting and restoring habitats throughout their range, including estuaries. While shorebird use of high tide roosting sites is well documented—thanks to significant investment in daytime, high-tide surveys—habitats used at night and during low tides, when shorebirds disperse to forage, are less understood. These knowledge gaps limit effective adaptive land management. Our study aimed to address this by gathering strategic data on shorebird land use during low tide and at night in coastal estuarine landscapes. We deployed an array of eight Motus automated telemetry stations to quantify habitat use within the Hunter Estuary, including a Ramsar-listed wetland of international importance. The array includes the combinations of omnidirectional and directional antennas, which 'listen' 24/7 for pulses of individually encoded, high temporal resolution (~15s pulse interval) Lotek nanotags attached to shorebirds. Tidal and circadian cycles were superimposed on detection periods, and variations in signal strength were examined to distinguish resting from activity. This comparative dataset reveals for the first time how species use areas of a coastal estuary at night and while foraging. It establishes a foundation for research into habitat selection drivers, such as food resources and predation risks, and to further analyse shorebird responses to environmental change.

Documenting conservation action for shorebird conservation in the East Asian-Australasian Flyway

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Shorebird populations face global threats, with many species along the East Asian-Australasian Flyway under significant pressure from economic development and human population growth. Nevertheless, recent assessments indicate stabilisation in some previously declining populations, suggesting conservation efforts may be yielding results. However, the extent to which these trends stem from specific conservation actions remains unclear. While various

conservation efforts have been implemented across the flyway to mitigate their decline, these actions are often conducted without coordinated communication between countries or sites, leading to duplicated efforts or resources spent on ineffective trials. In this study, we combine a literature review of English and non-English-language literature and a survey with shorebird practitioners across countries to compile published and unpublished evidence on conservation strategies that support the long-term survival of migratory shorebirds along the flyway. We examine the discrepancies in the documentation of conservation actions across regions and literature type (peer-reviewed literature, non-scientific publications, and unpublished efforts). Our findings highlight the need for conservation evaluations to extend beyond published scientific literature and incorporate direct communications to provide a more comprehensive understanding of conservation outcomes.

Surviving the times: 50 years of migratory shorebird population dynamics on Australian coasts

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Shorebirds migrating through the East Asian-Australasian Flyway have experienced severe population declines, leading to concerns about long-term population viability. Globally, climate change threatens these species, with evidence that the changing climate is driving a trophic mismatch between shorebird migration arrival to their Arctic breeding grounds and rearing of chicks – thereby impinging on recruitment. Further south along their migration, shorebirds are significantly hindered by conversion of vital tidal mudflat habitats to land, having lost up to 65% of their habitat along parts of the East Asian coast. Understanding the demographic processes underpinning these declines is critical for conservation of these long-distance migrants, both in Australia and along the flyway. Here, we present survival analyses based on 50 years of banding and resighting data, largely collected by dedicated volunteers along Australia's coasts. Using mark-recapture models, we assess long-term survival trends across twelve species. Modelling this extensive dataset offers an indispensable opportunity to assess how these already struggling species are influenced by changing climate conditions and habitat availability. Our research provides crucial insights that may be used to inform adaptive management strategies of coastal wetland habitats.

Shape-shifting in relative wing length of juvenile shorebirds: no evidence of developmental temperatures driving morphological changes

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Morphological changes concurrent with climate change are increasingly identified in birds, often through decreasing body size and increasing appendage size. Such changes could have thermoregulatory implications, through the improved surface area to body ratio they provide. Due to the role of bird wings in thermoregulation, wing length relative to body mass may be changing as another form of shape-shifting, where increased relative wing length may facilitate increased heat loss as climates warm. We investigated changes in relative wing length on a dataset of nearly 20 000 juvenile shorebirds from 11 species over the past four decades, to determine changes in morphology and whether these are linked to developmental temperatures. Overall, across species, we found that relative wing length increased across the 43-year study period in populations migrating to tropical northern Australia but not in those migrating to temperate southern Australia. Furthermore, we found that changes in relative wing length were not driven by immediate responses to high temperature at the breeding ground during juvenile growth. These results may suggest that relative wing length increases occur in shorebirds occupying already warm climates, where they might potentially be more thermally challenged under further warming, but that such changes are not occurring through plastic mechanisms during development.

Coastal shorebirds delay maturity more than inland ones

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Delaying the age of first breeding will lower lifetime reproductive output unless compensated for by increased fecundity or survival. Yet, in many migratory shorebird species (Charadriiformes) individuals delay their first return migration to the breeding grounds until they are several years old. Using data from non-breeding and breeding season counts of shorebirds in the non-breeding areas, recaptures, and long-term banding studies, we assess age of first return migration (as a measure of maturity) for 37 shorebird species that have migrated to Australian non-breeding grounds. We provide a comparative analysis of the association between the measure of maturity and habitat use during the non-breeding period, contrasting coastal and inland wetland habitats. After controlling for latitudinal and phylogenetic covariates, we found a positive relationship between body size and the age of first return migration. However, there was a still stronger relationship with the type of non-breeding habitat used. Coastal shorebird species delayed maturity more than species that spend the non-breeding season in non-tidal inland wetlands. This finding expands on previously identified ecological and physiological differences between coastal and inland shorebirds and leads to questions on the environmental characteristics embodied in the habitat contrast. We propose that the complicated tidal dynamics and differences in prey make it more difficult to become an individually competent coastal (rather than inland freshwater) forager.

Do red foxes pose a predation risk to roosting shorebirds? Faecal DNA and camera trap analysis

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Shorebird populations have experienced dramatic population declines worldwide. Reasons for these declines are varied, but one largely understudied threat at migratory shorebird non-breeding grounds is predation by introduced predators. High-tide roosting shorebirds may be vulnerable to ground predation, as they roost in a spatially clumped and temporally predictable manner in areas easily accessible to ground predators. We measured predation risk by the introduced red fox (Vulpes vulpes) at high-tide roosts within 2 internationally important shorebird estuaries in New South Wales, Australia, during a time when non-breeding shorebird numbers were at their annual peak, using a combination of camera trapping and environmental DNA (eDNA). Here I will present the findings of our research and their implications for fox management at shorebird roost sites. Foxes were present at all study sites and were seen most frequently at sites encompassing the 2 largest high-tide roosts within the study estuaries, and least frequently nearest the roosts. Metabarcoding identified a broad range of avian taxa in fox scats collected at roosts, including ground-dwelling birds, native waterbirds, and introduced pigeons and doves, but no shorebird species. Bird prevalence in fox scats reached levels that far exceeded those reported in prior studies. Future studies should examine whether red foxes present a non-lethal, rather than lethal, predation threat to high-tide roosting shorebirds when feeding on other co-occurring food sources, potentially inducing energetically costly predator avoidance.

Research and Conservation of Australia's Threatened Birds

Threats to the recovery of the critically endangered Capricorn Yellow Chat (*Epthianura crocea macgregori*)

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The Capricorn Yellow Chat (CYC) is a critically endangered passerine endemic to the Capricorn Coast in Central

Queensland. As a small endemic bird with a population size of only ~250 individuals, CYCs are faced with a myriad of threats, including climate change and sea level rise, infrastructure development, and predation and habitat destruction by invasive species. Despite considerable research over the past three decades into the distribution and ecology of this elusive bird, the Queensland CYC Recovery Action Plan 2023-2033 highlights significant gaps in our understanding of the impact of threats such as invasive species and climate change on the behaviour, reproduction, and population viability of this species. Our project aims to investigate and quantify the impacts of these threats on the CYC, in order to improve and extend the current management practices in place to protect this species. Using artificial nest experiments and natural nest monitoring, we will identify the main predators of CYC nests and quantify the impacts of these predators on CYC reproductive success, whilst concurrently increasing our understanding of the breeding biology of this species. We will also assess the impacts of climate change, including increasingly high temperatures, on the behaviour and physiology of CYCs, using behavioural observations, habitat and vegetation monitoring, and collection of faecal samples. Findings from this research will significantly increase our understanding of the threats to the survival of this critically endangered species and will assist in developing more targeted and effective management practices to support its recovery.

An assessment of how accurately we are classifying the extinction risk of Australia's birds

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Our entire conservation and recovery system is driven by the extinction risk classification framework; whether a species receives conservation attention is fully dependent upon that species' extinction risk classification. Furthermore, the level of conservation attention a species receives is contingent on that classification; a species at greater risk of extinction will generally receive more funding and on-ground action than a species at lower risk of extinction. As the guiding framework for everyone working within the conservation ecosystem, from conservation policy-makers and decision-makers, through to researchers and on-ground managers, confidence in this risk classification system is imperative. But what if that framework is not as robust as we think? Our analysis of the risk assessments for Australia’s birds over the past three assessment cycles (2000, 2010, and 2020), has revealed some worrying trends. Based on the results of the 2020 assessment, in both 2000 and 2010, around 35% of assessments were incorrect. Of course, there are errors in two directions – some species are over-classified while others are under-classified – and there are a variety of reasons for these misclassifications. In this presentation we look at some of the reasons for these misclassifications, examine some of the patterns revealed by our analysis, and discuss some of the ways the classification process could be improved.

New insights into Eastern Bristlebird song culture and conservation applications

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Little is known about the acoustic ecology of many threatened bird species, yet a deeper understanding could improve conservation management. In particular, evidence-based management of cultural traits like song – which mediate conspecific interactions and fitness outcomes for some birds – may improve the efficacy of conservation strategies. The Eastern Bristlebird is an endangered, semi-flightless songbird confined to three small, disjunct regions along Australia’s east coast. The species is especially sensitive to extirpation by wildfire and has undergone three conservation translocations over the past two decades to establish new populations and so reduce its risk of extinction. We present the first study of the Eastern Bristlebird’s loud, distinctive song. We quantify the singing behaviour, song structure, and song-type diversity of Eastern Bristlebirds in the most stable population of the species: Bherwerre Peninsula, Jervis Bay – immediately before the removal of individuals for translocation. Our investigation of geographic variation in song sharing revealed dialect separation between geographically distinct groups of individuals, which may partially be explained by the fragmentation of the species coastal heathland habitat. Our study provides an important baseline for investigating the impact of translocations on the cultural evolution and diversity of Eastern Bristlebird song. Translocations provide rare quasi-experimental opportunities to investigate how disturbance influences animal cultures, understand fundamental questions about the evolution and ecology of animal cultures, and incorporate animal cultures into conservation frameworks. Our study represents the first step towards developing new strategies to preserve cultural diversity alongside genetic diversity in future conservation management actions for this

endangered songbird species.

Conserving song culture in the critically endangered Regent Honeyeater (*Anthochaera phrygia*)

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Like other songbirds, the critically endangered Regent Honeyeater learns it's song at a young age through interactions with conspecifics. However, due to severe declines in density resulting from a population crash over the last half century, young birds often lack crucial interactions with song tutors, causing them to learn abnormal songs which could impede their ability to attract a mate. In an attempt to improve their breeding success in the wild, the Taronga Conservation Society now tutors their breed-for-release juvenile regent honeyeaters with a typical wild song. The release of tutored zoo-bred birds may have the added effect of stabilising the song culture in the wild, a crucial step towards arresting the catastrophic population declines which have the regent honeyeater on course for imminent extinction.

Factors affecting habitat occupancy of the Vulnerable Glossy Black-Cockatoo in south-east Queensland

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The south-eastern subspecies of the Glossy Black-Cockatoo is an Australian endemic with a highly specialised diet and has recently been listed as Vulnerable nationally. This listing was based on ongoing declines in the species' populations, and these were exacerbated by the 2019/2020 bushfires that affected large parts of the species' range in eastern Australia. Gaining a better understanding of how the Glossy Black-Cockatoo utilises the landscape is important for monitoring trends in populations, but also to better understand how the species responds to threats. We completed habitat assessments combined with acoustic surveys to assess the occupancy of the Glossy Black-Cockatoo at 97 randomly stratified sites throughout south-east Queensland. Unsurprisingly, recorders deployed at sites for at least one week detected birds from a greater number of sites (~33%) than any visual / feeding sign encounters (~10%) during surveys. We ran various occupancy models to test our hypotheses that occupancy of sites was predicted by both local site-level, as well as landscape-level predictors. Site-level predictors included features of the habitat condition and forage quality, e.g. she-oak density, tree size, cone availability and quality, while landscape-level factors within a 2km buffer around each site included the extent and connectivity of feeding habitat, fire regimes, geology and rainfall. In this talk I will discuss the key predictors of Glossy Black-Cockatoo occupancy and the implications for recovery of the species.

A review of the potential population trajectory and research needs of Letter-winged Kite

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The Letter-winged Kite is one of Australia's least-known birds, with an unusual ecology; a raptor that is nocturnal, colonial, and irruptive. They are consistently found within a relatively small area centred on south-west Queensland's Channel Country, but every now and then the population explodes, and during these irruptions they have been recorded from suburban Melbourne to Ashmore Reef. These unusual population dynamics, and a preference for some of the remotest parts of Australia make the Letter-winged Kite a very difficult species to understand. Occurrence

datasets suffer from extremely biased observer effort, meaning many of the usual approaches to assessing population trajectories are difficult. To try and understand the population dynamics of the Letter-winged Kite, we undertook an in-depth review of what is known about the species, what occurrence data exists, and tried to understand if there were indications that the population was trending in any particular direction. Here we present the results of that review, which points to the possibility that the species is in decline. More importantly, our research revealed some key research needs for this enigmatic species, an important step in trying to improve our understanding of its status and potential conservation requirements.

Optimising eDNA Detection Methods for the Critically Endangered Australasian Bittern

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Threatened species monitoring is integral to conservation efforts, yet traditional visual and acoustic survey methods often fail to detect cryptic and rare species. The recent emergence of Environmental DNA (eDNA) as a surveillance tool can reduce these limitations, using trace amounts of genetic material in the environment to confirm a species presence. For wetland taxa, eDNA facilitates large-scale surveys across waterbodies with minimal disturbance and effort, making it highly applicable for the critically endangered Australasian Bittern (*Botaurus poiciloptilus*), an elusive wetland bird with ~1300 individuals remaining. This study aimed to refine eDNA workflow protocols specific to detecting the presence of Australasian Bitterns in water samples. We collected water samples from 10 wetlands across Victoria, targeting sites of known presence and those including suitable habitat for the species. We developed and refined filtration and laboratory workflows to improve DNA yields from turbid water, common in Australasian Bittern habitats. We targeted four gene regions – 12S, 16S, ND2 and CO1, optimising PCR conditions for our water samples. We used a metabarcoding sequencing approach to identify Australasian Bitterns in water samples and other vertebrate taxa where present. Our research offers a complementary detection method to traditional Australasian Bittern survey methods. Implementation of our developed protocols will provide valuable statewide occurrence data for the Australasian Bittern, supplemented with vertebrate occurrence inventories at sampled wetlands. We demonstrated enhanced sensitivity for the species using our optimised filtering and extraction protocols supporting future application to monitor other high priority wetland species and faunal communities using this eDNA approach.

