Birds New Zealand Conference

Waitangi 2018

Scientific Days
Program and Abstracts

Scientific Day Presentations

Saturday, 3 June 2018

Session 1 Chair: Bruce McKinlay: Bird Communities , Society Rebranding

0915 **Walker** Multi-decade national-level changes in native bird occupancy revealed by OSNZ Atlases

0945 **Miskelly.** Changes in urban forest bird community in response to pest eradications and endemic bird reintroductions

1000 **Morgan.** Changes in species composition across an urban forest gradient.

1015 **Lee** & H. Taylor. Birds New Zealand rebranding.

1030 **Lee** & H. Taylor**.** Birds New Zealand rebranding.

Session 2 - Northern Seabirds - Chair: Keith Woodley

1115 **Lovegrove.** The spotted shag - a threatened species in the Hauraki Gulf?

1130 **Rayner.** Genetic isolation and dietary change in Hauraki Gulf spotted shags over 130 years

1145 **Gaskin.** Seabird feeding associations - fish schools and crustaceans

1200 **Galbraith.** The black-backed gull in northern New Zealand: evidence of changing diet from stable isotope analysis of bones and feathers

1215 **Frost.** How much do we really know about long-term population trends of some surface-feeding seabirds in northern New Zealand

Session 3 - Physiology & reproduction - Chair: Mel Gailbraith

1345 **Vieco Galvez.** The Eggshell adaptations of four species of Kiwi to a burrow nesting strategy

1400 **H. Taylor** Are translocated males firing blanks? Sperm biology, genetics and translocation management in threatened birds

1415 **Smiley.** Hormonal regulation of parental care in diparental songbird

1430 **Sweeney** Cognition, Social learning and The Role of Testosterone in Pūkeko

1445 **Whitehead.** Physiological indicators of sub-lethal stress in Grey-faced petrels

1500 **Loh.** The temperature characteristics of occupied Fairy prion nests in summer heat

Session 4 - Conservation management - Chair: Helen Taylor

1545 **Parker.** The translocation of mātātā/North Island fernbirds from Rotokare Scenic Reserve to Pauatahanui

1600 **Strang** Rats, kiwi, and native birds: What's really in a feral cat's diet

1615 **Hobbs** Sight or smell: What makes 'sense' for dogs in kiwi aversion training?

1630 **Castro.** Effect of landscape in the reception of bird sound by humans and autonomous recorders

1645 **Williams.** Is this a grey duck I see before me?

Scientific Day Presentations

Sunday, 4 June 2018

Session 5 - Southern Seabirds- Chair: Colin Miskelly

1015 **Fischer.** Absent population response of small seabird species to multiple invasive predator eradications

1030 **Tidey** and Webster. Characterisations of ethnic foraging habitat for hoiho

Session 6 - Southern Seabirds- Chair: Colin Miskelly

1115 **French** Human disturbance on subantarctic yellow-eyed penguin - what is the impact and how do we reduce it

1130 **Muller.** The Drone Ranger - a VHF-equipped drone to improve Yellow-eyed penguin nest-finding

1145 **Mattern.** Penguin cams- gaining a whole new perspective the foraging ecology and marine habitat of Yellow-eyed penguins

1200 **Bell.** Population size and trends in the Giant Petrel and albatross species breeding in the Chatham Islands

1215 **Parker.** Trial of three methods to obtain population estimates of light-mantled sooty albatross at Campbell and Auckland Islands

1230 **Rexer-Huber.** Connectivity for conservation of Southern Ocean seabirds: the case of White-chinned petrels

Session 7 - Urban Birds - Chair: Ian Armitage

1345 **Heggie-Grace** Urban Bird Composition at Different Spatial Scales

1400 **Galbraith** Patterns of feeder use by urban birds - not all are equal

1415 **Beauchamp** Roost sites and density of common mynas in the region surrounding upper Whangarei, Northland

1430 **Roper** Long term changes in the breeding biology of bellbirds on Tiritiri Matangi Island

1445 **Cockrem** Recognition of the significance of birds at the Port of Tauranga: an example of the value of OSNZ bird surveys

