BIRDS NEW ZEALAND
Te Kāhui Mātai Manu o Aotearoa

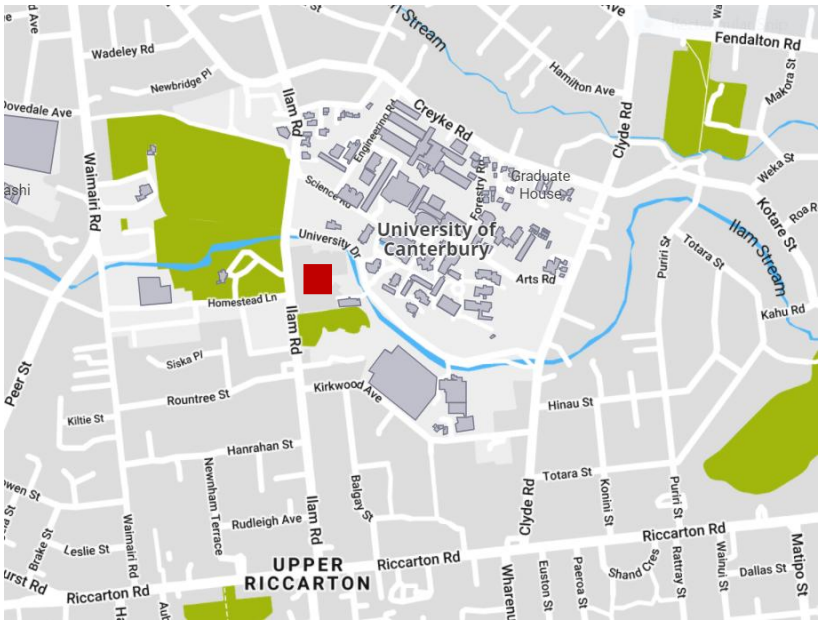
NZ Bird Conference 2022
Christchurch
4-6 June

Programme & Abstracts

On behalf of Canterbury Birds New Zealand
Welcome to Christchurch!

The 2022 NZ Bird Conference and Birds NZ AGM will be held at the University of Canterbury Students Association's new Haere Roa building, 90 Ilam Road, Ilam, Christchurch.

For conference details, AGM files, online registration and a conference programme with linked abstracts visit birdsnz.org.nz/nz-bird-conference/



Haere Roa Events Centre

Registration
Early registration is open Friday the 3rd - 6-7:30PM at Haere Roa. Registration opens at 8am on the 4th. Please be seated by 8:45 for the conference opening.

Covid precautions. Though not compulsory in the venue the organisers request that conference attendees wear a mask when not eating or drinking to keep other attendees as safe from Covid as possible and stay away from the venue if they have cold/flu-like symptoms.

Parking. Parking is available at the venue and on some nearby streets. Take careful heed of the numerous different parking restrictions in the area.

Public transport. Bus route 3 to Airport or Sheffield Crescent goes from City Centre Bus Exchange, along Riccarton Road and turns right along Clyde Road. Alight at 2nd stop on Clyde and walk via University Drive, or 3rd stop and walk through campus past University Bookshop to the UCSA Haere Roa Events Centre. Route 3 returns to the City along Ilam Road with the stop near UCSA building.

From the Bus Exchange, route 5 to Rolleston also goes along Riccarton Road. You can walk along Ilam Road from there. Or change to the Orbiter bus which turns right onto Waimari Road and walk down Homestead Lane.

From the City, there is a nice walk through the Botanic Gardens or Hagley Park, along Kilmarnock St, Kahu St and then join the cycle route through Riccarton Bush (adjacent to Deans Bush) that goes through to the University. 50-60 minutes.

Accessibility. We've done our best to ensure the conference is accessible, however if there is specific help you need please contact the organisers.

PROGRAMME: Saturday 4 June

	8:45	**Opening welcome and announcements**	
	Session 1	**Plenary address and seabird biology**	
1	9:00-9:30	Plenary: James Briskie	Will a Predator Free New Zealand open a Pandora's box for introduced birds?
2	9:30-9:45	Dan Burgin	At sea captures of tākoketai/black petrels and other seabirds using a cast net
3	9:45-10:00	Claudia Mischler	Southern royal albatross - a brief snapshot
4	10:00-10:15	James Russell	Spatio-temporal variation in chick growth and breeding success in the grey-faced petrel
	10:15-11:00	Morning tea	
	Session 2	**Stressed birds**	
5	11:00-11:15	Victoria L. Smith	Stressed out sootys: comparing interannual stress levels of sooty and flesh-footed shearwaters in Aotearoa
6	11:15-11:30	Ariel-Micaiah Heswall	Where are they landing? Mapping seabird fallout from artificial lighting in Auckland, New Zealand
7	11:30-11:45	Maira Fessardi	Stress physiology of grey-faced petrels: interannual measures of feather corticosterone as a conservation tool
8	11:45-12:00	Vanessa Kennard	Use of ptilochronology and feather stable isotopes to determine the causes of decline in the Australasian bittern/matuku in New Zealand
9	12:00-12:15	Grant Davey	The Ashley-Rakahuri Braided River Bird Habitat and Gravel Extraction
10	12:15-12:30	S. Lamb	Presence of plastic pollution on seabird islands: identifying hotspots for flesh-footed shearwaters
	12:30-1:30	Lunch	
	Session 3	**Monitoring and conservation**	
11	1:30-1:45	J.H. Fischer	Structured decision-making to guide values-based conservation of the critically endangered Kuaka/Whenua Hou diving petrel
12	1:45-2:00	Robin Toy	Long-term forest bird monitoring by a community conservation group in Kahurangi National Park
13	2:00-2:15	Christopher Bycroft	Sixteen years of monthly bird monitoring at the western end of Lake Rotoiti, Rotorua, and implications of one-off surveys
14	2:15-2:30	Chris Muller	Population monitoring of hoiho in the subantarctic - challenges, knowledge gaps and recommendations for the future
15	2:30-2:45	Matt Rayner	Seasonal movements and foraging activity of black-winged petrel from three New Zealand colonies
16	2:45-3:00	Graham Parker	Are we there yet? Seabird bycatch in Aotearoa and beyond
17	3:00-3:15	Laureline Rossignaud	Trends in bird counts 1978-2020 in Craigieburn Forest with variable control of mammalian predators
	3:15-3:30	Poster talks (see below)	1-2 minute talks by each poster presenter
	3:30-4:00	Afternoon tea & Poster session	

1P		Richard N. Holdaway	Moa as monitors of volcanogenic environment change
2P		Rachel P. Hickcox	Risks and refugia: assessing the spatial overlap between yellow-eyed penguin foraging distribution, commercial fisheries, and marine protected areas
3P		Paul R. Fisher	Describing the moult of the South Island fernbird: can birds be aged and sexed in the hand?
4P		Christopher Dawson	Native vs. introduced: does feeding of urban waterfowl by the public disproportionately favour one over the other?
5P		Isabella H. Stainthorpe	Increases in native bird diversity and abundance on the University of Canterbury campus over the past 30 years
6P		Archie MacFarlane	Long-term consequences of genetic rescue in two bottlenecked populations of the South Island robin
7P		Nyil Khwaja	Recruitment, survival and breeding success in a declining rifleman population
8P		Emily Beasley	Gull-human interactions in an urban population of herring gulls and lesser black-backed gulls
9P		Lucy Howell	Monitoring kororā/little blue penguin populations on Banks Peninsula using a portable MiniION sequencing device
10P		Stephen Rowe	The impacts of soil as a probiotic in altering the gut microbiome of the Ōkārito kiwi (*Apteryx rowi*) in hatcheries
11P		Chris G. Muller	Improving VHF tracking efficiency of wildlife using an Unmanned Aerial Vehicle (UAV) – A case study locating yellow-eyed penguin nests
	Session 4	**Data and bird banding**	
18	4:00-4:15	Bruce McKinlay	Old note books and what to do with them
19	4:15-4:30	David S. Melville & Scott Butcher	Bird banding to support local government biodiversity programmes and monitoring outcomes: a study of the South Island fernbird in Nelson, New Zealand
20	4:30-4:45	Dan Burgin	New Zealand Bird Atlas year 3 update
21	4:45-5:00	Michelle Bradshaw	Banding through the ages
	5:00-5:30	Bird banding gathering	
	5:00-5:30	eBird and NZ Bird Atlas workshop	
	5:00-7:00	Drinks - a bar will be available at the venue	
	7:00	Informal Dinner	