Feast or famine: the diet and habitat selection of the Black-throated Finch

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Effective conservation of the Endangered Black-throated Finch (southern) *(Poephila cincta cincta*) requires understanding its habitat and resource needs, particularly in semi-arid environments that experience seasonal fluctuations in food and water availability. A four-year study (2020–2024) in Queensland's Desert Uplands examined the finch's diet and habitat use through radio-tracking, colour banding, crop and faecal sampling and observational surveys. Findings indicate a strong preference for *Eucalyptus melanophloia* woodlands with high vegetation productivity, diverse native grasses, and minimal shrub and weed cover. Radio-tracking of 142 birds and 425 foraging observations revealed that the Black-throated Finch forages close to reliable water sources and exhibit a bimodal pattern, peaking in the early morning and late afternoon. DNA metabarcoding of crop and faecal samples identified 46 plant taxa, predominantly grasses, with a strong preference for three grass species that are rich in metabolisable energy and crude protein, and small, easily consumed seeds. As preferred grasses decline over the dry season, the black-throated finch diversifies its diet to more available grasses rather than traveling long distances for food. These results indicate that they employ a time minimization strategy that aims to maximise their energy intake and allow sufficient time for other activities. These findings emphasize the importance of local-scale habitat management to ensure stable food and water resources, which are critical for maintaining viable black-throated finch populations in the Desert Uplands.

Non-geographic call clustering in Australian Fairy Terns suggests populations connectivity and supports flexible playback use for conservation

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Understanding geographic variation in vocal signals can reveal population differentiation and inform conservation strategies. In this study, we analysed flight calls from Australian Fairy Terns (*Sternula nereis nereis*) across ten breeding colonies in South Australia and Western Australia to assess acoustic divergence between the two sub-populations (southern and western Australia) and evaluate the need for location-specific calls in conservation efforts. Although calls grouped into three different clusters, these did not align with geographic locations. This lack of vocal divergence suggests no reproductive isolation and implies potentially stronger connectivity between the populations than previously believed. Our findings also support the effective use of generic conspecific calls in conservation initiatives.

Genetic structure in a fragmented habitat: What Plains-wanderer population genetics reveal about isolation and connectivity

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Understanding genetic resilience is a central goal in conservation biology, particularly for species with restricted and declining populations. The endangered Plains-wanderer (*Pedionomus torquatus*) is a ground-dwelling bird endemic to the open plains of Australia. As the sole extant member of the family Pedionomidae, it represents over 40 million years of evolutionary history and is one of the worlds most evolutionary distinct birds. However, severe habitat loss and fragmentation have contributed to drastic population decline and the geographic isolation of the remaining populations. In this study, we assess the genetic diversity and population structure across the species' extant range. Contrary to expectations for a species with limited dispersal capacity, we found minimal population structuring and no genetic differentiations among regions. These findings suggest a near-panmictic population structure, despite known habitat fragmentation. We suggest this could be due to post-bottleneck recovery, undocumented stepping stone populations, or other unknown channels of connectivity. While our findings suggest that the population can be treated as one genetic unit, it also challenges our traditionally held notions on Plains-wanderer dispersal and connectivity.

Part of the 'forgotten flock': Western Bristlebird conservation in South West WA

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Western Bristlebirds were named part of BirdLife's 'forgotten flock', species that are on the edge of extinction but have not been a focus of conservation action or research compared to other threatened species. Historic land clearing, inappropriate fire regimes and introduced predators have all contributed to serious bristlebird population declines. Today, the remaining population strongholds exist between Two People's Bay Nature Reserve and Cheynes Beach area, and in Fitzgerald River National Park. Previous management action was focussed on habitat suitability and feral predator control. Efforts to continue monitoring the species has revealed how sensitive this species is to fire, and the recovery, if any, following major fire events. Here, we discuss what is currently known about this cryptic ground-dwelling species, some of the historical bushfire events in key population areas, what we currently know about the population status and how this knowledge has been used in formulating proposed conservation actions.

Western Hooded Plover Conservation: Empowering the southwest community

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In southwest Western Australia, we are lucky to share our shores with an incredible species, the Western Hooded Plover. The Hooded Plover breeding season overlaps with peak visitation (Spring and Summer), which means this species must overcome increasing human pressures, along with the growing impacts from weeds, pest animals and climate change. These threats to breeding success have led to a decline in the species. They rely on a dedicated network of volunteers, land managers and community members to help them survive. In this presentation, I will dive into the citizen science initiative that has significantly advanced our ecological understanding of the Western Hooded Plovers across the southwest coast extending from Dunsborough to Denmark. Trained citizen scientists and land managers collect critical data that deepens our knowledge of species ecology, threat assessment, and reproductive success. Data from newly banded individuals are yielding pivotal insights while resolving fundamental research questions regarding population dynamics and behavioural ecology. These findings collectively inform evidence-based management strategies for critical beach habitats and nesting site conservation.

Case study: Utilising two decades of research to inform habitat protection and a collaborative approach to fire management for the Endangered South-eastern Red-tailed Black Cockatoo (SeRtBC)

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The SeRtBC occurs in the border region of South Australia and Victoria as a single population of approximately 1400 individuals. The subspecies has a highly specialised diet, feeding almost entirely on seeds of two species of stringybark (*Eucalyptus baxteri* and *Eucalyptus arenacea*). On public land, planned burns have a temporary but prolonged (average of ten years post-fire) impact on stringybark food supply and thus fire management needs to be carefully managed. The recovery team has been successfully working in partnership with the Victorian state government using twenty years of research to inform fire management practices that ensure at least 85% of stringybark feeding habitat has not experienced crown scorch in any ten-year period. The impact of fire on habitat productivity has been known and managed for many years, but climate change is now shifting the goal posts. Wildfires are becoming more frequent and widespread and drought stress is causing widespread declines in stringybark seed supply, with recruitment of juvenile birds into the cockatoo population declining as a result. The SeRtBC recovery team continues to draw on research to inform adaptive management and a collaborative approach to fire management to give this cockatoo the best chance of survival into the future.

Coxen's Fig-Parrot: just missing, or extinct?

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No photos. No recorded calls. No accepted eBird records this century. Coxen’s Fig-Parrot is one of Australia’s most mysterious species, yet its known historical range overlaps with some of the most birded regions of Australia. And so, alongside Buff-breasted Button-quail, Cape Range Rufous Grasswren, and Tiwi Hooded Robin, it belongs to a small group of Australian birds that are probably best considered ‘missing’. The myth of a ‘missing’ species is often kept alive by a trickle of anecdotal reports, and Coxen’s Fig-Parrot is no different. Although there are no accepted sightings, it is still occasionally reported, giving hope to those who think it can be recovered. But as they say, the plural of anecdote is ‘anecdotes’, not ‘evidence’. Here, we examine the sightings record of Coxen’s Fig-Parrot in an effort to understand the possible plight of this mysterious bird. What is the evidence that it still exists? Conversely, does the

weight of evidence point to possible or even probable extinction? We also consider if there is anything that can be done to resolve this question, or is Coxen's Fig-Parrot destined to remain in conservation limbo until …….

Modelling Mallee futures: Managing threats for a priority bird community

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The mallee bird community of eastern Australia is a federally recognised threatened ecological community and has been designated a 'priority place' under the Threatened Species Action Plan 2022–2032. This unique assemblage of birds is increasingly imperilled by the combined impacts of altered fire regimes, legacy effects of historic pastoralism (including artificial waterpoints), vegetation degradation from feral herbivores, and habitat loss for agriculture. To support the conservation of this community, our research program is developing State and Transition Models (STMs) informed by expert elicitation and integrated with simulation software (ST-Sim). These models aim to capture the dynamics of key threats, their interactions, and potential outcomes under future climate scenarios and different management interventions (e.g. feral herbivore control, dam decommissioning, targeted revegetation). In this presentation, I will outline the modelling framework, highlight preliminary outputs, and discuss key challenges and opportunities encountered. I will also explore how this structured approach may be applied more broadly to guide conservation planning for other threatened ecological communities or taxonomic groups facing complex, multi-threat environments.

Djimaalap/Noisy Scrub-bird conservation and recovery: over 60 years and still overcoming challenges

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The recovery of Djimaalap/Noisy Scrub-bird has been one of the great conservation success stories in Western Australia. From around 100 birds in the years following rediscovery at Two Peoples Bay Nature Reserve, the population is now estimated at approximately 1,500 birds, largely due to proactive management of habitat and nearly 40 years of translocations. However, the species is still restricted to a small area of south coast WA, between Two Peoples Bay and Cheynes Beach. To increase the resilience of this unique songbird to bushfire and a drying climate, establishing a new, geographically distinct sub-population is a priority. This work has commenced in 2025, with source population monitoring completed in 2024. Here we share the results from this work and some of the improvements in site selection that have been incorporated to maximise the chances of success.

Rainfall immediately before and after fire influences long-term probability of occurrence for a rare, fire-sensitive passerine

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Attributes of fire regimes (e.g., fire frequency, severity, interval, and time since fire) can be important drivers of habitat suitability for many species in fire-prone environments. Comparatively little is known about how abiotic conditions at the time of fire may affect post-fire habitat quality (e.g. rainfall events, cumulative rainfall, occurrence of drought). We sought to establish whether the post-fire development of heathland habitat for the endangered Mallee Emu-wren is influenced by rainfall before or after most-recent fire. As secondary objectives, we aimed to a) identify the preferred fire-age of heathland vegetation for the mallee emu-wren and b) map the current distribution of potential habitat across a dynamic landscape (~270,000 ha) from which this species has been extirpated (Ngarkat Conservation Park in South

Australia). Using historic presence-only records (1990-2014), collected prior to the extirpation of the mallee emu-wren from much of its heathland habitat, we implemented a random-forest modelling approach to predict the distribution of habitat across our study region and to investigate interactions between time since fire and cumulative rainfall in the 12-months before and after fire. We demonstrate that rainfall prior to fire can have important and long-term consequences for habitat quality while providing timely insights about mallee emu-wren ecology and conservation management, a species which is the current focus of coordinated and large-scale conservation efforts by multiple organisations.

Recovering population of Glossy Black-Cockatoos on Kangaroo Island retains gene flow and genetic diversity despite isolation, fragmented habitat and recent fires

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Understanding genetic structure and diversity is critical to tracking the long-term potential of isolated island populations to persist, and their capacity to adapt to environmental change. We investigate the population genetics of the South Australian Glossy Black-Cockatoo, *Calyptorhynchus lathami halmaturinus*, that has been confined to Kangaroo Island for at least 60 years. Over that period, the population had declined to a few hundred individuals, before management allowed some recovery, but then suffered a major loss of habitat in the 2019-20 black summer bushfires. We analysed SNP data generated from pin feathers collected from 84 glossy black-cockatoo nestlings from across Kangaroo Island during two breeding seasons, focussing on population structure, genetic diversity, inbreeding and relatedness. Genetic differentiation between flock regions is statistically significant but very weak and there is sufficient movement of individuals for gene flow to occur across the population. We also conclude that the Kangaroo Island population has retained moderate levels of diversity and allelic richness. As expected from field observations, spatial autocorrelation confirms that there is stronger than random relatedness amongst nestlings in nesting clusters. A conservative estimate of Ne of 122 is above the 100 individuals sometimes suggested as the minimum required to avoid inbreeding depression in the short term.

Listening in the dark: Acoustic insights into Night Parrot roosting and habitat use

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During a baseline survey for a proposed development in Western Australia we identified a potential roost site for the elusive and nationally threatened Night Parrot (*Pezoporus occidentalis*). This prompted a follow-up survey to better understand the size and stability of the roost site. This survey was developed in collaboration with Night Parrot expert Dr Nicholas Leseberg. The follow up survey included a regional habitat assessment, the installation of a long-term acoustic recorder unit (ARU) at the roost site, listening surveys, and short-term deployment of a large array of 50 ARUs across potential roosting, foraging, dispersal, and watering habitats in the surrounding area.
These surveys provided direct observations of calling behaviour and an estimate of the number of birds at the roost site. The long-term ARU has confirmed Night Parrot persistence at the site over an 18-month period, offering insight into temporal patterns of presence and behaviour. The ARU data also provided insight into pre-sunset calling behaviour, identification of a second nearby roost site and a previously undocumented call type for Western Australia. With this data, we were able to produce a spatial 'heat map' of Night Parrot movement to better understand local habitat use and movement patterns. This work demonstrates the value of integrating traditional survey methods with passive acoustic monitoring techniques and spatial analysis to inform conservation planning and impact avoidance. The results contribute to the growing body of knowledge on Night Parrot ecology in Western Australia and highlights the importance of long-term monitoring surveys.

Monitoring Malleefowl and assessing the impact of feral predator management on population trends at multiple properties

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The Australian Wildlife Conservancy (AWC) manages over 30 properties and partnership areas across Australia, spanning more than 2% of the landmass and protecting 89% of native bird species. One of these is the Malleefowl *Leipoa ocellata*, a listed threatened species best known for the large and conspicuous mounds they build to incubate their eggs. Malleefowl are present at five AWC properties, four of which contain feral predator-free fenced areas (exclosures) from which introduced cats and foxes have been excluded. AWC works in partnership with the National Malleefowl Recovery Group and local chapters to monitor Malleefowl mound activity each year and document population trends. Regular nest mound activity surveys record breeding effort and can be used to investigate the impact of exclosures on extant threatened species, such as Malleefowl. Evidence of an effect of baiting for cats and foxes on Malleefowl mound activity is equivocal nationally. However, preliminary results from three AWC properties with Malleefowl populations that have known active nest mounds both within exclosures and in the surrounding unfenced landscape show that the number of mounds that were active each year was significantly higher in exclosure compared to adjacent unfenced areas. To further dig into this mound of evidence, AWC is planning to set up camera trap arrays to monitor Malleefowl activity and fledgling recruitment inside and outside of exclosures.