1500 **Wilson** Identifying conservation actions required to protect Little Penguins in New Zealand

Session 8 - Genetics and conservation- Chair: David Lawrie

1545 **Forsdick** Wading into genomics for threatened species recovery

1600 **Undin** What do we really know about kiwi genetics

1615 **Martini** A peek into the past and future of the New Zealand kaka

1630 **Davies** BirdSearch, encouraging birding in New Zealand

1645 **Bradshaw** Banding website update

2018 Birds New Zealand Conference
Abstracts for Presentations in the Scientific Programme

Multi-decade national-level changes in native bird occupancy revealed by the OSNZ Atlases

Susan Walker[1] and Adrian Monks[1,2]

[1]Manaaki Whenua–Landcare Research, Private Bag 1930, Dunedin, walkers@landcareresearch.co.nz
[2]Manaaki Whenua–Landcare Research, Private Bag 1930, Dunedin,monksa@landcareresearch.co.nz

National-level changes in occupancy in New Zealand's native avifauna between the 1970s and early 2000s are described based on occupancy models fit to data held in the Ornithological Society of New Zealand's two Atlases of bird distributions, along with discussion of some of the implications for bird conservation. A number of native bird taxa were either stable or expanding their ranges in human-dominated landscapes, and appear to be secure and low priorities for conservation effort. However, the data show widespread and substantial declines in occupancy in endemic birds on the mainland, especially in birds of forests, alpine zones and inland basins remote from cities and human communities. In forest and alpine birds, there was a widening gulf between stable or increasing species-level endemic and native species, and more-vulnerable family and genus-level endemics, which declined. Among Charadriiformes, coastal breeding native species are more secure than endemic species that breed in the inland South Island, which showed substantial decreases in occupancy. These insights show the exceptional value of spatially explicit, nationally comprehensive, all-species Atlas data to inform conservation effort and ecological understanding at national scale.

Changes in an urban forest bird community in response to pest mammal eradications and endemic bird reintroductions

Colin M. Miskelly[1]

[1]Museum of New Zealand Te Papa Tongarewa, PO Box 467, Wellington 6140, colin.miskelly@tepapa.govt.nz

Zealandia (Karori Sanctuary) is a forest sanctuary which is surrounded by a predator-exclusion fence, and is situated in the Wellington city town belt, New Zealand. Following eradication of introduced mammals from within the fence in 1999, 10 species of endemic forest birds were reintroduced between 2000 and 2011, and 2 other species recolonised naturally. Five-minute bird counts were used to assess changes in the Zealandia diurnal forest bird community over 2 time periods: 1995-98 to 2002-05, and 2002-05 to 2013-16, as well as changes over the full 21 year period. Tui (*Prosthemadera novaeseelandiae*) was the only bird species present before the fence was completed that showed a significant, year-round positive response to mammal removal. Following the recreation of a diverse and abundant endemic bird community post-2005, detection rates for most of the species that were present before 1999 declined significantly. This included highly significant declines in detection rates for 3 native bird species: silvereye (*Zosterops lateralis*), grey warbler (*Gerygone igata*) and New Zealand fantail (*Rhipidura fuliginosa*). These results suggest that populations of some New Zealand bird species are limited more by interspecific competition with other birds than by mammalian predation. The forest bird community in Zealandia is now more similar to that on Kapiti Island (the source site for many of the bird species translocated to Zealandia) than it is to the bird community that existed at the site before the fence was built.