PROGRAMME: Sunday 5 June

	8:50	**Announcements**	
	Session 1	**Something for everyone!**	
22	9:00-9:15	Graeme Taylor	Trends in Birds New Zealand funded research - what are people studying and what are the priorities for the future?
23	9:15-9:30	Sahar Firoozkoohi	Morphological variation of introduced passerines may indicate their adaptive directions of successful invasion
24	9:30-9:45	James Savage	Coordination and cooperation in avian parental care
25	9:45-10:00	Daria Erastova	Urban sugar water feeding is associated with infection prevalence and body condition in birds
26	10:00-10:15	Rebecca Teele	Finding the balance for development requirements within braided river systems
27	10:15-10:30	Jodie Crane	An update on the conservation management of the critically endangered kākāpō
	10:30-11:00	Morning tea	
	Session 2	**Genetic approaches**	
28	11:00-11:15	Ilina Cubrinovska	Managing inbreeding depression in captive breeding for translocation population of tchūriwat'/tūturuatu, a nationally critical shorebird
29	11:15-11:30	Alexander J.F. Verry	Ancient DNA reveals extensive diversification in the extinct New Zealand bush wren
30	11:30-11:45	Olivia Janes	Applying new tools to support the long-term recovery of a Nationally Critical shorebird, tchūriwat'/tūturuatu/shore plover
31	11:45-12:00	Kamolphat Atsawawaranunt	The past and present of New Zealand's common myna: insights from genomic analyses
32	12:00-12:15	Rebecca French	Using metagenomics to study the viral ecology of New Zealand avifauna
33	12:15-12:30	Imogen Foote	A whole-genome approach to resolve the genetic structure of Antipodean and Gibson's albatross populations
	12:30-1:30	Lunch	
	Session 3	**A little more for everyone and final plenary**	
34	1:30-1:45	André Bellvé	Burrowing into the past: reconstructing distributions of Procellariiformes
35	1:45-2:00	Richard N. Holdaway	The Manawatu-Tararua Highway fossil avifauna: a unique window into the late Pleistocene of North Island, NZ
36	2:00-2:15	Annemieke Hendriks	Getting stuffed: an investigation into marked taxidermy specimens
37	2:15-2:30	Blake Hornblow	Foraging ecology of tawaki (Fiordland penguin) in Doubtful Sound
38	2:30-3:00	Plenary: Colin Miskelly	Checklist of the Birds of New Zealand - what has changed since 2010?
	3:00-3:30	Afternoon tea	
	3:30-5:00	**AGM and awards**	
	5:00-7:00	Drinks - a bar will be available at the venue	
	7:00	Conference Dinner	

Saturday 4 June Talks

1. Will a Predator Free New Zealand open a Pandora's box for introduced birds?

James V. Briskie[1]
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Predator Free New Zealand aims to extend the success of local predator control programmes to a nation-wide scale with expected benefits to native biodiversity. However, like Pandora's box, large-scale predator control could also bring unexpected consequences such as increased populations of introduced birds, potentially countering benefits to native spcies. What is the evidence that introduced birds in New Zealand have a negative impact on native birds? How will widespread predator control affect the populations of introduced bird species and which species will be impacted? Will greater populations of introduced birds increase the risks to native birds? In this talk I'll review what we know about the impacts of introduced birds on native birds in New Zealand, and whether we should be concerned that programmes to control introduced mammalian predators at a national scale might run the risk of replacing one group of invasive species with another.

2. At sea captures of tākoketai/black petrels and other seabirds using a cast net

Burgin D.[1], & Crowe, P.[2]
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The monitoring of tākoketai/black petrels (*Procellaria parkinsoni*) has been primarily undertaken on-land at their two breeding colonies located on Aotea/Great Barrier Island and Te-Hauturu-o-Toi/Little Barrier Island. Here, we report on a potential monitoring method, the at-sea capturing of tākoketai from the back of a vessel using a cast net in the waters north-east of the Hen and Chicken, and Mokohinau Island groups, Northland, during in 2021/22. We present results on capture rates, as well as recaptures of tākoketai previously banded at the two known study colonies. Additionally, we report on the suitability of this method for future monitoring work of both tākoketai and other species of seabird, particularly in providing an additional method for estimating population size to complement ground-based surveys. With the poor apparent recruitment of birds back into the breeding population due to at-sea mortality factors such as fisheries-related mortality, we assess whether this method could support risk analyses to assist with reducing long term fisheries bycatch risk.

3. Southern royal albatross – a brief snapshot

Claudia Mischler
Department of Conservation, 15 Wairepo Road, Twizel 7901. cmischler@doc.govt.nz

Southern royal albatross are endemic to New Zealand, and Campbell Island is home to over 99% of the southern royal breeding population. Since its discovery in 1810, the island has been affected by human modifications, such as sealing, whaling, and farming. Modifications have also reduced albatross numbers through direct depredation of eggs and chicks by cats

and rats, depletion of suitable nesting habitat through sheep farming, and depredation of birds by humans. Southern royal albatross are slow to mature and only breed biennially and are therefore slow to recover from any population declines.
Between the 1940s and 1990s, breeding, banding, and population studies were set up in two plots on Campbell Island with regular and thorough studies from 1987 to 1998, and three additional plots were added in the 1990s to supplement study area counts. This has provided a clear baseline of data. The most recent census in 2004-2008 estimated 8,300 to 8,700 breeding pairs. In March 2020, a brief count of one of the study plots was conducted, and this presentation will report on these results and what it means for future monitoring on Campbell Island.

4. Spatio-temporal variation in chick growth and breeding success in the grey-faced petrel

Karen Bourgeois[1,2]; Jemma Welch[1,3]; Sylvain Dromzée[1,4]; Rob Dunn[1]; Megan Friesen[1,5]; Matt Rayner[6]; Graeme Taylor[7]; **James Russell**[1]
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[3]Department of Conservation, Chatham Islands, New Zealand
[4] Parc Naturel des Estuaires Picards et de la Mer d'Opale, Office Français de la Biodiversité, Saint-Etienne-au-Mont, France
[5]Saint Martin's University, Lacey, Washington, USA
[6]Auckland Museum, Auckland, New Zealand
[7]Department of Conservation, Wellington, New Zealand

The grey-faced petrel is endemic to the North Island of New Zealand. Although not threatened overall, this species is only abundant at a few sites, and in very small declining populations at most other sites. Causes for decline can be varied but are generally introduced mammal predation or changes in oceanographic conditions. Independently of predation, marked variation in chick development and breeding success has been observed among colonies, particularly between those located along the East and the West coasts, and among years. We investigated the role played by adult foraging strategy, oceanographic conditions and predation in breeding variation. East coast colonies were monitored for breeding performance from 2011 to 2015 breeding seasons. Both East and West coast colonies were monitored for breeding performance as well as adult foraging strategy during the 2013 and 2014 breeding seasons. We deployed GPS devices to identify foraging areas, determined the frequency of chick feeding and adult foraging trip duration, and evaluated trophic position by stable isotope analyses of adult and chick diet and their prey. We found that grey-faced petrels breeding on the East coast tended to travel further from their breeding ground to feed, foraging for a longer period and thus fed their chicks less frequently. Stable isotope analyses revealed different $\delta^{15}N$ and $\delta^{13}C$ values between East and West coast breeders suggesting the use of different trophic levels and foraging habitats during chick rearing. Oceanographic conditions affected chick growth while predation by introduced mammals strongly impacted breeding success.

5. Stressed Out Sootys: Comparing interannual stress levels of sooty and flesh-footed shearwaters in Aotearoa

Victoria L. Smith*[1], Graeme A. Taylor[2] and Brendon J.Dunphy[1]
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*Student presentation

Sooty shearwaters (*Puffinus griseus*) are trans-equatorial, migratory seabirds that raise their young across cooler regions of coastal Aotearoa. However, they are sensitive to changes in ocean conditions, leading to adults redirecting energy resources away from their reproductive requirements, resulting in increased stress, poor body condition and higher mortality in their offspring. As oceans continue to warm alongside increases in the frequency and intensity of marine heatwaves sooty shearwaters, especially those at the northern extremes of their range, are placed under increased stress. Using haematology and feather corticosterone levels, we aim to compare stress among breeding adults of sooty shearwaters and flesh-footed shearwaters (*Puffinus carneipes*), a warm temperate species that live sympatrically at Te Henga. The most northerly colony (Te Henga) has experienced a population decline over recent decades and preliminary results, when compared with historical data spanning 9 years, indicates that these individuals are sensitive indicators of heatwaves. Specifically, during heatwave years adults show an increase in MCH, linked to nutritional deficiencies (low body weight) and increases in H/L ratios which is indicative of high stress. Conversely, the physiology of flesh-footed shearwaters remains relatively unaffected. We hypothesise that the increased stress in sooty shearwaters may be linked with changes in food supplies as a consequence of changing ocean conditions.