Spatial ecology of Christmas Island's threatened raptors

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Christmas Island is a small volcanic island in the Indian Ocean, approximately 1400km northwest of Australia and just 135km^2. In the last century, the habitat on Christmas Island has experienced substantial alteration. Over 25% of the island has been cleared for mining, and at times, super-colonies of the invasive yellow crazy ant have encompassed 25-30% of the island, subverting the island through ‘invasional meltdown’. Little is known about the ecology of Christmas Island’s two endemic apex predators, the Christmas Island Hawk-owl (*Ninox natalis*) and Christmas Island Goshawk (*Accipiter fasciatus natalis*). This impedes the effective conservation management of these threatened and ecologically important species. To address the challenges of conserving these apex predators on Christmas Island, this research has been collecting GPS tracking data for the raptors since June 2024. GPS fixes were recorded at 30-minute intervals for each individual for at least 14 days. Tracking data has been used to investigate territoriality and home range size for each species. Tracking data was also paired with fine-scale habitat variables to quantify habitat suitability and the relative importance of environmental variables. Results will inform the spatial targeting of habitat management on Christmas Island.

Nocturnal movements of Red-necked Stints in a suburban environment: implications for non-breeding habitat use and conservation of threatened shorebirds

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Understanding the fine-scale movements of migratory shorebirds during the non-breeding season is critical for effective conservation, particularly in complex coastal landscapes. In this study, we used miniaturised GPS devices to investigate the local movement patterns of the Red-necked Stints (Calidris ruficollis), a small migratory shorebird overwintering in Australia. Devices were deployed on 14 individuals from Western Port, Victoria, during the austral summer of 2024–2025 to track movements across tidal cycles, including nocturnal behaviour. A striking and unexpected finding was that most tagged individuals travelled almost every night to the Melbourne Eastern Treatment Plant (ETP), approximately 25-30 kilometres inland. These consistent nocturnal commutes suggest that the ETP plays

an important, previously undocumented role in the birds foraging in Western Port. However, it remains unclear whether the birds were using the site for nocturnal foraging or as a safer night roost. This study highlights the value of miniaturised tracking technology in uncovering hidden aspects of shorebird movement and behaviour, particularly movements that occur outside typical daytime observation hours. The results emphasize the importance of considering inland artificial wetlands, alongside coastal intertidal habitats, in conservation planning for migratory shorebirds. As habitat pressures from urban development and climate change increase, a more comprehensive understanding of how migratory shorebirds use the landscape will be crucial for informed management and protection of critical resources throughout the non-breeding season.

A conservation needs ladder to assess the true status of Australian birds

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Effective conservation requires knowing where species occur, the habitats they depend on, the threats they face, and how to mitigate those threats. In this talk, I present a ‘conservation needs ladder’—a diagnostic framework assessing the state of conservation knowledge and action for 187 of Australia’s most threatened bird taxa, using data derived from each species' text from the latest Action Plan for Australian Birds. The analysis reveals major knowledge gaps: 3 species lack basic data on habitat and location; 35 species face threats that remain poorly understood; and for 92 species, we do not yet know how to effectively mitigate known threats. These 130 species require urgent research attention. Of the remaining taxa, 22 are not receiving adequate conservation action, and 11 lack effective monitoring to track progress. Only 24 species have sufficient knowledge, active management, and monitoring in place to enable confident assessments of recovery. This framework highlights where research, management, and monitoring shortfalls lie and provides a clear guide for prioritising conservation investment and effort.

One lost and one found - a tale of two owls

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Barking and Masked Owls, the two large owls of SW WA, are recognised as Priority 3 in WA’s Threatened and Priority Fauna list: known from few locations and/or in urgent need of further surveys. Belated attention to this call for action has shown the Barking Owl to have likely slipped into extinction while the Masked Owl has successfully transitioned to exploit introduced mammals associated with human habitation and enterprise. Eight years of citizen science research has found Masked Owls to be relatively abundant and widespread in the Margaret River region and likely elsewhere in the SW where-ever breeding is enabled in large hollows of retained ancient trees in forest remnants while interspersed agricultural and periurban clearing offers suitable habitat and rodent prey for this perch and pounce hunter. However, this does mean high exposure to anticoagulant rodenticides. In contrast, searches on ground, in the literature and through calls for public assistance have failed to find any recent confirmed records of Barking Owls, with only been 10 verified sightings in the past 20 years. Perhaps they were more a woodland than forest species, impacted early by factors associated with clearing of the wheatbelt, including an inability to shift to introduced prey in this intensively modified landscape. Without sufficient genetic material we may never know whether the Barking Owl would qualify as a distinct taxon, as for many SW WA isolates that now include the Masked Owl.

Seabird Conservation

Foraging ecology of Little Penguins (kororā) from Pōhatu Bay, Banks Peninsula (Horomaka), New Zealand

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Recent monitoring of the kororā /Little Penguin (*Eudyptula minor*) colony at Pōhatu Bay, Banks Peninsula (Horomaka), New Zealand, has revealed more frequent starvation events and a continued decline in the population, despite ongoing terrestrial management efforts. This has raised concerns about potential marine-based threats affecting the colony and kororā in general. Furthermore, there has been limited research on their foraging distribution and habitat selection. To address these gaps, we tracked 44 individuals at sea during the 2023 and 2024 breeding seasons using GPS dive loggers. We then created species distribution models using Maxent to identify the key environmental variables influencing their foraging distribution. During pre-breeding and incubation, individuals took multi-day foraging trips, often traveling over 100 km south into the Canterbury Bight, although they stayed within 10 km of the shore despite the continental shelf being relatively wide. In contrast, during chick-rearing, they foraged within 20 km south/southeast of the colony, which is expected central-place foraging behaviour. Distance to coast was the most influential environmental predictor for explaining the marine spatial distribution of kororā during pre-breeding and incubation, while distance to colony was most important during guard and post-guard. The spatial distribution of kororā extended well beyond existing marine protection zones surrounding Horomaka. The findings from this study highlight potential gaps in spatial protection and provide a foundation for future assessments of how environmental change and current protection measures may affect their foraging success and population stability.

Marine heatwaves affect breeding, diet and population size but not body condition of a range-edge Little Penguin colony

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Two marine heatwaves (MHWs) have developed along the Western Australian coast in 1999 and 2011. The extreme MHW in 2011 has been shown to have long term effects on the marine ecosystem. However, there have been few studies on the impacts of the this MHW on seabirds, and no biological impacts related to the severe 1999 MHW have been reported. Using data from 1986 - 2019 we investigated the impacts of these events on the ecology of Little Penguins on Penguin Island, located in temperate waters off Western Australia. Breeding outcomes but not body condition were negatively impacted by the MHWs. Diet composition changed during and after the 2011 MHW, with Sandy Sprat *Hyperlophus vittatus*, the typical major prey component, replaced by Scaly Mackerel *Sardinella lemuru*, a tropical fish species. Using an open robust design analysis for a single season, across six years from 2007 – 2019, we found the population during the austral spring decreased by 80% following the 2011 MHW, and the density of distribution on the island changed in relation to their foraging habitat. Finally, more penguins died from starvation or novel protozoal parasitic infections in 2011 and 2012. We show that the timing of MHW with respect to the birds breeding stage, as well as the timing of the return to more normal oceanic conditions influences the longevity of the impact of MHWs.

Mapping the sensitivity of Australia's seabirds to offshore wind

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Offshore wind developments are crucial for meeting our renewable energy needs, but they also negatively impact wildlife. Birds are particularly sensitive to collision with wind turbines or displacement from preferred areas. As Australia supports a great many seabird species, many of which are globally threatened, we aim to facilitate the consideration of seabirds in energy planning. To do this, BirdLife International and BirdLife Australia have mapped avian sensitivity to offshore wind development in Australia to guide energy development to avoid the areas of greatest importance to sensitive species. For all regularly occurring seabird species, we calculated collision and displacement sensitivity scores, which included conservation status and annual adult survival to capture potential population implications. We developed methods for integrating information on seabird colonies, range maps, tracking data and at-sea observations to model marine distributions in both the breeding and non-breeding season. This includes distribution models based on foraging ranges around colonies and kernel density estimates from tracking locations. We incorporated Key Biodiversity Areas, Marine Protected Areas, static habitats and migration corridors for terrestrial birds. The results are 5x5km gridded maps of relative avian sensitivity to offshore presented on an interacted web platform that highlights key species, sites and habitats in each cell. These maps provide valuable resources for decision-makers, such as governments, developers, funders and non-governmental organisations, to limit wildlife impacts by incorporating biodiversity into planning and site choice. Overall, we recommend sensitivity mapping in advance of selecting locations for large-scale wind energy projects.

Australian Pelicans as biovectors of anthropogenic debris: Implications for seabird conservation and waste management

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Anthropogenic debris poses a significant threat to marine ecosystem health. Understanding the pathways through which debris accumulates in the marine environment is critical to informing effective mitigation and management. The negative impacts of debris on seabirds are well recognised, however, the extent to which seabirds themselves serve as potential vectors in the transportation of debris between terrestrial and marine systems remains poorly understood. We quantified anthropogenic debris within breeding and roosting habitats occupied by Australian Pelicans (*Pelecanus conspicillatus*) on two islands off the coast of Perth, Western Australia, and used GPS tracking data from twelve adult pelicans to investigate potential sources of debris. A total of 5,298 items of anthropogenic origin were collected, with densities reaching up to twelve items per square metre. The most prevalent items were glass fragments (94%), followed by plastics (2.6%) and elastomers from the butchery industry (1.9%). Tracking data revealed that pelicans foraged at five separate waste management facilities, some located over 80 km from breeding islands. These findings suggest that pelicans may act as biovectors, transporting debris from terrestrial waste management sites to coastal areas, contributing to the leakage of landfill waste into marine environments. Recognising the role of seabirds in redistributing anthropogenic debris is critical to enhancing our understanding of pollution pathways. Restricting bird access to waste facilities could be an effective conservation strategy to reduce debris transfer and mitigate risks to seabird colonies and coastal ecosystems.

Using the prey captured by breeding Crested Terns to assess availability of forage fish for another coastal meso-predator

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Digital photography of fish-carrying Crested Terns returning to colonies on Penguin Island, Western Australia. was used to monitor forage fish availability for threatened Little Penguins over four seasons. Crested Terns breeding on Penguin Island captured a wider range of prey (73 species) than recorded in other diet studies at colonies in southern Australia and South Africa. Blue Sprat (*Spratelloides robustus*) and Sandy Sprat (*Hyperlophus vittatus*) dominated the forage fish taken by the terns in 2021 and 2022 breeding seasons with Sardines (*Sardinops vagax*) and Anchovies

(*Engraulis australis*) becoming more common in 2023 and 2024. A recruitment event was recorded in Sandy Sprats in 2021 after a near record winter rainfall in the region. This was significant because Sandy Sprats are a critical resource for the Little Penguins during chick-rearing and were thought to have been unavailable in local waters since a marine heatwave event in 2011. Crested Terns selected the small-sized sprat species when feeding young chicks.

Alone in a vast ocean: uncovering patterns of genetic connectivity in a philopatric seabird

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Seabirds are one of the most threatened groups of birds, with half of all species showing global population declines. Although seabirds are typically highly vagile with large distribution ranges, they also exhibit natal philopatry and nest-site fidelity, and many seabird populations can show genetic structuring between colonies as a result. In the absence of sufficient genetic connectivity, colonies can be very susceptible to deleterious effects of inbreeding and genetic drift when impacted by stochastic events. As such, understanding the dispersal patterns of seabirds and the degree of genetic connectivity between colonies is essential for ongoing conservation efforts. Red-tailed Tropicbirds (*Phaethon rubricauda*) are pelagic seabirds that show a high degree of natal philopatry and nest-site fidelity to remote islands found throughout the Pacific and Indian Oceans. The extent of connectivity between colonies is poorly understood, particularly at a localised scale. In Australian waters, two populations are found on the east and west coasts, with presumably little connectivity between them, although this has never been thoroughly investigated. Here, we present results from a genetic study of five total colonies found off eastern Australia and one found in western Australia, answering the question of whether red-tailed tropicbirds should be considered a contiguous population across this area, or whether they should be treated as distinct management units. In the face of threats such as avian influenza and climate change, it is increasingly important to understand how a primarily philopatric species can maintain genetic connectivity between colonies and thus genetic diversity throughout its range.

Exploring the health of the Black Noddy of the Capricornia Cays

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A globally significant breeding population of the Black Noddy (*Anous minutus*) occurs in the Capricornia Cays of the southern Great Barrier Reef. This population has distinct characteristics that include a pronounced exodus at the culmination of the Austral summer breeding period and multiple mass mortality events in recent decades. The cause of die-off has not been determined. In order to assess this population, a monitoring program has been launched on Lady Elliot Island. This research is tracking the success and fidelity of breeding pairs while collecting body condition, haematology and blood serum chemistry data to establish baseline health reference ranges for this species. It is hypothesised that black noddy die-off in this region is linked to starvation events, and that birds may be impacted by food scarcity along migratory routes. To further explore the complexities of Black Noddy health, we are launching geolocators to track the winter migration of the black noddy for the first time. This data will be integral to understanding the full annual range of this population, and to measuring how shifting oceanic conditions across this range may impact health. We are also excited to contribute to global efforts to map seabird flyways and connectivity across our oceans.

Toward a National Seabird Colony Register: Unifying colony data to strengthen seabird conservation across Australia

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Seabird breeding colonies across Australia have been monitored through a patchwork of research efforts, agency surveys, and community programs. Until now, these data have remained fragmented, inconsistent, and difficult to access at a national scale. In 2025, BirdLife Australia commenced development of the National Seabird Colony Register — a consolidated, spatially explicit dataset of all known seabird breeding colonies across the country — funded by the Commonwealth Department of Climate Change, Energy, the Environment and Water. The Register brings together colony records from state and territory jurisdictions, researchers, online platforms (e.g. Birdata), and grey literature, with a focus on standardising attributes such as species, site boundaries, breeding activity, and data quality. Here, we will present early outcomes of the project and lessons learned from consolidating disparate data sources including resolving differences in methodology and demographic variables collected. This centralised and standardised Register will support guidance into future investment, inform conservation decisions, and enhance preparedness for future environmental change.

Science to the rescue: the ASAP (Artificial Sites for tAhiti Petrels) project and the fight to save the Tahiti Petrel

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Recent advances in the understanding of seabird biology and ecology have led to the development of two main active restoration methods: translocation (the transfer of chicks from a threatened source colony to a secure artificial site) and social attraction (using acoustic and olfactory cues). In New Caledonia, the Tahiti Petrel is declining as its habitat is increasingly impacted by mining. To support the species, creating artificial colonies using social attraction was identified as the most suitable solution. Translocation was not an option due to the lack of a viable source population. After three years of research on the species, an artificial colony was established in 2021 on the Koniambo massif, in partnership with IRD and Bird Conservation New Caledonia. The colony was set up in suitable habitat for the Tahiti Petrel and included artificial burrows, an automated sound system, predator control traps, and a predator-exclusion fence. Petrels were observed at the site just days after the system was activated, and thousands of visits have since been recorded, with breeding pairs gradually settling in. In 2024, the BCNC association resumed monitoring and confirmed the first recorded egg-laying event. This exceptional feat marks a world first for a species whose natural habitat has been severely degraded. These encouraging results represent a major step forward in ecological restoration in New Caledonia and will help maintain breeding populations of the Tahiti Petrel in mining areas once operations have ceased.