Changes in species composition across an urban-forest gradient

Dai K.J. Morgan*, Oliver J-P. Ball, Nathan Arcus, Darren Gash, Tanya Cook and Jenny Gillanders

Applied and Environmental Sciences, NorthTec, 51 Raumanga Valley Road, Whangarei
*dmorgan@northtec.ac.nz

Urban landscapes are a mosaic of different habitat types that range from heavily modified residential and industrial zones to contiguous forests. Few studies have investigated the change in species composition as habitat transitions from modified 'urban' areas to forest fragments. We conducted five-minute bird counts in Whangarei city along a series of urban–forest gradients such that exotic and native species composition in urban count stations >150m, 50-150m and 0-50m from a forest fragment were able to be compared to the same variables collected from forest fragment count stations 0-50m, 50-150m and >150 from urban areas. Exotic species richness was greatest in urban areas with abundance highest at distance bands furthest from forest fragments and lowest >150m from urban habitat. The opposite was true for native species; however, some native species (sacred kingfisher and pukeko) were most abundant between habitat types. Our results showed that native species richness and abundance increased as distance from modified habitat increased; therefore, management of larger urban fragments should have priority over smaller fragments. Research into mitigating the negative impact edge effects have on native species should be undertaken to promote diversity in these areas.

The spotted shag - a threatened species in the Hauraki Gulf?

Tim Lovegrove[1], Samantha Hill[1], Andrew Nelson[1], Chris Bindon[1], & Ian Southey[2]

[1]Biodiversity group, Auckland Council, Private Bag 92300, Auckland 1142
Biodiversity@aucklandcouncil.govt.nz

[2]82 Red hill Road, Papakura, 2110. iansouthey@yahoo.co.nz

The spotted shag/parekareka (*Stictocarbo punctatus*) reaches its northern limit in the Hauraki Gulf. Nationally there are c. 30, 000 pairs, with most of these in the South Island. It is not threatened nationally, but in the northern North Island it is probably endangered. This is significant because northern spotted shags have recently been shown to be genetically distinct. Thousands formerly bred on inner Hauraki Gulf islands and along the western side of the Coromandel Peninsula. They also used to roost on the Firth of Thames coast north of Kaiaua. Until the 1970s they also bred on the west Waikato coast at Ngatutura Point, and until the 1980s-1990s, on Auckland's west coast at Te Henga and Oaia Island. Since January 2013, joint surveys by Auckland Council Biodiversity staff and Birds New Zealand members have covered all known northern breeding sites to assess the current status of the northern population. Spotted shags have now disappeared from the Auckland and Waikato west coast, and they probably no longer breed at the Noises and Coromandel Islands. We estimate that only about 300 pairs remain. We found just three breeding colonies, at Tarahiki Island and at Hooks and Anita Bays at the eastern end of Waiheke Island. Many still roost along the Thames to Coromandel coastline. Simultaneous counts at the breeding colonies and Thames coast roosts show that these are probably the same birds. Threats may include human disturbance at breeding colonies and roosts, shooting (despite protection), overfishing reducing key prey species, mortality through fisheries bycatch (especially set nets), and possibly climate change.

Genetic isolation and dietary change in Hauraki Gulf spotted shags over 130 years

Matt J. Rayner

Auckland War Memorial Museum, The Domain, Private Bag 92018 Auckland 1142.
mrayner@aucklandmuseum.com

Molecular analyses of museum specimens are increasingly used for prioritising species lineages for conservation and for assessing the ecological drivers of population declines in threatened birds. In Auckland's Hauraki Gulf spotted shag (*Phalacrocorax punctatus*) have experienced catastrophic population declines, today numbering less than 1000 individuals with only one major breeding colony. We used genetic sequencing and stable isotope analyses of museum specimens to assess the population diversity and food-web history of this single northern New Zealand population over 130 years. Mitochondrial (Control Region) and nuclear (Beta Fibrinogen Intron 7) DNA indicated that contrary to expectations, given the species widespread prehistoric distribution, historic and contemporary spotted shags from northern New Zealand form a geographically restricted haplogroup distinct from southern populations. Moreover, analysis of stable isotopes of nitrogen and carbon in spotted shag feathers suggest this population has undergone a reduction in dietary trophic level and a shift in prey carbon source over time, indicating changes in foraging habitat or baseline environmental change. That this result is also consistent across other resident gulf seabirds, including pied shag (*Phalacrocorax varius*) and Little blue penguin (*Eudyptula minor*), suggests widespread long-term human impacts on the Hauraki Gulf marine environment and its food chain. The consequences of these results in the context of spotted shag conservation in the Hauraki Gulf will be discussed.