6. Where are they landing? Mapping seabird fallout from artificial lighting in Auckland, New Zealand

Ariel-Micaiah Heswall[1*], Lynn Miller[2], Ellery McNaughton[1], Amy Brunton-Martin[3], Kristal Cain[1], Megan Friesen[4], Anne Gaskett[1]
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* Student presentation

One of the most highly threatened animal groups are the seabirds. Seabirds are at risk from an array of threats including light pollution. Artificial light at night (ALAN) is a growing concern for seabirds as they become disoriented and grounded by the lights. Fledglings are especially susceptible to artificial lights. The Hauraki Gulf, a seabird hotspot, is located near Tamaki Makaurau/Auckland, which is Aotearoa New Zealand's largest urban city with considerable ALAN, and regularly documented events of seabird groundings. We aim to identify the locations especially prone to seabird groundings in the Auckland region, and test for correlations between this seabird fallout and ALAN. Using the Wildlife Medical Rehabilitation Database we mapped seabird fallout in Auckland between 2018-2021. We also mapped the seabird fallout against the predicted night sky brightness/night sky quality. We found that the greater the light pollution, the greater the chance of a seabird becoming grounded. Also, there were differences in groundings between the urban and rural areas of Auckland for the different species. For example, the Cook's petrel had the greatest fall-out in the urban areas compared to the other seabird species. This is potentially due the Cook's petrel fledglings crossing over the Auckland isthmus on their migration route to the Tasman Sea. Different species could have differences in their visual ecology and breeding locations which may influence light attraction. Greater awareness of seabird groundings from light attraction in Auckland is needed to generate a larger database of the location of seabird groundings across Auckland.

7. Stress Physiology of Grey-Faced Petrels: interannual measures of feather corticosterone as a conservation tool

***Míra Fessardi[1],** Brendon J. Dunphy[1]**;** Todd Landers[2], Kristal Cain[1]
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*Master's student

Seabirds are the most threatened group of birds globally, and of critical ecological importance to ocean ecosystems. Breeding seabirds are touted as a potential low-cost bioassay of ocean health as reductions in ocean productivity influence foraging opportunities and increase bird stress. Accordingly, stress hormones (i.e., corticosterone/CORT) often show a strong link to food supply, suggesting they are useful tool for linking climate change, foraging conditions and seabird demographics. Because higher CORT levels in chicks experiencing stress are deposited in developing feathers, measures of feather CORT may provide useful estimates of the consequences of environmental stressors. This study investigated whether variation in Grey-faced petrel *(Pterodroma gouldi)* feather CORT can be used as a proxy of ocean conditions and as a monitoring tool for population breeding success. Reproductive success and feather CORT levels were obtained from chicks at Ihumoana Island over four years (2017, 2019-2021). These were matched to relevant remote sensing data to investigate whether feather CORT reflects changes in ocean conditions, and to measurements of feather quality and breeding success ((sea surface temperature and primary productivity) i.e., chick's body condition, fledging success for laid eggs). We found that chick stress levels fluctuated among seasons, but variation was not closely tied to ocean conditions. Productivity and fCORT were also not tightly coupled, however, increased fCORT and lower feather quality (brightness) predicted reduced breeding success. Taken together these measures offer a promising tool for seabird conservation.

8. Use of ptilochronology and feather stable isotopes to determine the causes of decline in the Australasian bittern/matuku in New Zealand

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The Australasian bittern/matuku (*Botaurus poiciloptilus*) has been classified as 'Threatened-Nationally Critical', but reasons for its decline are unclear. Recent autopsies on birds found dead revealed low bone marrow fats, suggesting birds are undergoing prolonged periods of starvation. To determine if dietary shifts due to a lack of suitable prey may be a cause of bittern decline, we used a combination of ptilochronology and stable isotope analysis on feathers from contemporary birds collected by DOC and historical museum skins sourced from throughout New Zealand. Ptilochronology involves measuring growth bars along the length of a feather. Consistent distances between growth bars are representative of a bird in good condition, whilst uneven and inconsistent growth bars are representative of periods of a bird in poor condition. Ptilochronology testing revealed an increase in growth bar variation in bitterns over the past ~130 years, with the largest changes occurring over the past ~20 years. This is consistent with recent environmental changes leading to bitterns experiencing greater levels of nutritional stress. To explore dietary and trophic level changes we measured carbon ($\delta^{13}C$) and nitrogen ($\delta^{15}N$) stable isotope ratios on bittern feathers from the Canterbury and Bay of Plenty regions. Our results identified inter- and intra-individual trophic position shifts, but we could not assess whether these differences were caused by periods of starvation and/or consumption of species in lower trophic positions. Both factors are likely to

result in a decline in body condition. Future sampling of recently collected bittern feathers to analyse compound specific isotope of nitrogen in amino acids will enable us to establish if there have been baseline shifts in energy sources and/or changes in trophic level of bitterns over time. We can then identify modern-day locations in which bitterns are most at risk.

9. The Ashley-Rakahuri braided river bird habitat and gravel extraction

Grant Davey[1], Nick Ledgard
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The Ashley-Rakahuri River is an important braided river bird nesting habitat. Key nesting requirements of these birds include braided sections of river with weed-free coarse gravel and elevated islands for protection against flood waters. These islands must have flow around them to deter predators. Gravel extraction can damage this habitat, but current Environment Canterbury gravel resource consent conditions only address bird disturbance. Recent discussions with Environment Canterbury (through the Braided River Revival staff), and with extractors, appear to be leading to significant progress and more protection in the future is envisaged.

10. Presence of plastic pollution on seabird islands: identifying hotspots for flesh-footed shearwaters

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Through their ingestion of plastics whilst foraging, seabirds act as vectors of plastic transmission from the marine environment to their terrestrial breeding grounds. Previous work almost a decade ago showed that the seabird colonies on Ohinau Island off the Coromandel Peninsula was a hot spot for plastic pollution within New Zealand. Here, we report on the incidental plastics found at, or near to, burrows while undertaking routine population monitoring of toanui/flesh-footed shearwaters (*Ardenna carneipes)* on Ohinau and Lady Alice Island (within the Hen and Chicken Island chain, Northland) during the 2021/22 breeding season. Additionally, we report on the lack of plastic debris found whilst undertaking a flesh-footed shearwater population census on Titi Island within the Marlborough Sounds during the 2021/22 breeding season. We show that the seabird colonies on Ohinau Island continue to be a hotspot for plastics, whereas only a handful of plastics were recovered from Lady Alice Island. The Titi Island seabird colonies thus far appear to be untouched by plastic pollution. We discuss possible reasons underlying these island differences and discuss the importance of monitoring plastics across seabird colonies in New Zealand.

11. Structured decision-making to guide values-based conservation of the critically endangered Kuaka/Whenua Hou Diving Petrel

JH Fischer[1], KA Parker[2], CF Kenup[3], GA Taylor[1], I Debski[1] & JG Ewen[4]
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Hidden values can create conflict. Therefore, transparency through explicit statements of underlying values can improve implementation of conservation management. This is particularly true for seabird conservation because seabirds utilise different ecosystems, increasing the number of values and uncertainty, further complicating management decisions. Through a structured decision-making process, we enabled values-based

conservation of Kuaka/Whenua Hou Diving Petrels (*Pelecanoides whenuahouensis*), which persist in low numbers (~210 adults) at a single colony on Whenua Hou/Codfish Island and are at risk from a several threats (e.g., storm-induced erosion, interspecific competition, and vessel-based light pollution). We formed a working group consisting of Kāi Tahu, government, and industry representatives. Together, we identified seven fundamental objectives (values) and eleven management alternatives, ranging from Status Quo to translocations and vessel curfews. By combining expert panels, Shiny-app-based elicitations, and projections using integrated population models (IPMs), we then predicted future outcomes, including associated uncertainty across objectives for all alternatives. This approach allowed the working group to navigate the decision landscape, avoid conflict, make well-informed trade-offs, and identify the best potential management option for Kuaka. A values-based approach allowed for transparent and inclusive decision-making for conservation management of Kuaka and has the potential to improve the recovery of many other threatened seabirds worldwide.

12. Long-term forest bird monitoring by a community conservation group in Kahurangi National Park

Robin Toy and Sandy Toy
Friends of Flora, Motueka, New Zealand (twotoys@xtra.co.nz)

Friends of Flora is a community conservation group that has worked with the Department of Conservation for over 20 years to enhance the biodiversity of the Flora Stream project area in Kahurangi National Park. Here we discuss the long-term bird monitoring that underpins our pest control activity. Methods include five minute bird counts, acoustic monitoring of birds that call at night, whio walk-through surveys, and motion-triggered camera monitoring of kea and roroa nest burrows. This monitoring has led to us expanding stoat trapping to cover about 10,000 ha. It has also identified cats and rats as new, hard-to-manage pests.