Hidden ‘food diaries’: stable isotopes across time and space reveal nuances in sooty shearwater diet

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Sooty shearwaters, or tītī, breed in New Zealand and other South Pacific countries and spend their non-breeding season in the Northern summer off the coast of Japan, California, and Alaska – a round trip of ~64,000 km. Like most seabirds, tītī face an uncertain future in our rapidly changing climate and populations are already showing signs of decreasing. Understanding the foraging ecology of tītī is important for the conservation of this species, and stable isotope analysis can shed light on dietary preferences and foraging locations. Few studies have explored tītī stable isotopes in the southern hemisphere, despite the criticality of the chick-provisioning period to the long-term survival of this species. This is the first study to present tītī feather and blood stable isotope analysis across 10 degrees of latitude in New Zealand. By accessing museum records, we are also able to present a novel timeseries of feather stable isotope data across the last century. These hidden ‘food diaries’ have revealed clear differences in dietary preferences between the North and South Islands of New Zealand, as well as stark differences in diet between adults, chicks during early chick-rearing, and chicks during late chick-rearing. Whilst interannual differences in diet were evident between contemporary sampling years, our long-term time series showed no apparent dietary shifts over time.

Our world-first results provide important insights into the resilience of tītī to climate change; and highlight the variable prey sources that need to be preserved throughout the breeding season to ensure the future of this species.

Restoration of native perennial vegetation increases Bridled Tern nesting density on a degraded coastal island

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Seabird populations have drastically declined since the 1950s, driven by threats at sea—such as overfishing and pollution—and on land, including invasive species, climate change, and habitat loss. Degradation of breeding habitat forces seabirds to relocate, which reduces their reproductive success. This is because seabirds have limited adaptability during their breeding season when they become central place foragers. One alarming trend is habitat desertification, particularly on coastal islands, which disproportionately affects species that depend on vegetation for nesting. Penguin Island, a small but significant seabird colony site in Western Australia, has undergone severe vegetation loss due to climate change, invasive weeds, and anthropogenic activities. This degradation has impacted bridled terns' nesting habitat. This study assessed whether restoration of native perennial vegetation on Penguin Island's northeast plateau could increase Bridled Tern (*Onychoprion anaethetus*) nesting density. From 2013 to 2016, techniques using brushing and hand-weeding were trialled, successfully re-establishing native plant cover. Nesting density served as the key indicator of habitat restoration success, reflecting not just vegetation recovery but actual use by the target species. This work demonstrates the value of habitat restoration and its ramifications.

Tracking Houtman Abrolhos seabirds to identify key foraging habitat: reassessing marine park spatial boundaries for targeted seabird conservation

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The Houtman Abrolhos (HA) Islands, Western Australia, have been identified as a Key Biodiversity Area that supports a unique mix of temperate and tropical species, resulting from the southward movement of species by the Leeuwin Current. These islands contain significant seabird colonies, including approximately 80% of Brown Noddy *Anous stolidus*, 40% of Sooty Tern *Onychoprion fuscata*, and all Lesser Noddy *Anous tenuirostris melanops* breeding populations found in Australia. This talk presents findings from GPS tracking of these species breeding on Pelsaert Island between 2018-2021, with 91 nano-GPS units successfully deployed, resulting in 282 completed foraging trips. Analysis of the kernel density estimation data revealed a strong southwest bias in foraging direction across all three species, with Brown Noddies also foraging in the northern sector. Foraging distance from breeding colonies ranged between 135 km (Lesser Noddy) to 220 km (Brown Noddy and Sooty Tern) and covered significant distances (324-644 km) per trip. Figures with foraging distribution and tracks are presented. Tracked foraging areas encompass the Houtman, Pelsaert and Geraldton sub-marine canyons which are ecologically important for localised productivity and aggregations of marine life. An adaptive management reassessment of the current spatial boundaries and zoning of the Abrolhos Marine Park (IUCN category VI), adjacent to the HA islands, is required to incorporate identified critical seabird habitat. Currently these 'hotspots', including Pelsaert and Geraldton Canyons, occur mostly in unprotected waters. A potential extension of the current south and west boundaries of the marine park is suggested in light of this new data.

The unseen contribution: Wildlife rescuers as sentinels and data providers in seabird research

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Wildlife rescuers often form the frontline of conservation efforts, particularly for marine avifauna. Frequently the first responders to seabirds washed ashore due to injury, illness, or environmental events, these dedicated individuals and organisations such as Western Australian Seabird Rescue unknowingly play a vital, yet often overlooked, role in scientific research. This presentation will explore their significant contributions to seabird research, highlighting their unique position in data collection and species monitoring. While scientists employ targeted surveys and tracking technologies, the vastness of coastlines, particularly in countries like Australia, presents a logistical challenge for comprehensive seabird monitoring. Wildlife carers, distributed along these extensive stretches, act as an invaluable early detection system. Their records of species, locations, and condition of rescued birds provide a geographically broad and temporally continuous dataset that complements traditional research methods. Furthermore, wildlife carers are often instrumental in the discovery of vagrant seabird species. These individuals, attuned to the local avifauna, are more likely to identify unusual or out-of-range birds that might otherwise go unnoticed by scientific surveys focused on resident populations. The detailed documentation can be crucial for confirming vagrancy events and understanding shifts in species distribution. This presentation will showcase examples of how data collected by wildlife rescue organisations has contributed to scientific understanding of seabird health, distribution, and the impacts of threats such as pollution, extreme weather events, and climate change. Recognising and integrating the contributions of wildlife rescuers is essential for a more comprehensive and responsive approach to understanding and protecting our vulnerable seabird populations.

What drives Lava Gull distribution patterns in the modern Galápagos Archipelago?

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Gulls are known scavengers, often using landfills, refuse areas and polluted waterways to forage, and as a result are sometimes classed as ‘pests’. However, they are undoubtedly an important part of many ecosystems, a role that can be overshadowed by their public reputation, ultimately impacting our approach to Larinae conservation status. This is particularly concerning when considering how to manage gull species or populations that may be under threat. The Galápagos Islands have provided an opportunity to study one such species, the Lava Gull (*Leucophaeus fuliginosus*), with a focus on how human settlement impacts population distribution and habitat use. Lava Gulls throughout the archipelago were captured and individually banded, in a citizen science project whereby re-sightings were documented and included data from local guides, eBird survey submissions and photo submissions from the public. This data was then compared with historical records from early settlement and expeditions in the 1900’s. Spatial mapping demonstrates that lava gull population distribution has significantly changed over time, with birds appearing to occupy only half of the number of islands as previously documented. The distribution of birds is now highly associated with human presence, in addition to the likely natural reliance on lagoonal areas, or fresh water sources. We also documented an age effect on home range, with adults holding territories in hotspot areas. Their overall population has remained unassessed since 2014, and drastic changes in the local human population and tourism over the last 20 years may be impacting their resilience to extinction.

Advancing the seabird monitoring toolkit: A machine-learning tool for estimating the abundance of tropical seabird communities in aerial imagery

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Drones enable the monitoring of seabird populations with greater precision and accuracy than ground-based methods. However, manually annotating and counting birds in aerial imagery remains time-consuming. Machine learning offers a solution, but existing models are often limited in scope. Such models are typically tailored to specific species or locations, requiring extensive manual input, and delivering outputs for only a subset of target species. We developed a

generalisable model for seabird monitoring across tropical islands globally. We trained the model using aerial imagery from seabird breeding islands in the Pacific and Indian Oceans, capturing variation in habitat and vegetation to ensure broad applicability. The model was then tested on previously unseen tropical islands, where it demonstrated high performance. This single model identified all our focal seabird species whilst also distinguishing adult and chick age classes. Compared to manual annotation, the model substantially reduces processing time, offering a more efficient method for quantifying seabird abundance. This advancement demonstrates machine learning tools can be transformed from narrow, single-use applications into a broadly applicable resource for seabird conservation. Our model represents a significant step forward in making drone-based monitoring practical and efficient for seabird practitioners working across diverse tropical island environments.

Pre-emptive translocation to save seabird lineages

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Many seabird populations and seabird species are threatened by climate change induced heat waves and prey population changes. Expansion of seabird breeding colonies away from the tropics, presumably to avoid climate change induced marine heatwaves, has been observed in multiple species. Current rates of movement are not keeping pace with climate induced changes and status quo conservation efforts are not expected to succeed in many locations. A radical rethink of conservation objectives by adopting lineages as units of conservation is needed. Using lineages as conservation units is a method that prioritises genes over geographic areas, ecosystems, ecological communities, or species. In this scenario, a concerted translocation of pre-fledged chicks from locations under pressure is proposed in an effort to either decommission failing colonies and preserve the genetic uniqueness of populations or provide insurance populations for species that are still common. Pre-emptive translocation to save seabird lineages is discussed in the context of “keeping common species common” and mainstreaming taxonomic translocations.

Visual ecology modelling and taste aversion learning to enable non-lethal intervention

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Nest failure is linked to the declining population of little terns, a coastal-dependent species that nests on beaches. Predation is a significant problem in this species, leading to egg losses and an increased risk of colony abandonment. Little Terns were recently listed under the Environmental Protection and Biodiversity Conservation (EPBC) Act. This project aims to utilise recent technological advances in visual ecology modelling to determine whether quail eggs resemble those of Little Terns through the eyes of one of their primary avian predators, namely the Silver Gull. Similarities and differences will be discussed, along with the implications for any attempt to use taste aversion learning in this species as a management tool to reduce avian predation on nests.

Conservation-industry Partnerships

A long-term partnership – the benefits of co-operation

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Since 2015 BirdLife Australia has been working with P. F. Olsen to monitor birds in plantations. The partnership came about when the plantation management company approached BirdLife Australia to set up a monitoring program within

the Green Triangle in Western Victoria as a requirement of the businesses need to ‘maintain and enhance’ biodiversity for their Forest Stewardship Council (FSC) and Responsible Wood certification. Over the past decade this monitoring has evolved into a close working relationship, with birds being just the tip of the iceberg. This talk will walk through how this initial small step has enabled a productive working relationship, detailing the opportunities and initiatives of both organisations, barriers to conservation and the future directions this partnership may initiate.

Integrating conservation and agriculture: Expanding Bittern-friendly wetland management across southern Australia

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Wetland loss and degradation across agricultural landscapes is a major driver of population decline for many waterbirds, including the Endangered Australasian Bittern (*Botaurus poiciloptilus*). The Bitterns on Farms project, led by BirdLife Australia, aims to improve wetland connectivity and expand the network of suitable habitat for Australasian Bittern through voluntary, farmer- and industry-led conservation to rehabilitate wetlands on privately owned land across the south-east Grampians region of Victoria and the south Coast of Western Australia. On ground actions currently being trialled within active farming systems include controlled grazing through fencing, revegetation, weed control, and hydrological restoration based on previous work by Glenelg Hopkins CMA and Landcare. With 12+ Voluntary Management Agreements in development and 25+ landholders now participating in bittern monitoring across more than 30 private wetlands and dams, the project demonstrates that biodiversity conservation can coexist with productive land use. This presentation will share early insights from landholder engagement, acoustic and visual bird monitoring, and the value of integrating local knowledge into species conservation efforts. We highlight how partnerships between farmers, industry, local land management groups, Aboriginal Rangers and scientists are delivering tangible outcomes for bittern habitat, while supporting broader ecological literacy and stewardship of Australasian Bittern in the farming community.

Can we design solar farms that increase biodiversity outcomes?

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Solar energy facilities are expanding as the world moves to utilising renewable energy sources for industrial use. These facilities would potentially impact the environment as they typically require large areas of cleared land, and indirectly as solar panels can mimic waterbodies causing impacts to overflying birds. This presentation explores considerations that may increase the biodiversity outcomes of solar facilities. Careful selection of location of solar facilities, avoiding significant habitat, and using degraded landscapes where possible. Solar panel installations can potentially enhance local biodiversity by providing habitat niches such as crevices that attract small animals, or nesting structures for birds. In regions like the Pilbara, Australia, shading effects of solar panels are also particularly significant. Maintaining natural corridors such as washes or habitat patches within solar farms can mitigate habitat fragmentation impacts. Additionally, fencing designs incorporating semi-permeable apertures allow the movement of reptiles and small mammals, at the exclusion of cats or foxes, supporting ecological connectivity. We discuss the different solar panel systems performance, reducing the potential risks of polarized light reflection to birds. Overall, mindful and adaptive solar facility design can balance renewable energy development with biodiversity conservation.

How forestry management shape birdlife in Tasmania

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Forest landscapes play a vital role in biodiversity conservation, yet understanding how different forestry practices influence bird communities remains a key challenge. This study investigates bird biodiversity across a gradient of

forest management intensity in Tasmania's wet eucalypt forests, including native reserves, native forests previously harvested using variable retention and clear-felling, as well as eucalypt and pine plantations. Using a combination of point count surveys and over 600 camera traps, we detected a total of 50 bird species. Pine plantations had the highest species richness (42 species), followed by clear-felled sites (41 species), while variable retention forests had the lowest (35 species). Although formal statistical analyses are still pending, these surprising patterns may be influenced by introduced species, surrounding habitat context, and other environmental factors. The results also highlight the value of integrating survey methods—camera traps proved particularly useful in detecting ground-dwelling and cryptic species, offering a more comprehensive picture of bird communities across forest types. Ongoing analyses will explore how bird community composition relates to forest age, silvicultural intensity, fire history, vegetation structure, and landscape context. Ultimately, this project aims to integrate biodiversity data with timber yield and economic information to model optimal forest landscape scenarios that balance timber production with the conservation of bird biodiversity. This research provides critical insights to inform sustainable forest policy and management in Tasmania's production forests.