Seabird feeding associations – fish schools and cetaceans

Chris P. Gaskin[1], Jochen Zaeschmar[2], Nigel Adams[3], James Ross[1], Edin A. Whitehead[1,4], Graeme A. Taylor[5]

[1]Northern New Zealand Seabird Trust, 400 Leigh Road, RD5, Warkworth, AUCKLAND

[2]Far Out Ocean Research Collective, PO Box 91, PAIHIA 0247

[3]Department of Natural Sciences, Faculty of Social and Health Sciences, Unitec Institute of Technology, AUCKLAND

[4]School of Biological Sciences, University of Auckland, Private Bag 92019, AUCKLAND

[5]Marine Species and Threats Team, Department of Conservation, PO Box 10 420, WELLINGTON 6143

For seabirds, being able to locate ephemeral food patches spread over vast areas of ocean is key their survival. Dense fish schools, active at or near the surface create a phenomenon known as 'fish work-ups' (or 'boil-ups' or 'bust-ups'). These fish – e.g. trevally, kahawai, and mackerel and tuna species - drive up prey items to the sea surface and observations suggest that this forms an important food source for a range of seabird species. There is currently poor knowledge of both the diet of surface-foraging seabirds and what prey items are being made available to seabirds from fish work-ups. This limits our understanding of the mechanisms through which changes in the distribution and/or abundance of fish work-ups may be driving seabird population changes (population status and annual breeding success). Our research presents new insights into our understanding of the foraging ecology of seabird species that regularly forage in association with fish work-ups (i.e. Buller's and fluttering shearwaters, fairy prion, Australasian gannet, red-billed gull and white-fronted tern). One other pattern of association behaviour are Procellariiforms feeding with cetaceans where the latter's feeding generates discards (i.e. uneaten parts of prey) that the birds then feed on. This behaviour has been observed with mixed pods of false killer whales, bottlenose dolphins and long-finned pilot whales. While black petrels dominate these feeding associations in northern New Zealand waters, other species (shearwaters, petrels and storm-petrels) have also been seen feeding around pods. These behaviours highlight the

interconnectedness within marine ecosystems, with future research encompassing population trends and prey caught by seabirds and fed to chicks during breeding.

The black-backed gull in northern New Zealand: evidence of changing diet from stable isotope analysis of bone and feathers

Mel Galbraith[1], Matt Rayner[2], Sarah Bury[3], Graham Jones[4], Diane Fraser[5]

[1]Environmental & Animal Sciences, Unitec Institute of Technology, Private Bag 92025, Auckland 1142, mgalbraith@unitec.ac.nz

[2]Auckland War Memorial Museum, Private Bag 92018, Auckland 1142, mrayner@aucklandmuseum.com

[3]National Institute of Water and Atmosphere, Private Bag 14901, Wellington 6241, Sarah.Bury@niwa.co.nz

[4]Environmental & Animal Sciences, Unitec Institute of Technology, Private Bag 92025, Auckland 1142, gjones@unitec.ac.nz

[5]Environmental & Animal Sciences, Unitec Institute of Technology, Private Bag 92025, Auckland 1142, dfraser@unitec.ac.nz

Gulls are generally both marine and terrestrial feeders, and, consequently, their populations are likely to reflect changes in environmental quality at relatively small timescales compared to pelagic, migratory seabirds. The southern black-backed gull (*Larus dominicanus*) is an ideal species to investigate the long-term impacts of environmental changes in northern New Zealand as the species is a resident coastal seabird, a generalist marine and terrestrial feeder, and common in the Auckland region. In Auckland, the species showed steady population growth through the early 20th century as the city established and grew, followed by a decrease and stabilisation since the 1970s due to improved urban waste management. This pattern of population change is consistent with that of other gull species globally. We used stable isotope ($\delta^{13}C$, $\delta^{15}N$) analysis of feathers and sub-fossil bones to investigate long-term human impacts on black-backed gull diet. Feathers from within the Auckland region were sourced from specimens held in the Auckland Museum, collected between 1914 and 2012, and from a local breeding colony collected in 2017. Isotope analysis of sub-fossil bones gave information of the trophic status of the gulls prior to European colonisation. Time series values of $\delta^{13}C$ and $\delta^{15}N$ from sub-fossil to modern bones indicate the diet of the black-backed gull has become progressively more enriched with carbon and nitrogen from terrestrial (anthropogenic) sources over time. The consequences of the species occupying a “far from natural niche” will be discussed.