13. Sixteen years of monthly bird monitoring at the western end of Lake Rotoiti, Rotorua, and implications of one-off surveys

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Many avifauna assessments are undertaken as one-off surveys, or repeat surveys at similar times of the year. Results are presented of 16 years of monthly bird counts (adults, and juveniles in three size classes) on the same part of Lake Rotoiti. In 2005 a bird monitoring programme was initiated to monitor the effects of a diversion wall structure in Lake Rotoiti. Monitoring was established prior to wall construction and was funded by Bay of Plenty Regional Council until autumn 2017 and has been continued in a private capacity since then. Lake Rotoiti is outstanding water bird habitat and the western end being monitored contains representative populations of key water bird species in the Rotorua Lakes complex. These lakes support the largest national populations of two endemic species: weiwea/New Zealand dabchick (*Poliocephalus rufopectus*) and pāpango/New Zealand scaup (*Aythya novaeseelandiae*). Some species at Rotoiti show marked seasonal patterns throughout the year. Higher numbers of adult pāpango/scaup are present between July and January, with numbers declining from late summer. There is also some evidence that population of pāpango may be slowly declining at the site, although the population does vary between years. Similar information will be presented for other water birds, and the time of year young have been recorded. Breeding season information is potentially useful for the timing of lakeshore developments.

14. Population monitoring of hoiho in the subantarctic – challenges, knowledge gaps and recommendations for the future

Chris Muller[1*], Rebecca French[2*]
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Accurately and regularly monitoring the endangered hoiho/yellow-eyed penguin population is critically important for their conservation. However, this species is a cryptic breeder, making population monitoring extremely challenging. Monitoring in the northern population is time- and labour-intensive, involving rigorous nest searches along the South Island and Stewart Island coastline every year to monitor breeding effort and population trends. However, due to the size of the coastline, difficult terrain and isolation of the Subantarctic, the same nest search method cannot be applied in the southern population of hoiho in the Auckland and Campbell Islands. This means that despite constituting over 60% of the total population, much less is known about the status and trends of the southern population. While other methods to estimate population size and trends exist, these are often less accurate when applied to hoiho and have significant biases that must be accounted for. In light of these challenges, we created a report at the request of the Department of Conservation which synthesised the current state of hoiho monitoring in the Subantarctic, identified gaps in knowledge, and developed recommendations for a future hoiho monitoring programme in the Subantarctic. Herein we present the results of this report, with a focus on the recommendations for future monitoring to achieve the objective of improved understanding of hoiho distribution, numbers and trend information.

15. Seasonal movements and foraging activity of black-winged petrel *Pterodroma nigripennis* from three New Zealand colonies

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Black-winged petrels (*Pterodroma nigripennis*) were tracked from Rangitahua (Raoul Island, The Kermadecs, n = 11), Burgess Island (The Mokohinaus, n = 5) and Rangitira (South East Island, Rekohu, The Chatham Islands, n = 6) between 2009 and 2010 using miniature geolocators in the first study to examine inter-seasonal movements and activity in this species. During the breeding season (November-April) birds from all three colonies foraged extensively in waters North and East of New Zealand with particular use of the subtropical convergence zone east of the Chatham Islands with maximum foraging ranges of up to 4000 km. Extensive migrations by this species occurred between April and November with migration routes shared between birds from different colonies. Atypical of other *Pterodroma* to date birds did not occupy a tight non-breeding core distribution rather migrated rapidly North-Northeast to the eastern equatorial tropical Pacific followed by more gradual movements North-West June – October reaching 30 degrees North in a broad longitudinal band west of Hawaii over 9000 km from the breeding colony. A South-West pre breeding migration was conducted over approximately 30 days. Activity data from the geolocators indicate that outside the breeding season black-winged petrels show strong nocturnal foraging behaviour with stable isotope data suggesting a mixed diet of vertically migrating zooplankton and fish prey. Comparisons of these data with work on other *Pterodroma* petrels will be discussed.

16. Are we there yet? Seabird bycatch in Aotearoa and beyond

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Aotearoa is the seabird capital of the world. Our diverse span of islands hold the highest number of breeding endemic seabird species, and more threatened seabirds, than anywhere else in the world. The space our seabirds call home for at least part of their life-cycles is one the world's largest marine exclusive economic zones. It is hugely important to Aotearoa ecologically and economically. Out there where everyday New Zealanders are not watching, seabirds and fishing vessels overlap in time and space, and at times seabirds are incidentally caught in fishing gear (bycatch).
In speaking with New Zealanders about seabird bycatch in commercial fisheries, I frequently find the problem is poorly understood, and often the ongoing challenge that bycatch presents to seabird conservation is underappreciated. Many seabirds have life history traits that make them highly vulnerable to population declines. Despite this, we are not doing a very good job collecting vital management data for many of our charismatic mega-avi-fauna.
Here I summarise the current state of seabird bycatch in New Zealand commercial fisheries and beyond, seabird bycatch mitigation practices in use, the legal requirement (or not) to mitigate seabird bycatch, current knowledge gaps, and touch on the challenges to reducing seabird bycatch from its current still-high state. I also use seabirds to briefly explore the contrasts in the approach our society currently takes to terrestrial versus marine conservation. Lastly, I suggest there is a role for a more decentralised path to achieving reductions in seabird bycatch.

17. Trends in bird counts 1978-2020 in Craigieburn Forest with variable control of mammalian predators

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Many New Zealand native bird species are threatened by introduced mammalian predators, and pest management programmes are common in the country. Despite that, measuring the efficacy of such programmes is often limited by resources and thus the long-term population status of many native birds is not well documented. Here, we examined long-term population trends of forest bird species and changes in the bird community structure at Craigieburn Forest Park where there was intermittent control of stoats (*Mustela erminea*). We analyzed 10,938 5-minute bird point counts covering the periods 1978-1982, 1999-2004 and 2019-2020 in old-growth *Nothofagus* (southern beech) forest. We assessed trends over time in the counts of each bird species with season, elevation, and site as co-variables. We also tested for a relationship with variable seed crops of the mast-seeding canopy tree, *N. solandri* var. *cliffortioides*. Bellbird (*Anthornis melanura*) was the only native species showing a continuous increase over time. In the first 25 years of the study, stoat control was intermittent and more native birds decreased than increased. In later years, stoat control was continuous, and more native species increased than decreased.
Large *Nothofagus* seed crops were associated with significant increases in all six exotic bird species tested, but only one of nine native bird species. These findings suggest that long-term trends of bird populations are influenced by the interactions of species vulnerability to stoat predation and the consistency of pest control efforts. Unfortunately, ship rats (*Rattus rattus*), which were absent at Craigieburn before 2010, are now common and may pose a new threat to native birds. Our results show that systematic long-term bird and seedfall monitoring, including careful archiving of sampling information, is helpful to guide conservation of the remaining native birds in New Zealand.

18. Old note books and what to do with them

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As the recognition of eBird as the key depository for historic as well as current ornithological observation grows we are left with the residual problem of what to do with notebooks and the records contained in them. A case study of this challenge has been being worked through in Otago in the last three years. George and Doreen Grant were long term members of the society and kept notes of the birds they saw in the South Island in the period 1966-1995. These hand written records reported the distribution of 54 species of birds. Based on the Taieri Plains at this time enabled the Grants to be close observers of the pattern of cattle egret and black-fronted dotterel on the plains at this time and they made c. 500 observations of these two species.
The challenge of digitizing these records and the importance of completing this to the stage of uploading these records to eBird is discussed. The priority for members to complete this work themselves is highlighted and the benefit.

19. Bird banding to support local government biodiversity programmes and monitoring outcomes: a study of the South Island Fernbird in Nelson, New Zealand.

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Regional councils are undertaking extensive habitat restoration and predator trapping programmes to meet biodiversity and national policy targets, with support from community groups and non-governmental environmental agencies and government funding. However, there is limited outcome monitoring of the success, over the course of projects, or once complete and whether key biodiversity species have benefited from conservation management. Nelson Birds New Zealand have commenced a banding programme to monitor the South Island Fernbird population in collaboration with the Nelson City Council and Department of Conservation. The project involves colour banding the Fernbird population in the Nelson Haven Wakapuaka Flats Esplanade Reserve and Significant Natural Area, prior to introducing predator trapping across the 30-hectare coastal saltmarsh and scrubland. The distribution of banded Fernbird, and local movements of adult and juvenile birds have been recorded over the last year from retraps and resightings of colour banded individuals using digital photography and a citizen science survey app. The project highlights how little is known about the basic ecology of the endemic Fernbird and how this study can contribute to refining survey methodologies and improving conservation management outcomes.