Temperate Woodland Birds Conservation and Recovery

Long-term trends in woodland bird observations in temperate south-east Australia

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Australia's south-east woodlands have been drastically impacted by habitat loss and modification, climate change effects, altered fire regimes, impacts of agriculture and invasive species. The Temperate Woodland Bird Conservation Action Plan in 2020 identified 51 south-east woodland bird species that are threatened and/or declining. We examined how the populations of these 51 species have changed over recent decades. Fifteen of these species are listed as threatened under the EPBC Act. We compared the probability of these species being observed in surveys during this period by rural LGAs within the woodland bird communities' range between 1990 and 2024 using Birdata surveys. We also compared the total range of these species between 1990 and 2024. We found significant declines the occurrence and range of many woodland bird species.

Prioritising conservation actions for temperate woodland birds

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Allocating limited funds for conservation is a challenge for many species, including Australia's temperate woodland bird community. Whilst there are many actions that can be implemented, there is a lack of information about which site-level actions would maximise recovery outcomes. We used priority threat management (PTM), a decision-support framework to identify the most cost-effective management strategies for threatened and declining Australian woodland birds over the next 20 years. Using structured expert elicitation, we quantified the benefits, costs and feasibility of implementing nine management strategies for nine woodland bird groups within three hypothetical woodland site scenarios (intact, degraded and cleared). Implementing all strategies together had the highest benefit across all site types, however this was the costliest option. Revegetation was the individual strategy with the highest expected benefit in degraded and cleared sites, while feral predator control delivered the greatest benefits in intact sites. When accounting for the cost and feasibility, the most cost-effective strategy overall was Noisy miner control in the degraded site scenario. Within the intact site scenario, retaining mature habitat features was the most cost-effective, likely because this strategy was relatively inexpensive. In the cleared site scenario, revegetation was the most cost-effective intervention to implement. Our findings underscore the need to quantify the cost, benefit, and feasibility of management strategies to inform strategic planning for woodland birds. Many landholders want to 'do their bit' for birds, so our findings provide an approach to coordinate site-scale efforts to ensure ground-up actions are cost-

effective, providing the greatest return on investment.

Hollow promises for biodiversity: insights from a failed artificial hollows project

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This study evaluated the use of 495 artificial hollows created with the Hollowhog tool across 16 sites in the Central West Local Land Services (CWLLS) region of NSW. Monitoring was conducted 24 to 34 months post installation. Of the reported hollows, only 339 were located during monitoring, 9 had scarred closed with wound wood, 7 were inaccessible for inspection, and some were evidently natural hollows falsely claimed as installed carved hollows. Despite the broad range of species targeted – including the Powerful Owl, Squirrel Glider, and Glossy Black-Cockatoo – only 22 hollows (6.63%) showed any evidence of use, and none by the target species. The few occupants recorded included exotic bees, a pair of Gould's Wattled Bats (*Chalinolobus gouldii*), and a Striated Pardalote (Pardalotus striatus) nest. The hollows were almost uniformly shallow (≤ 20 cm deep), narrow (≤ 50 mm diameter), and low to the ground (≤ 6.5m). While the project did not meet its objectives in terms of target species occupancy, it provides critical insights for improving future artificial habitat initiatives. These findings reveal a critical failure in installation linked directly to a lack of ecological expertise and underscore the importance of species-specific hollow dimensions, tree selection and installation height. Artificial hollows are a science; inadequate design at installation not only renders hollows ineffective but also risks perverse outcomes. Without trained ecologists leading design and implementation, the proliferation of poorly constructed hollows risks undermining public trust, wasting funding and delivering nothing but hollow promises for biodiversity.

Birds on Farms: Woodland bird conservation through citizen science

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BirdLife Australia's Birds on Farms is working with rural landholders to monitor woodland bird populations and protect and restore their valuable habitat. Since its inception in 2017, Birds on Farms has demonstrated the powerful role citizen science can play in advancing bird conservation on private land. The project connects rural landholders with experienced birdwatchers to conduct standardised surveys. This has generated a rapidly growing dataset on woodland bird populations and provides critical information on the threatened and declining species outlined in BirdLife Australia's 'Temperate Woodland Bird Conservation Action Plan'. Additionally, birdwatchers play an important role in supporting landholders' knowledge by helping them to identify the birds on their property and providing insights into habitat preferences. These interactions increase landholders' awareness and understanding of the ecological value of their land and the birds it supports, which, in turn, encourages the adoption of conservation practices to better support these species. Beyond monitoring, one of Birds on Farms' most significant achievements has been its success in facilitating habitat planning and restoration. In selected regions, Birds on Farms, in collaboration with local partnerships, has supported landholders in enhancing their properties through native plantings, improved habitat connectivity, and the adoption of more sustainable land management practices. To date, more than 500 properties across regional Australia have joined the initiative, and over 100 habitat restoration plans have been developed. These numbers reflect Birds on Farms' ability to build meaningful partnerships, facilitate practical conservation outcomes, and foster a community committed to protecting woodland birds.

From structure to species: Predicting avian diversity in peri-urban fragmented grassy woodlands

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Woodland bird communities in southeastern Australia are declining due to habitat loss, fragmentation, and degradation. To support evidence-based conservation planning, we explore how vegetation structure, functional traits, and landscape context shape biodiversity patterns across the endangered grassy woodlands of the Cumberland Plain near Sydney, NSW. Using aerial LiDAR data and plant trait information, we derive metrics of structural complexity and ecological function across a network of over 700 plots in remnant vegetation. These are integrated with eBird records to evaluate how fine-scale vegetation structure and broader landscape attributes influence bird species richness and composition. This multi-taxa approach offers insights into habitat quality and restoration potential, with the goal of recommending priority sites for restoration in the context of the Cumberland Plain Conservation Plan and improving outcomes for declining woodland birds.

Revegetation and colocation of natural assets increases bird biodiversity and breeding activity at farm dams

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Woodland birds are an assemblage of conservation concern primarily due to extensive habitat loss and degradation across their range. Addressing this conservation challenge requires restoration efforts that are grounded in scientific evidence and strategically targeted. The Sustainable Farms project at the Australian National University has conducted over 25 years of bird research on farms in the extensively modified temperate woodlands of south-eastern Australia. This presentation highlights key insights from this research to inform and optimise restoration strategies for the conservation of woodland birds on farms. Restoration efforts accumulate over time, with contributions from many different incentive programs and organisations in any one landscape. Aligning new actions with existing natural assets can lead to greater biodiversity outcomes from investments. I will discuss how co-locating two critical landscape elements, farm dams and restoration plantings, provides an opportunity to support the persistence and recovery of woodland birds in agricultural landscapes. Additionally, I will explore how managing and enhancing farm dams can improve bird biodiversity and support ecological processes, including bird breeding as a key lifecycle stage. The presentation will emphasise the importance of thoughtfully designed restoration techniques that not only maximise ecological outcomes but offer co-benefits for farm productivity.

Birds on the books: incorporating bird species richness into farm-scale natural capital accounts

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Natural capital accounting can be used to report on biodiversity assets and ecosystem services and inform management decisions to improve the natural capital position on farms. A prerequisite for including bird communities in natural capital accounting is an understanding of the relationship between habitats found on farms and their capacity to support bird species. To include birds in natural capital accounts, we previously built predictive models of bird species richness based on ecological condition states using empirical data collected from 50 farms across NSW, north-central Victoria and Tasmania. Here, we test the generality of these models by using them to predict bird species richness at 157 sites on six farms in south-west Victoria, a region outside the footprint of the original model development. We then undertook bird surveys at these farms and compared observed and predicted species richness for all birds, woodland birds and grassland birds. The relationships between ecosystem condition state and relative species richness present in the original models were consistently observed on the six test farms. Predicted richness from the original models explained 66%, 62% and 55% of deviance in observed richness on the test farms for all birds, woodland birds and grassland birds, respectively. However, model predictions consistently underestimated observed species richness across all bird groups. The absence of Noisy Miners and prevalence of riparian habitat on the test farms may explain this. Notwithstanding the underestimation, with further refinement the models provide a robust

basis for including bird species richness in natural capital accounts.

We can now automatically identify bird species across entire woodland communities. What's next?

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Using bird calls for species identification has long underpinned survey reliability, and acoustic monitoring is increasingly able to expand sampling efforts to scales and resolutions previously unimaginable. Our group has developed a custom recogniser to identify 164 bird species across eastern Australian woodlands that prioritises precision, classifying calls with robust confidence estimates to derive site-based inventories comparable to fixed effort transects and area-based searches. By applying this tool to long duration recordings from the Australian Acoustic Observatory (up to ten continuous years of 24/7 recordings), we can now chart the vocal activity and model occurrence patterns of entire assemblages of birds for weeks, months, years at a time. As other community-wide recognisers are developed and become increasingly reliable, we'll soon be able to automatically identify most species in most Australian ecosystems. This high resolution data has never before been available at scale, prompting numerous questions previously beyond reach, both regarding ways to use bird survey data for quantifying environmental change, but also regarding the ecology of birds, their vocal behaviour, distributional dynamics and community composition. With continuous monitoring of entire assemblages available (noting proportions of calls, species and groups unreliably detected), we consider what questions we can now ask—about quantifying environmental change and understanding bird ecology. We share initial thoughts on these questions and map future priorities for woodland birds, highlighting the utility of reporting rate, divergent insights from monthly versus daily detection windows and the potential for multi-species approaches for quantifying breeding success and site/season quality.

Urban Birds

Trends in the bird assemblage of a peri-urban reserve; Whiteman Park 1990 to 2024

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Whiteman Park is a large (ca. 1000ha conservation area) reserve on the outskirts of Perth. Originally linked to native vegetation, it has gradually been surrounded by encroaching urban development, while part of the reserve lies within a predator-exclusion fence. Birds have been censused in the park quarterly since 1990 using point and transect approaches. Census points have generated nearly 60,000 records; transects nearly 15,000. Predictably, a few species have disappeared (eg: Yellow-throated Miner, Hooded Robin, White-winged Fairy-wren), several have declined (eg: most parrots, cuckoos, honeyeaters and thornbills), some have increased (eg: Weebill, Spotted Scrubwren, Common Bronzewing), and many appear stable (eg: Rufous Whistler, Splendid Fairy-wren, New Holland Honeyeater). A few species not present originally are now present regularly (eg: Forest Red-tailed Black-Cockatoo, Rainbow Lorikeet). Trends in abundance reflect several factors. At least some increases in abundance can be linked to regional range expansions, while some declines can be linked to declining rainfall, extreme weather events and declining vegetation condition. Reserve size and increasing isolation may be a factor for some species, but Whiteman Park appears capable of supporting a substantially intact avifauna.

The bird diversity at large street trees in urban Melbourne

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There is an increasing recognition of the ecological importance of large trees in Australian cities, as they have been associated with biodiversity benefits for birds and other faunal taxa. In fragmented landscapes, isolated large trees are keystone structures, as they have a disproportionate effect on bird diversity. However, in urban areas, large trees face the threat of removal due to perceived safety risks or for development projects. My Honours project aimed to build on the existing literature in this field, by explicitly examining how the bird diversity (species richness, abundance, and proportion of neighbourhood species richness) at large street trees varies depending on their species type (*Eucalyptus* type versus *Melaleuca* sp. versus exotic deciduous), and the surrounding percentage tree canopy cover. Bird surveys were conducted at 72 large street trees and surrounding neighbourhoods across three local government areas within Greater Melbourne. This study found that large street tree species type was an important predictor, with *Eucalyptus* type large street trees recording significantly higher bird species richness and abundance than both *Melaleuca* sp. and exotic deciduous trees. However, no significant difference in bird species richness nor abundance was found between trees located in different percentage tree canopy cover classes, suggesting that other environmental features in the immediate vicinity and wider landscape might be more influential in predicting bird use of large street trees. Based on the findings of this study, recommendations are made to local governments in Australia to assist in formulating evidence-based policy on large street trees.

Factors impacting variability in the breeding season of Black Swans (*Cygnus atratus*) in Southeast Queensland, Australia

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Urban waterways have become an important habitat for black swans as resources are less limited than in natural systems, allowing for potentially extended breeding seasons, and higher reproductive success. Despite this, the factors which impact the variability of breeding in black swans in urban areas in sub-tropical regions, including human factors, remains understudied. Between 2007 and 2022, the population of Black Swans on the Gold Coast, Queensland, were studied to identify factors influencing recruitment to the breeding population and evaluate the factors impacting reproductive success in this species. The number of pairs per annum increased over the study period (from 20 to 72), as did the number of successful breeding attempts per annum (from 18 to 74). Almost 40% of pairs breed two or more times per year with some making five nesting attempts in a single year. The number of cygnets hatched and reared per breeding attempt increased over time and pairs hatched cygnets in every month of the year with a peak recorded in the Austral winter. However, the breeding season varied significantly between years extending over the whole year in some years and only over a three-month period in others. Breeding season extent was linked to the number of territorial pairs recorded which may reflect competition for favoured breeding and foraging locations for family groups. Factors influencing the number of breeding attempts in any one season were primarily influenced by summer rainfall and Southern Oscillation Index with higher values for both leading to increased breeding attempts.

Using citizen science as a tool to identify innovative behaviours in urban-living cockatoo

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The capacity to develop new behaviours has played a fundamental role in cognitive evolution, allowing animals to invent solutions to adverse conditions. While innovations arise from cognitive abilities, they can also be shaped by ecological factors such as urbanisation, environmental heterogeneity, and group size. However, the role of these factors in determining innovation rates remains largely unexplored in wild populations. Although citizen science has a long-standing tradition in ecological research, it is rarely used to identify animal innovations, despite its potential to capture behaviours across diverse environments. In this study, we used data from the Big City Birds platform, where users report bird observations with GPS location and timestamp, to identify innovations in Sulphur-crested Cockatoos (*Cacatua galerita*) and examine their ecological drivers. We categorised observed innovations into feeding and non-

feeding types and modelled their occurrence in relation to urbanisation intensity, environmental heterogeneity, and local cockatoo population size. Our results reveal contrasting patterns: non-feeding innovations were more likely to occur in highly urbanised areas, whereas feeding innovations were more frequently reported in less urbanised regions and were also positively associated with local population size. These findings suggest that different innovation types may be shaped by distinct ecological pressures. This study offers new insights into how ecological conditions influence innovativeness and highlights the power of citizen science in detecting behavioural innovations at broad spatial scales, particularly in dynamic urban environments.