How much do we really know about long-term population trends of some surface-feeding seabirds in northern New Zealand?

Peter G.H. Frost[1] and Graeme A. Taylor[2]

[1]Science Support Service, 87 Ikitara Rd, Whanganui 4500, pghfrost@xtra.co.nz

[2]Science and Policy Group, Department of Conservation, 18-32 Manners Street, Wellington 6011. gtaylor@doc.govt.nz

We review the available information on population trends in Australasian gannet (*Morus serrator*), spotted shag (*Stictocarbo punctatus*), red-billed gull (*Larus novaehollandiae*) and white-fronted tern (*Sterna striata*) in northern New Zealand. Information was collated from numerous published and unpublished sources, principally the Classified Summarised Notes of the Ornithological Society of

New Zealand, and more recent surveys and online records lodged with New Zealand eBird. The Australasian gannet population expanded overall from 1946-47 to 1980-81, since when the trends have become less clear. The Three Kings and White Island populations have apparent declined, whereas the colony at Muriwai, barely established in 1980-81, grew rapidly until the late 1990s, from when it has seemingly stabilized. Spotted shag historically bred at up to 18 sites in the region, but currently does so at only 3, indicating a long-term decline in both numbers of breeding pairs and sites. Changes in the size of red-billed gull colonies suggest order-of-magnitude declines at 16 sites; increases at 9; and no obvious change at 4. White-fronted terns are erratic breeders, with colony size apparently fluctuating between years and birds often shifting sites. Colonies are currently smaller than in the past, suggesting a possible overall long-term decline. Common problems encountered with all data sets included: inconsistency in survey methods; lack of clarity as to what the reported numbers denote—birds, pairs, or active nests; exact location of colonies often unclear; a potential bias in only reporting large colonies; and irregular monitoring. We discuss the implications of these trends and shortcomings.

The translocation of mātātā/North Island fernbirds from Rotokare Scenic Reserve to Pauatahanui

Kevin A. Parker[1], David Cornick, Geoff de Lisle, Wanda Tate

[1]Parker Conservation, PO Box 130, Warkworth 0941

[2]66 Rongotai Road, Kilbirnie, Wellington 6022

[3]244 Blue Mountains Road, RD1, Upper Hutt 5371

[4] Villa 89, 15 Aotea Drive, Aotea, Porirua 5024

The Pauatahanui Wildlife Management Reserve Committee was established by Forest and Bird in the early 1980s to restore and protect wildlife habitats in the Pauatahanui Inlet. Since then much of the saltmarsh habitat has naturally regenerated, c. 20 000 plants have been planted, and an intensive introduced predator control network has been established. Around 36 bird species are present in the Pauatahanui Inlet but one wetland species was conspicuous by its absence – the mātātā or North Island fernbird (*Bowdleria punctata vealeae*). Fernbirds are relatively good colonisers but are absent from most of the lower North Island. Therefore, translocation was proposed as a means to restore fernbirds to Pauatahanui. Twenty two birds were translocated from the Rotokare Scenic Reserve in April 2017 with a further translocation of 25 birds planned for April 2018. There was significant uncertainty as to the outcome of this translocation because of the contrasting habitats birds were being translocated between (an inland freshwater wetland to a coastal saltmarsh habitat), the potential for post release dispersal from Pauatahanui and the logistics of moving a relatively delicate species some distance from capture to release site. However, despite these challenges some of the translocated birds have established and successfully bred at the site. If fernbirds persist at Pauatahanui they will likely recolonise other saltmarsh and wetland habitats on the Kapiti Coast, especially given the expansion of introduced predator control in the area.