20. NZ Bird Atlas Year 3 Update

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The New Zealand Bird Atlas has just over two years left until the five year data collection period is complete, with a conservative estimate of $2 million worth of volunteer effort having gone into the project so far. To date just 234 of the 3,232 Atlas grid squares are still without

data, and many squares have relatively little data in them, so there's plenty birding to be done. The Atlas team will present on how this nationally significant project is progressing, some initial findings, as well as reviewing the myriad tools available to participants to assist with more targeted Atlasing, such as the Effort Map, Species Maps, Seasonal points and more. All of this to inspire the membership and community to work together to meet the Atlas project's objectives and to ensure the dataset has lasting positive impacts on bird conservation and research in Aotearoa New Zealand, at a variety of scales.

21. Banding through the ages

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The Department of Conservation's Banding Office curates New Zealand's national bird banding data spanning 86 years and comprising over 1.5 million records. This long-term dataset enables us to draw insights into banding trends while also highlighting missing records or under-represented taxa. We will compare three different decades of banding and recapture data: the 1960s, 1990s and 2010s. Richer insights can also be drawn from known-age birds – for instance calculating longevity – so we investigate the age structure of birds marked as pulli, juveniles or adults). The value of banding data lies in the proportion of marked birds that are reported (re-sighting and recovery data). From 1960 to 2000 this proportion was over 20% but dropped sharply to 7% after 2000. The new FALCON Bird Banding Database is an accessible online repository of all national banding data that enables banders to upload, view and export data while retaining control over data sharing. This system has already facilitated increased reporting of re-sighting and recapture data to 18% of marked birds in the past decade. We hope that continued engagement will facilitate coordination between researchers and make the most of this valuable dataset for ages to come.

Sunday 5 June Talks

22. Trends in Birds New Zealand funded research – what are people studying and what are the priorities for the future?

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Birds New Zealand, in partnership with their sponsors, fund a significant amount of research on New Zealand birds through small grants handed out annually, mainly to student projects. These include the Birds New Zealand Research fund, as well as the David Medway Scholarship and the Projects Assistance Fund. These science projects are assessed and vetted by the Birds New Zealand Scientific Committee before being approved for funding by the Birds New Zealand Council. The research projects have largely been driven by the interests of the applicants and their supervisors, with some guidance from Birds New Zealand about preferred projects. This talk will assess the general themes and topics covered in the past five years that were supported by Birds New Zealand. What types of birds are being studied, where and by what research groups? What are the broad topic headings that are covered in these projects? How does this research assist conservation of these species or improve our ability to monitor populations or understand the pressures birds are facing? Birds New Zealand has also prepared a list of suggested research themes that highlight gaps in our knowledge of New Zealand birds. These will be discussed in the hope that applicants will use these to help guide what types of study are needed to better understand our bird species and the habitats they live in.

23. Morphological variation of introduced passerines may indicate their adaptive directions of successful invasion

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Introductions to new anthropogenic environments requires adaptive responses for a species to thrive and establish. New challenges include food resources, temperature, competition and predation. Comparative studies of phenotypic divergence of introduced species comparing n source and introduced populations, as well as between urban and rural populations, are little studied in New Zealand. We measured variation in locomotor related traits (e.g., wing, tarsus and tail morphology) and feeding-related traits (e.g., bill morphology and body mass) along a gradient from urban to rural and between the source (England) and introduced (New Zealand) populations of blackbirds (*Turdus merula merula*) and song thrushes (*Turdus philomelos*) from the Wellington and Canterbury regions.

There were significant morphological differences in body mass of blackbirds with increasing body mass from urban to rural habitats. There were morphological differences in tarsus and tail lengths between New Zealand and the United Kingdom. The NZ population had shorter tails and tarsus length compared to the English population. Smaller locomotor morphological traits may be related to tendency of NZ populations to be sedentary, importance of flight distance, different predator pressures, sexual selection on tail length.

Testing the intensity level of pollution, predator pressures, inter-and intra-specific competitions, connectivity and composition of landscape patches may highlight the intrinsic factors important in explaining variation between these populations. Studying morphological differences would help us to understand isolation forces processes that eventually lead to reinforcement and speciation between habitats.

24. Coordination and cooperation in avian parental care

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Care by both parents is common among birds, and in a significant fraction of species offspring also receive care from other members of their social group. This creates an evolutionary tension as carers must contribute to a joint project that delivers shared benefits (successful offspring) based on the personal costs (care effort) expended by each individual. From an individual fitness perspective, how much care each carer should provide depends both on offspring need and the contributions of everyone, but carers cannot trust each other to contribute fairly as each benefits when the other(s) do a greater share of the work. Carers can adaptively adjust their behaviour by responding to others' behaviour, but carers often have only incomplete information about offspring need, the contributions of others, or future conditions. Until recently carer decisions about responding to others were poorly understood, but advances in modelling and new technologies have provided fresh insights into how individuals coordinate their cooperation over care. This talk will briefly present recent theoretical and empirical findings by the author and from an edited collection, identify outstanding questions around coordination, and suggest avenues for future research.

25. Urban sugar water feeding is associated with infection prevalence and body condition of visiting birds

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Despite the growing popularity of residential backyards sugar water bird feeding in New Zealand, the effect of this activity on wild birds remains understudied. One concern is that feeding stations can accumulate and favour infection transmission between individuals, negatively impacting visiting birds' body conditions. This is the first study in New Zealand to investigate associations between sugar water feeder presence, city climate, season, sugar water concentrations and pathogenic, parasitic infections prevalence, body condition in urban birds. Birds caught in gardens with feeders had poorer body condition than gardens without feeders, but better body condition in the city with the warmer climate during summer and in gardens with higher sugar concentration feeders in winter. All screening tests for avian pathogens (*C. psittaci* and *Salmonella spp.*) returned negative results. Avian poxvirus prevalence in tauhou (*Zosterops lateralis*) was higher in the city with a warmer climate. The likelihood of lice infection in tauhou was lower in gardens with feeders than gardens without feeders but was lower in tauhou in the warmer city, in summer, and at feeders with higher sugar concentrations. In tūī (*Prosthemadera novaeseelandiae*), the likelihood of lice infection decreased with an increase in sugar concentration. Coccidia infection was higher in tauhou in gardens with feeders. The observed associations suggest that while there are potential benefits of winter sugar water feeding for native nectarivorous birds, sugar water feeding should be carried out cautiously, with attention to feeder type and hygiene to reduce infection transmission risks.

26. Finding the balance for development requirements within braided river systems

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New Zealand's braided river systems provide essential breeding and foraging habitat for a number of At Risk and Threatened bird species. However, braided rivers are also sought-after for their abundance of gravel used for construction and landscaping requirements. As an ecological consultancy we provide assessments for companies to meet Resource Consent requirements to manage the extraction of gravel islands whilst also avoiding or minimising the disturbance to breeding birds. We complete site specific surveys, consisting of bank observations as well as site walkovers to determine the bird species present and any breeding activity. We then produce locality maps to inform suitable extraction locations. In this talk we will detail the work we have completed to date, including solutions that seek to balance the demands of development with avifaunal conservation.

27. An update on the conservation management of the critically endangered kākāpō

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The critically endangered kākāpō declined to just 51 individuals by 1995, prompting the formation of the Kākāpō Recovery Programme. Since then, intensive and innovative conservation efforts have increased the population to 201 adult individuals in early 2022. This talk will give an overview of the conservation methods currently being applied, the outcome and challenges of the 2022 breeding season, and the future of the programme.

28. Managing inbreeding depression in captive breeding for translocation population of tchūriwat' | tūturuatu, a nationally critical shorebird

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The ultimate goal of captive breeding for translocation programmes for threatened species is to prevent extinction by ensuring species have sufficient genetic diversity to adapt to environmental change, while also minimising inbreeding and any negative effects associated with it. One such threatened species currently facing this challenge is the endangered tchūriwat' | tūturuatu (New Zealand shore plover, *Thinornis novaeseelandiae*). Once widespread across New Zealand, this endemic bird is now confined to a single self-sustaining wild population on the Chatham Islands, two small translocated populations on predator-free islands (Motutapu and Waikawa), and a captive breeding for translocation population which was sourced from a small number of wild individuals in the 1990s. The captive population has become genetically differentiated from the wild population, and has been suffering from infertility and unusually frequent and severe avian pox outbreaks in recent years. Here, I will present preliminary results from my PhD research based on pedigree, life history, and genomic data to determine whether inbreeding is driving these negative fitness traits in the captive population. As well as assess whether the wild population could be used as a source for a genetic rescue to mitigate these effects. These results will be used to make recommendations for conservation genetic management of tchūriwat' including pairing decisions for captive individuals, as well as highlight the importance of genetic augmentation of the captive population.