White-bellied Sea-Eagle - a surprising urban bird struggling in a busy city

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The EagleCAM project has been monitoring the breeding behaviour of Sea-Eagles at Sydney Olympic Park since 2008. Life in an urban environment is not ideal for young eagles and many juvenile birds over the past years have not survived. Pressures at the nest from other birds, such as nesting currawongs and magpies, cause early fledge and leaving the safety of the forest nest area. Then our young fledglings are out in the wider world. They are not yet urban adapters - though the adult birds manage with wider experience. Post-fledge problems include disturbance, traffic, development, high rise buildings, glass and window strikes - let alone pollution and rubbish in the river hampering their developing hunting skills. Why do we encourage the eagles to nest here? The nest area itself is well protected in a restricted area and continues to be used by successive pairs for many years, when other safe breeding areas are rare in this city. By close monitoring on the nest and post-fledge we hope to learn more and protect this vulnerable raptor. Our Citizen Scientist team in the community monitor behaviour out of the forest, along the river and in the wider area. We watch carefully without interference unless in extreme circumstances. Then hopefully we continue to foster co-existence between this magnificent raptor and people in a busy urban environment.

Ducks in a row: Human population density influences aggression and vigilance behaviour in Australian Wood Ducks

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Urbanisation reshapes landscapes and profoundly impacts biodiversity. While some bird species decline in urban environments, others thrive. Understanding the adaptations of common species is critical for informing conservation efforts and designing urban landscapes that support diverse bird communities. This study investigated the behavioural plasticity of the Australian Wood Duck (*Chenonetta jubata*), a species that has successfully adapted to open green spaces in Melbourne, Australia. We examined the frequency of intraspecific aggression (attack and warn) and vigilance (scan) behaviours across a gradient of human population density, and considered sex, season, and group size. Male ducks exhibited more aggression and vigilance than females, particularly in autumn and in larger groups. However, these relationships were mediated by the level of human activity: attack behaviour was more frequent in male ducks and in autumn at lower density sites, but in both cases this difference lessened with increasing human population density. There was also an increased occurrence of attack and warn behaviours with human population density in larger groups. Scan behaviour increased with human population density across all variables, especially in spring and in smaller groups. These findings indicate that Australian wood ducks modify their behaviour in response to urbanisation. Species lacking this behavioural plasticity, particularly those with niche habitat requirements, may struggle to persist in cities unless considered in the design and management of open green spaces.

Superb City Wrens: understanding little birds in the big city

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The Superb City Wrens project is a partnership between BirdLife Australia, City of Melbourne, Curtin University and University of Melbourne. This citizen science powered monitoring project is aimed at answering applied questions on the effectiveness of targeted revegetation strategies and understanding the behaviour and habitat preferences of small urban birds, using Superb Fairy-wrens (*Malurus cyaneus*) as an indicator species. We established strategic monitoring sites in existing and new vegetation around a core, resident population of Superb Fairy-wrens in Royal Park, Melbourne. Citizen scientists were directed to these locations to survey for a range of species, with a focus on looking for unique colour-banded individuals, while also recording other species presence, absence and abundance where possible. Over 60 fairy-wrens in the Royal Park population were individually marked to allow monitoring of how this species is using urban habitat and dispersing through the city. The project launched in mid-2021, with the first banding taking place in November 2021. Results confirm Superb Fairy- wrens are successfully breeding within a restricted area of Royal Park with a small number of individuals detected outside this area, indicating successful longer-range dispersal events are taking place across the city. Broader patterns of Superb Fairy-wren occurrence are also apparent from the strategic survey data collected by citizen scientists. We have also trialled a range of events and incentives for motivating broader community and local government engagement with this project, helping us to better understand how to design targeted citizen science monitoring projects.

Gardening for birds: Evaluating the impact of an online course on urban habitat creation

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Private gardens make up a significant proportion of land tenure in Australian urban areas, meaning that individual choices about garden design and plant selection can have a cumulative impact on urban bird conservation. In January 2025, BirdLife Australia launched the Habitat Gardening for Birds online course as part of the long-running Birds in Backyards program. The course was created in direct response to findings from an evaluation of Birds in Backyards participants, which showed demand for accessible guidance on what to plant, where to source plants, and how to create habitat for birds. With over 1,000 participants in the first six months, the course provides ecological context, plant recommendations, and links to where to source plants to support diverse types of urban gardeners. Participants are guided through short, flexible modules with video content, interactive activities, and downloadable resources and the course connects participants to Birds in Backyards seasonal bird surveys. This presentation shares early evaluation results, highlighting which course features best participants are finding most effective, what action they have taken or intend to take, and the barriers they continue to face. Urban landscapes pose a wide range of challenges for bird conservation, from large-scale habitat loss, invasive species, and climate impacts to local planning decisions, domestic cats, and everyday choices like rodenticide use. Amidst these complex pressures, this course offers a practical tool to help individuals take informed, meaningful evidence-based action in their own gardens. By combining learning, local action, and citizen science, the course is aiming to show how household-scale efforts can play a role in broader conservation outcomes across Australia's towns and cities.

Thematic analysis exploring global patterns in urban wetland bird research

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With rapid global urbanisation, wetlands are being replaced or altered, affecting urban bird diversity. Understanding how urban wetlands, ranging from natural to artificial and from small to landscape scale, support birds is important. We reviewed academic articles on birds in urban wetlands using a bibliometric analysis involving both quantitative and qualitative approaches. Scopus and Web of Science databases were searched to identify relevant literature using the PRISMA protocol. We then assessed metadata from 1,845 articles published between 1960 and 2023, including keywords, titles, and abstracts, using thematic mapping with VOSviewer and Leximancer. The VOSviewer map reveals four main themes: conservation biology in cities, migratory birds, habitat maintenance, and water quality

monitoring. In addition, the Leximancer concept map identifies ‘wetland’, ‘water’, ‘species’, and ‘concentrations’ as main themes along with their associated concepts. Comparing early and recent thematic maps shows a shift from a focus on industrial pollution and individual species to a broader emphasis on ecosystems, ecology, habitats, biodiversity, conservation, and urban planning. Future research should involve more cities and researchers from the Global South, as well as explore technologies such as remote sensing for mapping and characterisation of urban wetlands, artificial intelligence for identifying bird images and sounds, and citizen science to examine human–nature interactions. Also, more information on the values of urban wetlands for birds and people is needed, including their roles in flood prevention and mitigating urban heat islands and heatwaves.

Drought-Driven Urban Immigration in South-west Australian Birds?

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Urban areas are a significant and rapidly expanding part of the global landscape. Urban expansion occurs alongside climate change, with both linked to declines in native species. However, urban environments can offer unexpected refuge during extreme climatic events such as droughts. We investigated whether bird communities in south-west Western Australia shifted into urban areas during a recent climate anomaly characterised by record low rainfall and extreme heat. Using five years of eBird data, we tracked changes in reporting rates across the Perth metropolitan region and modelled their relationship with cumulative rainfall deficits. We found that several species exhibited dramatic spikes in urban reporting—up to nine times higher than average—during the peak of the drought, before rapidly declining once rainfall resumed. These species-specific responses suggest that urban ecosystems may act as important, albeit temporary, refuges during climate extremes. As climate change accelerates, integrating urban environments into broader conservation strategies will be critical to supporting mobile native fauna.

Community reporting of window strikes affecting Australian birds: geographic and taxonomic observations

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Window strike is a pervasive issue affecting birds all over the world. Window strike has previously been associated strongly with migratory and nomadic species unfamiliar with the urban environments and concomitant hazards they are exposed to during large-scale movement. While coverage of this issue has received broad attention in North America and the United Kingdom, window strikes affecting Australian birds have received relatively less attention. This research will review historical community posts in bird-interest social media groups, whose memberships can exceed 10,000 people per group, to capture the time, location and species affected by window strikes across Australia. Research is expected to show a prevalence of urban exploiter species as per the findings of the 2019 Birds in Backyards Bird Strike project. Importantly, it is also expected to document window strikes in species that undergo mid-range or altitudinal migrations through Australia's capital cities and large towns. While Australia’s migratory bird community often sees an emphasis placed on shorebirds of the East Asian Australasian Flyway, this research hopes to shine a light on the species that undergo migrations on smaller scales within Australia. These species face unique threats across their range, some of which are amplified by the process and characteristics of urbanisation.

Open Forum

Impacts of climate change on Mallee bird communities: The role of microhabitats in buffering physiological stress

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Climate change is expected to increase heat and hydric stress in arid-zone birds, threatening the persistence of many species. Here, we develop biophysical models to predict the physiological impacts of future climates on Mallee bird communities, with a focus on Gluepot Reserve, SA. The models account for thermoregulatory strategies of species inhabiting hot environments and are parameterised with experimental physiological data, as well as information from museum specimens and the literature. To validate microclimatic simulations, we deployed iButtons across habitats to capture fine-scale thermal conditions. Gluepot's vegetation states, mapped using a state-and-transition (STM) framework, range from reference habitats with intact canopy and understory (cooler, shaded environments) to degraded states with sparse cover and hotter conditions. We studied eight representative species (Mulga Parrot, Apostlebird, Chestnut-crowned Babbler, Australian Owlet-nightjar, Galah, Spiny-cheeked Honeyeater, Yellow-plumed Honeyeater, and Grey Butcherbird), which differ in morphology, natural history, and behaviour. Our results indicate that birds will experience greater dehydration and heat stress under future climates, but reference habitats will act as refuges by buffering extreme microclimates. By integrating STMs with our biophysical predictions, we show how management actions that maintain or restore reference states can secure critical refugia, supporting bird community resilience under climate change.

Keeping pace with taxonomic change in ornithology

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Because taxonomy is critical to ornithology, differences in species classification and nomenclature are significant barriers to efficient collaboration and effective research and conservation. To maximize its utility across disciplines, stability is often a goal of taxonomy, yet taxonomy is inherently dynamic, with new research challenging the classification of species, genera, and families, something that is further complicated by the divergence of global and regional checklists. While AviList is a significant advancement for aligning the world's taxonomies, platforms like Birds of the World (BOW) from the Cornell Lab of Ornithology still have the annual challenge of keeping pace with the changing taxonomic landscape. To maintain alignment, the BOW platform undergoes an annual, comprehensive revision of avian taxonomy in response to the eBird/Clements Checklist and AviList annual updates. Species accounts are then updated to reflect the latest taxonomic changes, which may mean splitting or lumping accounts, adding or synonymizing subspecies, changes to genera, families, nomenclature, and common names, and, importantly, matching existing life history data to each changing concept. The 2024 taxonomic update resulted in changes to 615 species accounts. These efforts ensure that Birds of the World reflects taxonomic change in a comprehensive, timely, and informative manner that not only provides a clear, concise archive of the justification for present and prior classifications, but also pairs each current species concept with a comprehensive life-history synthesis. In this way, BOW provides an authoritative resource for ornithologists dealing with the pressing issues facing all birds.

Improving strategies for shorebird conservation by understanding the environmental values of beach users

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Human recreation can exacerbate environmental pressures on sandy beaches and on the shorebirds that utilise them. Regulations restricting human activities can help, however, compliance with regulations is often low. To better understand and influence how people respond to beach regulations and encourage compliance, we need to consider determinants of behaviour, such as individual value systems. We used an online survey to investigate beach users' environmental values and their knowledge of and compliance with regulations regarding vehicle use, dog walking, and behaviours around beach nesting birds at 11 beaches in South Australia. Beach users were divided into four groups depending on whether or not they used their vehicle or walked their dog(s) on the beach. Those who used their

vehicle on the beach had the highest levels of self-reported compliance with and knowledge of beach regulations compared to other groups. Those who used their vehicle and/or walked their dog(s) on the beach held competing self-transcendence (altruistic: valuing wellbeing of others and biospheric: valuing the environment) and self-enhancement values (hedonic: valuing our pleasure and comfort), whereas those who did not placed the highest importance on biospheric values. The relationship between environmental values and compliance was the strongest for those who used a vehicle and walked their dog(s) on the beach. These results suggest that interventions targeted at those using a vehicle and walking their dog(s) on the beach would be most effective when aligned with biospheric and hedonic values, promoting pro-environmental behaviour for our own pleasure and comfort and for the environment.

Using dietary metabarcoding analyses to characterise waterbirds–agriculture interactions

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Globally, the use of agricultural fields by waterbirds has increased, resulting in conflicts with farmers. Designing effective management strategies to resolve these conflicts requires an understanding of the species' resource use. Dietary analyses can shed light on the extent of consumption of agricultural crops and surrounding natural resources, as well as the potential relationship between diet and an individual's body condition and ultimately its fitness. The Magpie Goose (*Anseranas semipalmata*) is a unique tropical waterbird protected by law but is considered a pest species by mango growers in northern Australia. Geese are reported to damage fruits, trees, and irrigation equipment, which is often exacerbated when fruit development coincides with the late dry season as natural resources for Magpie Geese are scarce. In this study, we examined the dietary composition of the Magpie Goose seasonally utilising a mixed natural-agricultural landscape of the Northern Territory. We used DNA metabarcoding of intestinal contents from hunted geese to reconstruct individual diets and evaluated body condition from morphometric measurements. We compared the relative contribution of agricultural and natural foods to dietary composition, and investigated how this contribution varied spatially, temporally and among individuals that differed in body condition. Our results showed that individuals forage opportunistically, and that agricultural crops, while eaten, may not represent an essential part of geese diet across the study region. The knowledge acquired provides new insights into the species' foraging ecology, offering clear alternatives for mitigating goose–agriculture interactions.

Role of functional insectivorous birds in biological pest control in rice agroecosystem

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Sustainable agricultural practices are imperative for global food security in face of burgeoning population; to harmonize this with conservation efforts the potential of bird-mediated pest suppression becomes increasingly evident. While studies have elucidated benefits of bird-mediated pest-control in various crops, the paddy remain understudied in this regard, despite being a major crop in India and other Asian countries. The present study aimed at understanding the role of functional insectivorous birds in managing insect pests of rice agroecosystems in Gangetic floodplain of India. Bird species composition and their insect predation rates were compared between pesticide-treated and untreated rice fields. Functional diversity indices were used to better understand how species interactions contribute to provisioning of pest control service. The study identified 15 functional insectivores in rice paddies, of which Indian Pied Starling, Black Drongo, Green Bee-eater, Plain Prinia could be potential control agents of rice pests due to their high cumulative abundance, high insect predation rates, and mixed-species flock foraging effort. The result showed that insect predation rate by birds was positively associated with Rao's Q and FDiv indices which suggests that enhanced resource use efficiency, resulting from more distinct ecological niches, leads to a greater magnitude of bird ecosystem functions. Results from economic analysis showed that birds could indirectly save $41.55 to $42.74 per acre of paddy fields by adopting pesticide-free farming. The findings indicated that integrating avian insectivory in pest management strategies alongside reduced pesticide use can yield tangible benefits to farmers in terms of increased yield and economic returns.