29. Ancient DNA reveals extensive diversification in the extinct New Zealand bush wren

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Numerous bird species were driven to extinction throughout Aotearoa following human arrival and introduced mammalian predators. Among those affected was the endemic bush wren (*Xenicus longipes*). Three subspecies are currently recognised, each restricted to either the North, South or Stewart Island, and their associated near-shore islands. However, the phylogenetic relationships between different populations and subspecies is currently unknown. Here we sequenced mitogenomes from bush wren historical museum skins and analysed them within a temporal phylogenetic framework. External morphology was also examined to aid reassessment of bush wren taxonomy. Phylogenetic analyses revealed significant genetic divergence between the North and South Island/Stewart Island subspecies, with strong phylogeographic structure within South Island populations. Stewart Island specimens, described as Stead's bush wren, were closely related to southern South Island populations, and could not be readily distinguished based on external morphology. The divergence of North and South Island bush wrens was likely associated with dispersal between these two landmasses 5 Mya, linked to the formation of Pliocene islands and

straits. Near simultaneous Pleistocene diversification of South Island lineages (~800-600 Kya) was possibly promoted by glacial cycle intensification during the mid-Pleistocene transition, which isolated populations in distinct refugia. Our genetic and morphological analyses strongly support the elevation of the North and South Island subspecies to full species status, and that Stead's bush wren should be synonymised with the South Island species. Our research highlights how glaciations can be a creative evolutionary force for biodiversity and the ability of palaeogenomics to resolve the taxonomy of extinct species.

30. Applying new tools to support the long-term recovery of a Nationally Critical shorebird, tchūriwat' | tūturuatu | shore plover

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Conservation breeding programmes often rely on neutral diversity as a measure of genetic 'health'. However, incorporating functional diversity, such as immune gene diversity, may better inform species recovery. The Nationally Critical tchuriwat' | tūturuatu | shore plover (*Thinornis novaeseelandiae*) is a species whose recovery may be hampered by a lack of immune gene diversity. Unlike birds in the wild, captive birds are highly susceptible to avian pox infections and show poor immune response to vaccination. Here, we characterise toll-like receptor (TLR) diversity in relation to immune response in both the captive and wild populations. TLRs are a key part of recognition and activation pathways in the immune system. This research demonstrates the importance of functional diversity in the recovery of a Nationally Critical shorebird and is highly applicable to conservation breeding programmes of other threatened birds in Aotearoa New Zealand and beyond.

31. The past and present of New Zealand's common myna: insights from genomic analyses

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The common myna (*Acridotheres tristis*) is an invasive species in many places in the world, including New Zealand, where it is currently found across most of the North Island. Its environmental, economic and health impacts have made the myna one of only three birds on the IUCN 100 Worst Invasive Alien Species list. Historical accounts suggest that myna was introduced to New Zealand from Australia in the 1870s, where it had been introduced from India in the 1860s, but the timing, the number of individuals, the number of introductions, and the source population(s) from both India and Australia are unclear.
We have used genomics to investigate the population structure and history of myna in New Zealand. Our analyses have identified two sub-populations within New Zealand: one on the east of the North Island's axial mountain range, and one encompassing the rest of the North Island. While the former population has a smaller range, it is more genetically diverse, suggesting that it experienced less of a population bottleneck. We have identified Melbourne as the potential introduction source of mynas to New Zealand, and Maharashtra, India, as the likely origin source of these mynas. We plan to investigate the genome for signals of

local adaptations, and hopefully find out why they are so successful in New Zealand. We also plan to conduct similar analyses for the common starling (*Sturnus vulgaris*).

32. Using metagenomics to study the viral ecology of New Zealand avifauna

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Disease is a significant threat to wildlife, particularly for species with small populations and those with low genetic diversity. The emergence of new infectious diseases can occur via cross species transmission whereby benign microorganisms become pathogenic after jumping from one host species to another. Understanding the 'infectome' (viruses, bacteria, fungi etc) of New Zealand's introduced and native birds is therefore crucial for wildlife conservation. Despite this, very little is known about the viruses present in New Zealand avifauna, primarily because previous techniques required having some knowledge of what microorganisms to test for. The development of metagenomics allows the entire virome of a sample to be sequenced so that the extent and diversity of viruses (as well as bacteria and fungi) can be explored in ways that were previously impossible. Herein, we show how viral metagenomics can be applied to ecology, wildlife management, and avian conservation using examples from three studies we have conducted over the past two years on wild New Zealand avifauna. Through these studies we have discovered multiple novel avian viruses; we will discuss their potential for cross-species transmission and disease emergence.

33. A whole-genome approach to resolve the genetic structure of Antipodean and Gibson's albatross populations

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Although seabirds are a comparatively well studied group, a major barrier to their conservation is the taxonomic uncertainty that exists across many groups. For instance, albatrosses (family Diomedeidae) have been subject to several taxonomic revisions, but debate is ongoing. Genetic datasets have been used to inform albatross taxonomy, but only a handful of low-resolution genetic markers have been used, limiting the power to delineate species boundaries. Recently, genome-wide DNA sequencing has become more accessible, and this type of genomic data can greatly improve species-level taxonomic resolution.
The Antipodean albatrosses of New Zealand presently comprise two subspecies, the Antipodean albatross (*Diomedea antipodensis antipodensis*) and Gibson's albatross (*D. a. gibsoni*). Both taxa are highly threatened, due largely to mortality associated with fisheries bycatch, and the populations continue to decline. Long-term population monitoring has revealed several differences between them; when the sex is known they can be distinguished morphologically, they have distinct foraging ranges and their breeding seasons differ temporally by several weeks, yet based on current genetic data they are considered one Evolutionary Significant Unit (ESU).

We are presently assembling a reference genome for both the Antipodean and Gibson's albatross. We intend to use genome-wide SNP data to determine the level of genetic differentiation between these two subspecies and estimate demographic parameters such as genetic diversity and effective population size for each taxon. The findings from this study should help to better define species and population units, inform conservation management and provide fertile ground for further conservation genomic studies of albatross.

34. Burrowing into the past: reconstructing distributions of Procellariiformes

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Seabirds play a crucial role in linking marine and terrestrial ecosystems by moving phosphorus from the ocean to the land. Although contemporary seabird diversity and abundance are relatively high in Aotearoa, the fossil bone record reveals they were more abundant and widespread in the recent past. Seabirds declined rapidly following human arrival c. 750 years ago as a result of predation by introduced mammals, human harvesting, and habitat loss. As a result, the pre-human breeding range and influence of seabirds on native ecosystems remains uncertain, although in some places, nutrient fluxes are known to have collapsed.

Understanding the past and present distributions of seabird colonies is essential from a conservation perspective to help identify favoured breeding habitats and the processes that restrict their current breeding grounds. Identifying past and present breeding sites also provides a basis for characterizing shifts in the land-ocean nutrient fluxes that are an integral component of Aotearoa's forest ecosystems. However, scanty fossil bone deposits and the restricted ranges of extant seabirds limit the ability to provide such information. Here, we overcome these limitations by presenting species distribution models of pre-human and contemporary breeding sites for native Procellariiformes built using presence-only data. We collated an extensive nationwide database of contemporary breeding colonies to predict the distribution of breeding habitat and contrasted this with models built on historical accounts and fossil records. We collapsed these observations into groups based on weight and behavioural ecology. Across all groups, there was non-random loss in seabird breeding ranges, with models using (pre)historic data predicting seabirds across the interior of both North and South Islands. These distributions can inform conservation management, including determining the most suitable sites for habitat restoration and translocation.

35. The Manawatu-Tararua Highway fossil avifauna: a unique window into the late Pleistocene of North Island, New Zealand

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Most well-preserved fossil avifaunas in New Zealand date from within the past 40,000 years. Earthworks for the Manawatu-Tararua highway have exposed a fauna which may be much older. Bones uncovered at 100 m a.s.l. at the western end of the Manawatu River gorge were lifted and moved to the Manawatu Museum under a process agreed between the New Zealand Transport Agency and the *iwi* Working Group, then cleaned and examined at the museum under *iwi* supervision. The bones could not be moved to Te Papa Tongarewa, so they were identified by RNH and museum curator Alan Tennyson during email and

telephone consultations. Nine major elements were 3D scanned for replication and deposition of copies in Te Papa Tongarewa. Bone samples were taken for radiocarbon dating, stable isotopic analysis, and potential aDNA content. Samples from the overlying sediments were taken for luminescence dating and characterisation of the matrix enclosing the bones. The fauna included several individuals of two genera of moa, *Euryapteryx* and *Pachyornis*, at least one North Island adzebill (*Aptornis otidiformis*) and at least one North Island goose (*Cnemiornis gracilis*). Both sexes of *Euryapteryx* were present, as well as an unidentified moa hatchling. The bones rested on a pebble estuarine shoreline pavement and were covered by a blue-grey "clay" up to 1.25 m thick. The overlying and adjacent sediments included an estuarine cockle bed, several metres of laminated silty sand, and 10+ m of loess. The potential geologic age of the fauna, its mode of emplacement and implications are discussed.