Monitoring food availability for shorebirds in the Leschenault Estuary: A community-based approach

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This study presents a community-driven initiative aimed at understanding the ecological drivers of shorebird habitat use in the Leschenault Estuary, a coastal wetland in south-west Western Australia. Initiated by local residents and BirdLife Australia Bunbury members, the project focused on monitoring benthic macroinvertebrate populations as a proxy for food availability for migratory shorebirds. Researchers and volunteers collaboratively designed a benthic invertebrate monitoring program, with community members actively contributing to site selection, field sampling, and laboratory analysis. The Leschenault Catchment Council, a local natural resource management group, led field operations and coordinated community engagement through public information sessions and volunteer training workshops. Over the study period (2020–2025), overall macroinvertebrate abundance remained stable, though spatial variability was evident. Notably, significant temporal shifts in species richness, diversity, and community composition were observed, with a marked decline in diversity and an increase in stress-tolerant and opportunistic taxa between 2020–2021 and 2024–2025. Despite challenges—including limited resources, alignment of sampling with bird surveys, and variability in sample processing accuracy—the project successfully empowered community members to engage in ecological research and contribute to the conservation of a valued local wetland. This case study underscores the potential of community-led science to generate meaningful ecological insights and foster stewardship of migratory species in vulnerable habitats.

A quantitative review of bird–litter interactions and the influence of avian functional traits

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Anthropogenic litter poses a significant global threat to birdlife, which interact with litter in three main ways: ingestion, entanglement and use of litter as nesting material. The literature is dominated by studies focusing on marine based birds, preventing a holistic understanding of bird–litter interactions. We conducted a quantitative review that aimed to examine relationships between commonly reported litter metrics (frequency of occurrence, litter mass ingested, and count of litter ingested), avian functional traits including habitat, trophic niche, primary lifestyle, and body mass as well as latitudinal gradient. Of the 325 studies assessed in the review, many had low sample sizes, and there was high variability in the methods used and the way results were presented. Despite this, we found that habitat, trophic niche and primary lifestyle had varying influence on the frequency of occurrence of each interaction. We found a positive relationship between body mass and mean litter mass ingested. Litter mass ingested varied across a latitudinal gradient for two species, the Yellow-legged Gull (*Larus michahellis*) and the Northern Fulmar (*Fulmarus glacialis*). We also found positive correlation between litter metrics, but results revealed several species with the largest litter mass burden did not have high frequency of occurrence, and vice-versa. This prompts us to consider how litter metrics relate to identification of priority species for research and management of bird–litter interactions. Ultimately, we call for more research on non-marine bird species and an increase in standardisation of data to support a more holistic understanding of bird–litter interactions.

Applications of genetics and genomics for conservation management of Aotearoa New Zealand birds

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To achieve Aotearoa New Zealand's national strategy for biodiversity, Te Mana o te Taiao, diverse and innovative approaches are required to protect, restore, and enhance our biodiversity for the future. One tool in the conservation

toolbox is genetic and genomic data, used to understand evolutionary relationships and underlying genomic factors that may influence the extinction risk of threatened species. Incorporating this knowledge alongside other aspects of conservation biology builds a deeper understanding of conservation need, and supports robust, evidence-based management strategies for threatened species. Here I present case studies from three threatened Aotearoa endemic birds: karure (Chatham Island Black Robin, *Petroica traversi*), Kakī (Black Stilt, *Himantopus novaezelandiae*), and Kuaka Whenua Hou (Whenua Hou Diving Petrel, *Pelecanoides whenuahouensis*). Data ranging from small genetic marker sets for Black Robins, mid-sized sets derived from reduced-representation sequencing for Kakī, and large marker sets from whole-genome sequencing for Kuaka Whenua Hou have been used to resolve questions around genetic diversity and interspecific hybridisation. Inbreeding and low genetic diversity are common risk factors identified across all three species. In addition, interspecific hybridisation raised concerns for species recovery of both Kakī and Kuaka Whenua Hou. However, genomic analyses found no evidence of introgression into either species. Results of these studies have been used to inform conservation management strategies for all three species.

Is bigger better? Prey-driven evolution of reversed sexual dimorphism in Australian raptors

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The evolution of reversed sexual dimorphism (RSD) in raptors remains a subject of ongoing debate, with over 20 hypotheses proposed to explain its origins. These include reduced intersexual food competition and enhanced nest defence. Most raptors exhibit asymmetric parental roles, and recent theories suggest that prey size and type play a key role in the evolution of female-biased size dimorphism, particularly in species that rely heavily on avian prey, which often require longer handling times and delayed feeding of nestlings. We tested this theory in the raptor guild of the Australian highlands, assessing whether prey size and the overall proportion of avian prey correlate with the degree of RSD across species. We further explore how the evolution of size dimorphism may be linked to optimal prey sizes and ecological niche differentiation. Finally, we discuss how understanding these prey preferences may inform future management and conservation strategies for raptor communities.

Understanding the ecological value of different quality restoration using birds as indicators

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Ecological restoration facilitates recovery of ecosystems that are no longer intact. Restoration projects may vary in their habitat value and success of returning ecosystems to pre-disturbance states due to the restoration techniques employed, initial condition of the degraded ecosystem, and chemical and physical factors at the time of restoration. Birds, as bio-indicators, play a crucial role in assessing the ecological value of restoration projects given their sensitivity to environmental change, diverse habitat requirements, and relatively high mobility. The fragmented Fitz-Stirling macro-corridor in Western Australia, between the Fitzgerald River and Stirling Range National Parks, is a high priority for conservation efforts with a focus on increasing habitat connectivity through restoration projects. In this study, we assess the ecological value of these restoration projects in the Fitz-Stirling, utilising birds as indicators of habitat quality. Sites with varying restoration goals (e.g., carbon plantations, biodiverse revegetation) were assessed against the ‘recovery wheel’ developed by the Society for Ecological Restoration Australia and scored for restoration quality. Bird surveys (20-min surveys conducted in discrete 1-min intervals counting individuals/species) were conducted simultaneously at each site. Here, we present relationships between restoration quality and bird metrics (such as species and guild diversity, and community assemblages). We explain how these results are indicative of ecosystem health and the value different quality restoration has for avian fauna. Our findings will inform future restoration projects in the region.

Cockatoos playing laser tag: Evaluating the use of bird-scaring lasers to reduce conflict between critically endangered Baudin's Black-Cockatoos and orchard growers

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Baudin's Black-Cockatoo (*Zanda baudinii*) is a Critically Endangered species endemic to south-western Australia. These cockatoos are known to cause considerable damage to pome fruit crops such as apples and pears, bringing them into conflict with orchard growers. Despite legal protections, the legacy of historic shooting combined with small amounts of ongoing illegal activity is still believed to form the most persistent major threat to remaining populations. Orchard management is also made difficult by the birds' responses to non-lethal, bird-scaring management alternatives, i.e. that smart parrots and cockatoos quickly learn that these scaring tactics pose no real threat, and their efficiency quickly reduces over time. In June 2023, BirdLife Australia initiated a field trial in Dwellingup to evaluate the use of bird-scaring lasers as a non-lethal method to deter Baudin's Black-Cockatoos and co-occurring Australian Ringneck (*Barnadius zonarius*) from foraging in orchards. Bird-scaring lasers are a relatively new technology that have been marketed as a permanent, bird-friendly solution for orchard managers, one that can out-smart clever cockatoos and parrots. From this small trial, we will report on emerging behavioural patterns, seasonal variation in site use, and the observable effects of laser deterrents and its implications for management. Understanding the effectiveness of non-lethal deterrents is vital for mitigating human-wildlife conflict - protecting endangered species while supporting sustainable agriculture in the region.

Living in a changing landscape: Ecological and social predictors of survival in a tropical riparian specialist

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For long-lived species, individual differences in annual adult survival can have major effects on lifetime fitness. When broad-scale environmental changes influence survival, the effects on individual fitness can manifest as impacts on population persistence—particularly when the affected populations are small and isolated, as in the Endangered Purple-crowned Fairy-wren (*Malurus coronatus coronatus*), a specialist of riparian habitats in northern Australia's tropical savannas. Since 2005, we have followed 1,318 individually-marked purple-crowned fairy-wrens inhabiting ~15 km of riparian habitat managed by the Australian Wildlife Conservancy to control impacts of fire and introduced herbivores. Using a multi-state modelling approach, we investigated how climate and habitat relate to survival and the acquisition of breeding status in this population. Mortality is greatest during extreme wet and extreme dry conditions, although mean maximum daily temperature appears unrelated to individual survival. We also found that territory quality (density of preferred riparian vegetation Pandanus aquaticus) positively predicts individual survival. We found evidence for a high survival cost of postnatal dispersal, as mortality is highest among young (6–12 month-old), non-breeding females during the monsoonal Wet season (December–May). Females are the more dispersive sex in this species, in which postnatal dispersal also tends to occur during the late Dry/early Wet season. Extremely high (>96%) detection probability in the main study area, combined with high detection (~90%) of emigrants from the main study area during annual censuses of surrounding populations allow us to confidently attribute these disappearances to dispersal-related mortality, and not dispersal itself.

Pan-Avian Epigenetic Clock

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Epigenetic clocks are emerging as powerful tools for estimating animal age, offering new opportunities for population monitoring, demographic modelling, behavioural and ecophysiological research, and a wide range of other biological and ecological applications. These clocks use DNA methylation profiles to accurately estimate the age of individuals without date of birth information. While most epigenetic clocks have been developed for mammals, we are leveraging a long-term monitoring dataset and biobank collected from King penguins (*Aptenodytes patagonicus*) to pioneer a pan-species age-estimation tool. This clock was developed using blood-based genome-wide methylation data from 96 known-age King penguins. The majority of the samples were collected from a population electronically monitored in the Crozet archipelago since 2000, complemented with samples from Zoo Zurich (Switzerland) and Loro Parque (Spain) to expand the utility of the clock beyond the wild Crozet population. To improve the accuracy and broad applicability of the epigenetic clock across bird taxa, we utilized a multispecies alignment of 364 bird genomes and incorporated samples from long-term studies beyond the King Penguin, representing 19 species across nine avian orders. The resulting tool—a multiplex PCR protocol and a computational model—can be adopted by other researchers and conservationists. It enables age estimation from a blood sample, which, combined with individual capture-mark-recapture programs, supports population viability analyses. Beyond population monitoring and conservation applications, preliminary annotation of clock-related genes suggests evolutionary convergence in aging pathways, offering avenues for ecological and evolutionary research. This project illustrates how genomics can enhance long-term monitoring strategies.

Brain gene regulatory networks coordinate nest construction in zebra finches

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Nest building is a vital behaviour exhibited during breeding in birds and is possibly induced by environmental and social cues. Although such behavioural plasticity has been hypothesised to be controlled by adult neuronal plasticity, empirical evidence, especially at the neurogenomic level, remains limited. Here, we aim to uncover the gene regulatory networks that govern avian nest construction and examine whether they are associated with circuit rewiring. We designed an experiment to dissect this complex behaviour into components in response to pair bonding and nest material acquisition by manipulating the presence of mates and nest materials in 30 pairs of zebra finches. Whole-transcriptome analysis of 300 samples from five brain regions linked to avian nesting behaviours revealed nesting-associated gene expression enriched with neural rewiring functions, including neurogenesis and neuron projection. The enriched expression was observed in the sensorimotor and social behaviour networks of female finches, and in the dopaminergic reward system of males. Female birds exhibited predominant neurotranscriptomic changes to initiate the nesting stage, while males showed major changes after entering this stage, underscoring sex-specific roles in nesting behaviour. Notably, major neurotranscriptomic changes occurred during pair bonding, with minor changes during nest material acquisition, emphasizing social interactions in nest construction. We also revealed gene expression associated with tactile sensing for nesting behaviour. This study presents novel neurogenomic evidence supporting the hypothesis of adult neural plasticity underlying avian nest-construction behaviour. By uncovering the genetic toolkits involved, we offer novel insights into the evolution of animals' innate ability to construct nests.

Waterbirds surveillance and monitoring to support planning for H5N1 arrival in the Murray-Darling Basin

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The Murray-Darling Basin (MDB) supports many of the continent's most important inland breeding sites for aggregate-nesting waterbirds including ibis, spoonbills and egrets. The imminent threat of H5N1 avian influenza incursion into Australia poses a huge threat to native birds. The large size and high density of waterbird breeding aggregations could make them highly susceptible to large mortality events. In addition, extensive waterbird tracking of post-breeding dispersal movements shows that these species can move long distances very rapidly, including into intensive agricultural areas, which could facilitate H5N1 spread. The Commonwealth Environmental Water Holder (CEWH) is responsible for managing the Commonwealth environmental water holdings to deliver water to rivers, wetlands and floodplains in the MDB to support ecological assets such as waterbird feeding areas and nesting sites. Considering

the pending arrival of H5N1 the CEWH has engaged CSIRO to lead a project to coordinate an expert panel and design and establish surveillance and monitoring associated with the detection of H5N1 bird flu in the MDB. The overall aim of this initiative is to provide advice on how directing environmental water within the MDB could aid with managing the risks that H5N1 poses, including the dire ecological outcomes for threatened and endangered birds and potentially mammals. The project leverages extensive knowledge and ongoing research and monitoring done through the Flow Monitoring, Evaluation, and Research (Flow-MER) – the CEWH's Science Program.

Climate change and habitat dynamics: Implications for resident vultures

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Climate change and biodiversity loss are two of the most pressing current global challenges. Vultures are not only obligate scavengers but also provide critical ecosystem services by removing carcasses and controlling important disease risks. Of the 15 resident species, eight are classified as Critically Endangered, while one species each is listed as Endangered, Vulnerable, and Near Threatened, and the remaining four are of Least Concern. There is a major knowledge gap regarding their habitat use and impact of climate change. One powerful approach to address these gaps is combining citizen science data for species occurrence with 20 dynamic and three static environmental variables to implement Random Forest machine learning techniques. Herein, we examined the present habitat of resident vulture species and the projected distribution under the moderate climate change scenario 50 years in the future. Given the large scale of modelling and heavy computational power required, the workflow was carried out using Google Earth Engine. All the models obtained excellent model evaluation scores and were successfully validated using GPS data. Eight species showed a net gain (1.1% to 26.3%) in habitat suitability while, five species across showed a net loss (0.83% to 2.43%). Two species showed negligible change. The climatic gains in habitats may not be enough to offset habitat loss, especially if they occur in areas of high anthropogenic pressure. Further, given the wide geographic distribution of vulture habitats, transnational collaboration is crucial. These projections could be used as reference data and be utilized from a management perspective.