36. Getting Stuffed: An investigation into marked taxidermy specimens

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Taxidermy specimens held in museums provide an opportunity for researchers to investigate questions on specimens representing in a moment in time. Insights can be drawn from comparisons spanning decades or centuries – a genuine time travel opportunity! Marked individuals (such as banded birds) can be especially valuable for research, providing additional context to that specimen's life history. While many museums added extensively to their collections during the Victorian era, this fascination with taxidermy and donating bird specimens has dwindled world-wide. This investigation considered collection trends and specimen traits in Te Papa's banded taxidermy bird collection. Such insights are useful in understanding collection history, and opportunities for comprehensive avian research and reporting. If every band tells the story of an individual bird, then a museum is a library of data waiting to be discovered! In the process of 'getting stuffed', the stories of these birds will continue to contribute to our knowledge well into the future.

37. Foraging ecology of Tawaki (Fiordland Penguin) in Doubtful Sound

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Tawaki or the Fiordland penguin only breeds along the South Westland coast, Fiordland and the Foveaux Strait region. This is one of the smallest breeding ranges of any penguin species making tawaki particularly susceptible to regional threats. Tawaki are thought to be in decline and are classed as 'near threatened' by the IUCN Redlist. However, the key causes of this decline remain mostly unknown as the current knowledge of tawaki foraging behaviour is limited. We are expanding the knowledge of fiord breeding tawaki diets as they have access to different resource pools compared to coastal foraging birds. We aim to investigate the potential of fiord prey resources acting as a 'buffer' against climate perturbations that affect tawaki foraging on the continental shelf & coastal Fiordland. GPS tracking, animal borne-video loggers and stable isotope analyses were used to understand the movements and diet of tawaki from birds breeding on three islands within Doubtful Sound. We found very little overlap in the home range of breeding tawaki and will report on the foraging plasticity across the three islands colonies ranging from the entrance to the head of the fiord.

38. Checklist of the Birds of New Zealand – what has changed since 2010?

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The fifth edition (2022) of the *Checklist of the Birds of New Zealand* no longer includes birds from Norfolk Island, Macquarie Island, or Antarctica. Since 2010, one previously unknown living taxon (a snipe) has been described, an endemic shag has been split into two species, and 11 new vagrant species have been accepted as occurring in New Zealand. The Australian little penguin is recognised as breeding in New Zealand, and the American whimbrel is now recognised as a full species. Black falcon has been removed from the New Zealand list, crimson rosella is now considered to be a failed introduction, and the blue shag is no longer recognised as distinct. Royal penguin, Waitaha penguin, and Whenua Hou diving petrel are treated as subspecies, and mainland ravens are treated as subspecies of a single species that also occurred on the Chatham Islands. Eight recently extinct taxa (including two subspecies) have been described or resurrected, and 30 species that became extinct more than *c*. 1 million years ago have been described. Several iconic birds, including Stewart Island kiwi, great spotted kiwi, and kākāpō, require changes to their scientific names. Species now placed in different genera include Australasian shoveler, spotless crake, ruff, broad-billed sandpiper, Terek sandpiper, common sandpiper, southern skua, grey noddy, red-billed gull, sooty shearwater, New Zealand storm petrel, little shag, spotted shag, cattle egret, laughing owl, stout-legged wrens, fernbird, greenfinch, and redpoll. The total number of bird species, including fossil species, now accepted from the New Zealand region is 485.

Abstracts of Posters

1P. Moa as monitors of volcanogenic environment change

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Sequences of radiocarbon ages for habitat-specific moa taxa can reveal local environment change driven by single eruptions and during eruption sequences. Examples are given from radiocarbon ages for moa in deposits on the lower Whanganui River and in the Waitomo karst. These show that high resolution radiocarbon ages for key moa taxa can provide eruption dates that are unbiased by geologic carbon and other issues of contamination that arise in the conventional eruption dating of volcanic tephras in peat sequences.

2P. Risks and refugia: assessing the spatial overlap between yellow-eyed penguin foraging distribution, commercial fisheries, and marine protected areas

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While at sea, yellow-eyed penguins are most vulnerable to the risk of accidental bycatch, the impacts of reduced prey availability and foraging efficiency, seafloor habitat degradation caused by trawling and dredging, and other indirect threats in areas where they overlap with commercial fisheries. Marine protected areas (MPAs) are one primary method used to mitigate some of these threats that are likely contributing to the continued population decline of yellow-eyed penguins on mainland New Zealand. It is therefore imperative to identify areas where MPAs would be the most effective at protecting foraging penguins. We first created a novel index to assess the spatial overlap between the projected distribution of penguins and commercial gillnet/trawl fishing intensity. We then established a baseline measure of the overlap between the predicted mainland foraging range of yellow-eyed penguins, current MPAs, and the proposed South-East Marine Protected Area (SEMPA) network. Penguins are most at risk from gillnet fisheries over the middle of the continental shelf and around Stewart Island and from trawl fisheries inshore along much of the South Island coast and north of the Otago Peninsula. However, less than 1% of their total range overlaps with a marine reserve or MPA, and the proposed SEMPA network will only protect 3.6% of the penguins' range. By assessing threats to yellow-eyed penguin survival, these findings can be used to inform ongoing conservation management decisions and marine spatial planning to prevent the predicted localised extinction of this endangered species.

3P. Describing the moult of the South Island Fernbird: can birds be aged and sexed in the hand?

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The timing, extent and sequence of moult for juvenile and adult Fernbird (all five subspecies are Threatened - At Risk) has not been described – there is only very limited information from museum specimens. An understanding of plumage and moult is vital when determining the age and sex of birds while studying population structure, productivity, recruitment and survival for conservation management. Moult, being energetically expensive, is an important

part of the annual cycle, which may be influenced by seasonal environmental *(e.g. from extreme climatic events, food availability)* and anthropogenic factors *(e.g. seasonal changes in disturbance and predation)*, as well as long term effects of climate change on biogeographic populations. The morphology and moult of adult and juvenile Fernbird was described and photographed over the first year of a Nelson Birds NZ/Nelson City Council conservation study. Over forty Fernbirds were banded over the summer (2021/22) in the Nelson Haven saltmarsh - Wakapuaka Flats Esplanade Reserve and Significant Natural Area, to study the local distribution and abundance of birds prior to establishing a predator control programme. The key learnings from describing the moult are presented.

4P. Native vs Introduced: Does feeding of urban waterfowl by the public disproportionately favour one over the other?

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Public feeding of birds adds a large amount of energy to avian systems every year, potentially altering community structure. Introduced waterfowl are common throughout New Zealand, but could this be due to introduced species being favoured when members of the public feed waterfowl? To determine whether introduced waterfowl disproportionately attend public feeding, I set up a series of feeding experiments around Christchurch and recorded all aggressive interactions among native and introduced species of waterfowl. I found that numbers of native waterfowl were less than number of introduced waterfowl across most of my 19 study sites, but native species were more common in larger waterways. Introduced species were more likely to attend my feeding experiments. The rate of aggressive behaviours was significantly different between native and introduced species, with natives more likely being the recipients of aggressive acts from introduced waterfowl. This was likely due to the larger body size of introduced waterfowl, allowing them to dominate a feeding event. There were low numbers of native waterfowl in the smaller waterbodies in Christchurch, and given the levels of aggression by introduced species, I suggest native waterfowl may over time become excluded from small lakes in part due to their inability to compete. Restricting public feeding to waterways where introduced species are already common may save native waterfowl being outcompeted in lakes where both co-exist. Alternatively, development of duck feed that is specific to native species may allow feeding without inadvertently assisting introduced species.

5P. Increases in native bird diversity and abundance on the University of Canterbury campus over the past 30 years

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With increasing anthropogenic disturbance to natural habitats, there are calls for urban and suburban environments to become more accommodating to support viable populations of native flora and fauna. The University of Canterbury (UC) central Ilam campus in Christchurch city, New Zealand, provided an ideal opportunity to demonstrate the potential for large urban areas to be managed in ways that facilitate an increase in native biodiversity. In this project I estimated how bird diversity and abundance on the UC Ilam campus has changed in the past 30 years by replicating an historical 1990 campus bird atlas study. I observed a total of 22 species (11 native and 11 introduced) during summer, 2019/2020. I observed 7 additional native species and 1 additional introduced species in 2019/20 compared to the 1990 study. The increase in native bird diversity since 1990 is likely due to increasing vegetation cover, which has increased from 42% of survey squares containing at least some tree cover in 1961 to 79% in 1990, and to 95% of grid squares in 2016. The greatest concentration of native birds occurred along the two waterways that pass through

the UC campus. These are areas where extensive planting of native vegetation has occurred in recent years. Further recommendations for enhancement of native bird diversity include targeted planting of native vegetation in the areas of campus that are currently dominated by exotic trees, the creation of a 'habitat corridor' between the UC campus and Riccarton Bush, and the reintroduction of more native species once additional native habitat is restored.