Identifying environmental reservoirs in captive Plains-wanderer facilities via environmental microbiome profiling

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The Plains-wanderer (*P. torquatus*) is a Critically Endangered flightless bird endemic to SE Australia and is the only member of the Gondwanan Pedionomidae family. Its evolutionary distinctiveness and endangered status makes it of the highest priority for conservation action globally (EDGE, 2023). Captive populations have been established for conservation, with release programs in place to mitigate the threat of extinction. However, a significant gap in PW microbiome research means release of captive-bred individuals risks the introduction novel pathogens into already fragile wild populations. Following an outbreak of mycobacteria, a captive PW population has faced infections, and even some mortalities, despite an unknown origin. This study investigates the use of environmental microbiome profiling in contributing to a disease risk assessment of captive breeding programs for the Plains-wanderer. We aim to determine whether mycobacterium was present in the enclosure environment, and whether infected conspecifics presented a risk for future occupants. A follow up study will investigate where stress induced by captive breeding increase susceptibility to infection. A facility wide assessment was conducted, using faecal, substrate, and water samples from unaffected, non-fatal cases, and enclosures with mycomacterium-associated mortalities. These samples were assessed for risk of contamination, to identify potential environmental reservoirs of disease associated bacteria, and to determine the risk of new infection from environmental sources. The findings form the work will contribute to a whole systems approach to managing disease risk in captive breeding programs. In doing so, this research will provide valuable insight into the health of captive birds and enable conservation programs to develop appropriate strategies for the prevention & mitigation of infection, outbreaks & pandemics.

Research gaps for mitigating impacts of wind energy on birds during environmental assessments

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Significant progress has been made in strategies to mitigate wind farm impacts on bird populations, yet critical research gaps remain that limit the industry's ability to fully address turbine-related risks. The wind is required to quantify the impacts new wind turbines will have on native birds despite uncertainty on the distribution, behaviour and general ecology of many species that may be at risk of collision. Wind farm proponents engage environmental consultants to quantify the impacts that a new wind farm will have on birds. Teams of ornithologists perform extensive generalised and targeted pre-construction bird surveys to identify the species at highest risk, then provide advice on how to mitigate those risks through both design and operational mechanisms such as turbine-free buffer areas, turbine feathering and targeted curtailment. Despite significant progress and demonstrable success in reducing the incidence of birds colliding with turbine blades, operational monitoring indicates that there is more to learn. Improving understanding of the temporal and spatial patterns of birds flying at rotor swept area height will allow improved wind farm design and operation to further protecting birdlife whilst maximising clean energy production. Drawing on Nature Advisory's decades of experience and real-world case studies, this presentation highlights the most important research priorities needed to strengthen the evidence-based, ecologically sound guidance for the wind farm industry.

Scale-dependent factors influencing avian community composition with implications for fire management

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Fire shapes ecological communities through various mechanisms across multiple spatial scales. In fire-prone regions, land managers use prescribed fire to provide species with the conditions required for survival. In south-eastern Australia, managers use time since fire to define vegetation growth stages representing distinct successional stages. The general aim of this study was to determine whether observed changes in the composition of bird communities aligned with these growth stage intervals. We conducted bird surveys in two semi-arid vegetation types (Heathland Sands and Lowan Mallee), across two geographically distinct sub-regions spanning an aridity gradient. Using canonical correspondence analyses, we examined changes in bird community composition at two spatial scales in each vegetation type, determining the environmental factors and individual species associated with those changes and their alignment with the fire management growth stages. Broad-scale ordinations revealed that compositional differences strongly aligned with the aridity gradient. At finer scales, compositional change was more strongly associated with vegetation structure. Changes aligned with current growth stage intervals for some communities (northern Heathland Sands) more than others (southern Lowan Mallee), with post-fire regeneration traits of plants in each sub-region creating variable patterns of change. These findings demonstrate the importance of scale when examining factors influencing faunal communities following fire. Uniform application of growth stages across broad spatial scales may not capture nuanced changes in bird communities detected at finer scales.

Past research and future directions in understanding how birds use their sense of smell

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Our understanding of the functional importance of olfaction to birds has improved over the past 60 years, largely as the result of experimental studies testing how birds use their sense of smell in different contexts. As it is impossible to measure directly which odours birds can detect, we rely on measuring behavioural responses to scent cues or manipulations which diminish their olfactory acuity. Here, we review the findings of these studies structured by when and how birds used their sense of smell: during foraging, navigation, social interactions with con- or hetero-specifics, nesting or for predator detection. Most studies investigated how birds use their olfactory sense during foraging (*n* =

52) and nesting (*n* = 42), but fewer examined how birds use olfaction during social interactions (*n* = 38), navigation (*n* = 20) or predator recognition (*n* = 21). Knowledge is mainly restricted to certain Orders (e.g. Procellariiformes). Although the diversity of neuroanatomical and molecular structures underlying olfaction suggests that olfactory acuity varies considerably among extant bird species, an understanding of which ecological factors drive selection for olfactory acuity in birds is mostly lacking. How experiences expand a bird's chemosensory knowledge over time and whether birds can learn to recognise odours associated with foraging opportunities or danger from predators is still poorly understood. Finally, there is a lack of knowledge about how long some volatiles remain useful to birds before they have decayed, and which volatiles, or combinations of volatiles, contained within some olfactory cues are being detected by birds. We encourage ornithologists to tackle these broader questions to better understand the functional importance of olfaction to birds.

Identifying Australian bird communities using semi-structured citizen science data: strengths and limitations.

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Definitions of faunal communities are severely lacking compared to vegetation communities. To address this critical knowledge gap, we used an iterative process of hierarchical clustering and expert elicitation to construct a preliminary typology of Australia's terrestrial bird communities. This process was based on standardised 2-minute, 20-hectare surveys submitted by citizen scientists to BirdLife Australia's Birdata database. However, comparatively few geographic regions and taxonomic groups are sufficiently covered by standardised datasets. Semi-structured citizen science projects, which collect information on survey protocol and effort without requiring a standardised methodology, may be viable alternative or additional data sources if the approaches utilising them are resilient to, or can be adjusted for, variation in survey methodology. To examine this, we replicated our original typology development process using surveys from the Cornell Laboratory of Ornithology's eBird database, constrained to different thresholds of survey effort, and compared the results to those we obtained from the BirdLife data. Through this exercise, we note some strengths and weaknesses of using semi-structured data and identify key considerations for wider implementation of our typology development process.

Cormorants prefer water with high dissolved oxygen content and aquatic vegetation: An occupancy modelling study in the polluted river Yamuna in Delhi, India

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Cormorants, as piscivorous apex predators and environmentally sensitive taxa, serve as reliable bioindicators of freshwater ecosystem integrity. This study assesses the occupancy patterns of two sympatric species—*Phalacrocorax carbo* (Great Cormorant) and *Microcarbo niger* (Little Cormorant)—along a 102 km stretch of the Yamuna River, encompassing the highly degraded 48 km Delhi segment. Using a single-season occupancy modelling framework (MacKenzie *et al*., 2002) and detection/non-detection data from 176 spatially independent sites (2018–2019), we evaluated species–habitat associations in relation to key abiotic and anthropogenic variables: dissolved oxygen (DO), pH, total dissolved solids (TDS), aquatic vegetation (VEG), human disturbance (HD), and solid waste (SW). Model selection based on Akaike Information Criterion (AIC) indicated that occupancy probability (ψ) for both species increased with moderate DO concentrations (3–4 mg/L), reflecting a preference for suboxic but non-hypoxic conditions. In contrast, ψ declined with elevated TDS and SW, underscoring aversion to eutrophic or anthropogenically degraded waters. The Little Cormorant exhibited greater sensitivity to water chemistry, particularly TDS and pH, whereas the Great Cormorant was more affected by HD and SW, suggesting divergent ecological tolerances. Detection probability (*p*) was negatively influenced by VEG and HD, highlighting the necessity of accounting for detection bias in avian occupancy surveys. Both species showed markedly reduced occupancy in the lower section of the river, characterised by maximal pollution and flow alteration. These results affirm the utility of cormorants as sentinel species in monitoring freshwater health and underscore the urgent need for wastewater remediation and riverine habitat restoration in urban landscapes.

Are there genetic benefits to multi-source translocations in Aotearoa New Zealand's Toutouwai / North Island Robin?

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Translocations are the human-assisted movement of plants or animals from one location to another to found a new population or supplement an existing one. Such endeavours are both logistically and financially expensive. As such, maximising translocation success is paramount. From a genetic perspective, translocations that source individuals from multiple source locations theoretically introduce greater diversity to the founded or supplemented population than single-source translocations, which can have associated fitness benefits. However, multi-source translocations come at a greater expense (time and money). Here, we use a genomic approach (genotyping-by-sequencing, GBS) to compare the genetic outcome of single-source versus multi-source translocations in the Toutouwai/North Island Robin (*Petroica longipes*) of Aotearoa New Zealand. We also examine the genetic characteristics (genetic diversity and inbreeding levels) of those translocated Toutouwai that survive to the first breeding season (i.e. putative founders). We created a single-nucleotide polymorphism (SNP) dataset of 198,474 SNPs among 413 Toutouwai from eight populations, involved in eight translocations. Survival to the first breeding season was determined by resighting individually-marked Toutouwai, which allowed us to explore differences between individuals that survived to the first breeding season (putative founders) and those that did not survive. Genetic diversity, inbreeding levels, and survival for both single- and multi-source translocations were examined to explore whether there are any benefits of sourcing translocated individuals from multiple populations. Our findings will help inform future translocations of this and other species.

Birds of the World: Activating a global partner network to advance ornithological knowledge and conservation

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Effective bird conservation depends on access to reliable, synthesized knowledge of species' life histories – spanning taxonomy and phylogeny, functional traits, demography, habitats, diets, moult cycles, movements, and indigenous knowledge. Yet such critical information is often fragmented across disparate resources or remains unpublished. Birds of the World (BOW) offers a platform to bridge these gaps through activating a global network of partners—including over 2,200 ornithologist authors and 36 international conservation organizations—who contribute their expertise to create and update authoritative, editor-reviewed species accounts for all 11,000+ bird species and 250+ families. By integrating observation data from eBird, multimedia from the Macaulay Library, and ecological insights, BOW partners transform scattered data into actionable knowledge. This collaboration has yielded updates of more than 2,700 species accounts in recent years, empowering researchers, educators, policymakers, and conservationists worldwide to make informed decisions that precisely target challenges and optimize conservation impact. Birds of the World exemplifies the power of partnerships to synthesize science, drive discovery, and guide effective action to conserve avian biodiversity on a global scale.

Implications of landscapes dominated by forest plantations on bird species

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Working lands with forest plantations are widespread. To sustain biodiversity in these landscapes there is a need to understand how species respond to patterns such as the amount and configuration of remnant vegetation. We examine how bird species are shaped by landscape composition and configuration in working lands with extensive

forest plantations in south-eastern Australia. We used a whole-of-landscape study design, surveying birds in 36 landscapes (each 1 km in diameter) with Blue Gum (*Eucalyptus globulus*) plantations. Landscapes varied in the proportion (0–72%) and arrangement of remnant vegetation. Birds were surveyed four times (8 sites per landscape) at a total of 288 sites. We modelled responses of bird species as a function of remnant vegetation amount and configuration, and the diversity of landscape elements. We detected 107 bird species and quantified landscape effects at three levels – site, landscape and extended landscape – on 26 species occurring at ≥10% of sites. Overall, bird species showed varied responses, with some such as the White-throated Treecreeper (*Cormobates leucophaea*) responding at all levels and others such as the Gang-gang Cockatoo (*Callocephalon fimbriatum*) at only one. The distribution of bird species is linked to the occurrence, amount and configuration of remnant vegetation within working lands composed of tree plantations. While the distribution of remnant vegetation in the landscape had strong effects on selected bird species, we also recorded several species and groups of birds that are common even in landscapes with a large proportion of plantations. This information can be used to identify priority species for habitat protection and ways to improve working lands for bird conservation, including through enhancing and connecting areas of remnant vegetation at appropriate spatial scales.

Deterrence and diversion: Investigating new ways of managing Aotearoa's Swamp Harrier (Kāhu) to protect our most endangered bird: the Tara Iti

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The New Zealand Fairy Tern (*Sternula nereis davisae* - Tara iti), is New Zealand's most endangered bird, with an estimated adult population of 28 individuals, a figure that has remained stable for around two decades. While ground based predator control has improved, avian predation – particularly by Australasian Harrier Hawk (*Circus approximans* - Kahu) and Southern Black Backed Gull (*Larus dominicanus* - Karoro) now poses the greatest threat to breeding success. This study explores two novel, non-lethal strategies for managing Kahu: 1. Supplementary feeding Kahu nests, aims to fulfil their nutritional requirements thereby reducing predation on local nesting birds. 2. Using technology such as a drone or a bird mimicking drone such as the 'Robofalcon' to deter Kahu from hunting in sensitive areas. These approaches aim to offer more ethical, cost effective and more sustainable alternatives to current management practices of culling. Additionally, this study will also analyse the gut contents of culled Kahu. This will provide useful information on the diet composition of Kahu in the area and shed light on their food preferences which may inform management practice on whether all Kahu are consuming seabird chicks. Together, these three approaches will provide critical insights into the threat posed by Kahu to vulnerable species, and evaluate the potential of non-lethal interventions to mitigate their impact on Tara iti.

Telling the time in the egg: development of the avian circadian network during embryonic life.

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Life on Earth has always evolved in the presence of daily cycles of light and temperature. These changes are detected by animals, whereby a group of genes called clock genes rhythmically express and subsequently time physiological and behavioural changes. Within adult animals, clock genes rhythmically express differentially across tissues to reflect periods of activity/rest for optimal function. Yet, it remains unknown when the central clock starts in avian embryos and how the establishment of rhythmic gene expression varies across the body. To test this, we exposed developing precocial embryos (*Gallus gallus*) to rhythmic cycles of light and temperature or a combination of the two using a 2x2 factorial design. We tested how the development of rhythmic gene expression is established i) across embryonic life, ii) across tissues and iii) across incubation conditions. Remarkably, we found that incubation conditions differentially impact the establishment of rhythmic gene expression and subsequently the establishment of biological pathways in developing embryos. Furthermore, tissues differed in their response to external stimuli, differentially impacting their development and rhythmic biological functions. To our knowledge, this is the first study that provides evidence on how

rhythmic gene expression develops in any bird species across embryonic life. This study raises questions on the impact that urban light may have on impeding the establishment of rhythmic gene expression in developing birds. Importantly, it also highlights the crucial role that light and temperature cycles could play in breeding programs in simulating natural environmental conditions during incubation for optimal development in developing birds.