6P. Long-term consequences of genetic rescue in two bottlenecked populations of the South Island robin

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Anthropogenic activities have led to large declines in New Zealand's bird species, leaving many with limited genetic diversity and exhibiting signs of inbreeding depression. This is problematic as few outbred populations survive to use as donors for genetic rescue. Using only inbred donors, we investigated the long-term effects of a reciprocal translocation between two isolated and inbred island populations of South Island robin *Petroica australis* undertaken in 2008. Within a generation, genetic rescue significantly increased heterozygosity and allelic diversity and was accompanied by increased juvenile survival and recruitment, sperm quality, and immunocompetence. From 2016-2018 we reassessed the long-term consequences of genetic rescue in both populations by collecting data on population demographics and genetic diversity. Both heterozygosity and allelic richness had declined since 2008, but both remained higher in 2018 than before the genetic rescue. Despite the already high density of robins on both islands, we found a 45% population increase on Motuara Island and 73% increase on Allports Island. This was due to juvenile and adult robins with higher genetic diversity having greater survival rates. Showing genetic rescue resulted in both increased genetic diversity, survival and increased population size. Our results confirm that genetic rescue provides a viable technique for the long-term management of endangered birds restricted to small and isolated populations.

7P. Recruitment, survival and breeding success in a declining rifleman population

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We used detailed life-history data collected over a six-year period from a colour-banded population of riflemen (*Acanthisitta chloris*) at Kowhai Bush, Kaikoura, to estimate population vital rates and assess their likely contribution to a concurrent population decline. Both mean juvenile survival (18%) and mean adult survival (49%) were low in comparison with reports from other populations. In contrast, breeding success was high, with pairs producing ~3 fledglings per season on average. High breeding success was likely associated with nestbox use. We then used survival and breeding success estimates to parameterise a population matrix model, and perturbation analysis of this model confirmed a projected negative trend, with reduced recruitment having the greatest absolute contribution to population decline. We discuss possible explanations for the comparatively low rates of recruitment and survival observed. Data from other populations of riflemen experiencing stable or positive population trajectories would be especially useful to better understand factors affecting vital rates, and to identify the thresholds that signal a rifleman population at risk of decline.

8P. Gull-human interactions in an urban population of Herring gulls (*Larus argentatus*) and Lesser Black-backed gulls (*Larus fuscus*)

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Gulls are a common sight in many UK towns and cities not only near the sea, but also inland. Although urban populations of gulls appear to be increasing, overall gull populations in the UK are in decline, and all breeding gulls in Britain are protected by law. An increase in the urban population of gulls has resulted in larger rooftop breeding colonies and increased interaction with humans. The main urban gull colonists in the UK are Herring gulls (*Larus argentatus)* and Lesser Black-backed gulls (*Larus fuscus)*. The aim of the present study was to determine how the gull population and overall gull nuisance events changed across the breeding season, and to investigate how humans are contributing to gull nuisance behaviours. Herring gulls and Lesser Black-backed gulls were observed across six sites in Bath for five months during the 2017 breeding season. We found that fluctuations in the mean number of gulls could partially be explained by phases in the breeding season. Mean number of gull nuisance events were low, and fluctuations were not significantly linked to breeding phase. There was a strong, positive correlation between the number of humans feeding gulls and the number of gull nuisance events recorded. Nuisance events occurred infrequently throughout the breeding season and predominantly in areas where humans were feeding the gulls. Measures to avoid nuisance should focus on reducing food availability, but more longitudinal research is needed to determine long-term trends in gull population and nuisance behaviours.

9P. Monitoring kororā/little blue penguin populations on the Banks Peninsula using a portable MinION sequencing device.

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New Zealand's unique birdlife is experiencing increasing pressure through the disturbance of critical environments and predation by introduced mammals. Even species of least concern are often dependent on the continued efforts of conservation groups. One such species is the kororā/little blue penguin (*Eudyptula minor*), the smallest of the world's penguin species. Found across New Zealand and Southern Australia, the population in the Canterbury region is unique due to the presence of the white-flippered morphotype. Local efforts to monitor the charismatic species are often time and labour intensive, and genetic analysis is invasive. With increasing research in the application of eDNA to the field of population genetics, I will discuss the potential of portable nanopore sequencing for monitoring kororā populations using the MinION device (Oxford Nanopore Technologies). I will then highlight the challenges that arose during our pilot study on a group of rescue kororā at the International Antarctic Centre in Christchurch, where we sequenced feather and tank water samples using universal marine vertebrate MarVer3 primers, targeting a region of the 16s gene. I will compare preliminary data on Sanger and MinION sequencing technologies for sequencing multiple individuals using potentially degraded eDNA samples; and discuss the sensitivity of MinION sequencing for detecting our target species, kororā in our captive population samples. I will highlight the future direction of our research as we consider the opportunities portable eDNA sequencing presents for informing the conservation management of the Banks Peninsula Kororā population.

10P. The impacts of soil as a probiotic in altering the gut microbiome of the Ōkārito kiwi (*Apteryx rowi*) in hatcheries

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The Ōkārito kiwi, or rowi, is the rarest of the kiwi species and among the least studied. With less than a thousand birds left in the wild, captive rearing has become a critical tool in the conservation of this species. However, many challenges in captive rearing remain, including exposure to diseases, unnatural diets, antimicrobial usage and the potential long-term effects these factors may have on the microbial communities that live in symbiosis with the rowi – their microbiome. Recent research has begun to highlight the importance of managing the microbiome of captive animals in an effort to improve their overall well-being and prepare them for release into the wild. The gut microbiome in particular could offer a uniquely impactful avenue of mitigating disease and bolstering the health of captive animals, through the development of direct probiotics or more natural diets.
This research aimed to analyse the impact of natal soils, lifted from the Ōkārito reserve, as a direct probiotic and a source of environmentally relevant microorganisms for the captive rowi gut microbiome. In doing so, this study would also provide an overview of the composition of bacterial and fungal communities in the gut microbiome of rowi, using 16S rRNA and ITS gene sequencing to identify the key taxonomic groups present. The health outcomes of rowi were monitored to identify any differences between the control and treatment group.
Results showed a distinct microbial profile of rowi in captivity that diversifies as the birds' age, with the relative abundances of major taxonomic groups changing over time. A majority of the microorganisms present were of the bacterial phyla *Firmicutes, Proteobacteria* and *Actinobacteria,* and the fungal orders *Malasseziales* and *Trichosporon.* Exposure to natal Ōkārito soils did have an effect on the composition of the gut microbiome in rowi. Treated birds harboured a more specialised set of microbial taxa, with the key organisms in this diversity shift being the bacteria *Escherichia/Shigella, Faecalibacterium, Burkholderia*, *Terrisporobacter* and *Liquorilactobacillus,* and the fungi *Malassezia*. The fungal component of the rowi gut microbiome was especially responsive to outside influence, with the majority of treatment bird gut communities directly reflecting the fungi they were exposed to. No significant changes to rowi growth rates or overall health were found between rowi control and treatment groups.
The findings of this study represent the first exploration of the gut microbiome of *Apteryx rowi* using next-generation sequencing methods, and a positive indication that mediation of the gut microbial communities of captive rowi can be achieved through the introduction of natal soils.

11P. Improving VHF tracking efficiency of wildlife using an Unmanned Aerial Vehicle (UAV) – A case study locating yellow-eyed penguin nests

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Endangered yellow-eyed penguins (*Megadyptes antipodes*) breed on Enderby Island in the New Zealand subantarctic, nesting individually underneath thick coastal scrub up to 1 km from the sea. Nests are difficult and time-consuming to find by ground searching. Handheld VHF tracking is useful but detection range and tracking ability are affected by topography and vegetation, and field conditions can be hazardous. Unmanned Aerial Vehicles (UAVs) or

drones fitted with a camera are increasingly used for counting and monitoring wildlife, however, visual and thermal imagery are not suitable for detecting penguin nests under thick vegetation cover. We developed a multi-frequency VHF receiver and fitted it to a UAV (the Drone Ranger) to track penguins to their nests. The receiver simultaneously tracked multiple VHF transmitters operating on individual frequencies, providing key advantages over single-frequency receiver designs. Here we present the results of nest location using several different methods: manual ground searching, ground-based VHF tracking, and aerial tracking using the UAV system. This novel technology has applications for locating and tracking a wide range of wildlife, particularly when screened by thick vegetation, underground, or cryptic species which are difficult to see.