Eggshell adaptations of four species of Kiwi to a burrow nesting strategy

David Vieco Gálvez[1]**,** Isabel Castro[1], Patrick Morel[2] and Wei Hang Chua[3]

[1]Ecology group, Massey University, Private Bag 11-222, Palmerston North, d.vieco@massey.ac.nz. i.c.castro@massey.ac.nz

[2]Animal Science group, Massey University, Private Bag 11-222, Palmerston North, p.c.morel@massey.ac.nz

[3]School of Health Sciences, Massey University, Private Bag 11-222, Palmerston North, w.h.chua@massey.ac.nz

Kiwi species are known for their unusual aspect and behaviour, they are entirely nocturnal insectivores that build very elaborate nests in comparison to other ratites and that breed during the austral winter. They nest in underground burrows or tree cavities; this type of nesting requires particular egg adaptations to allow a proper embryo development, because burrows are characterised by having a humid microclimate, less concentration of oxygen and a higher concentration of carbon dioxide.

Water vapour conductance is a property of avian eggshells that permits the appropriate amount of daily water loss allowing the embryo to develop while avoiding desiccation. Water vapour conductance is a function of eggshell thickness, pore area and pore number and it is expected that burrowing birds present an increased eggshell conductance.

Kiwi species have a very thin eggshell in proportion to the mass of the egg. A thinner eggshell is something that is expected in burrowing species but in the case of Kiwi, the thin eggshell exceeds the expectation for the compensation of water loss. In addition, kiwi eggshells present a very unusual pore system, with very few cylindrical pores that traverse the whole thickness of the eggshell, and many subsidiary pores that don't open into the exterior of the egg, which is opposite to what is expected to increase water vapour conductance. In this presentation, we will explore the variability in eggshell thickness across four species of Kiwi and the water vapour conductance of their eggshells.

Are translocated males firing blanks? Sperm biology, genetics and translocation management in threatened birds

Helen R. Taylor[1], Neil J. Gemmell[1]

[1]Department of Anatomy, University of Otago, Lindo Ferguson Building, Great King Street, Dunedin, 9016, helen.taylor@otago.ac.nz neil.gemmell@otago.ac.nz

Translocations are regularly used in conservation management to (re-)establish populations of threatened species in protected locations. These populations are often, by necessity, founded with relatively few individuals. A small founding population can lead to reduced genetic diversity, and increased mating between relatives (inbreeding), both of which can lead to reduced fitness. Inbreeding is known to negatively affect male fertility across numerous species of mammals, plants, and insects. Surprisingly, very little is known about the impact of inbreeding on sperm quality in birds – common subjects for translocations in New Zealand. We used a specially designed mobile sperm laboratory to measure sperm quality (speed, morphology, and DNA fragmentation) in hihi/stitchbird (*Notiomystis cincta*), a vulnerable nectivore endemic to New Zealand. We sampled semen from 128 male hihi across four populations, all of which except one were founded via translocations. Inbred hihi are known to exhibit increased nest failure compared to less inbred individuals, but the cause of this failure remains unknown. Our sperm quality data suggest at least some of these failures are due to poor male fertility, as a result of reduced genetic diversity and increased inbreeding. We are also measuring inbreeding in hihi using >10,000 genetic markers. Establishing whether inbred male birds exhibit lower fertility will improve the management of translocated populations and help maximise breeding success.

Hormonal regulation of parental care in a biparental songbird

Kristina O. Smiley [1,2] and Elizabeth Adkins-Regan [1,3]

[1]Department of Psychology, Cornell University, Ithaca, NY, USA 14853,

[2]Centre for Neuroendocrinology, Department of Anatomy, University of Otago, Dunedin, 9011, Kristina.smiley@otago.ac.nz

[3]Department of Neurobiology and Behavior, Cornell University, Ithaca, NY, USA 14853, er12@cornell.edu

Parental care is an important component of reproduction that is observed in a diverse range of vertebrate taxa but is the most prevalent in birds. However, the hormonal basis of avian parental care is not well understood. In most birds that hatch immature young, circulating levels of the hormone prolactin (PRL) are low during non-breeding times and significantly increase during late incubation and early post-hatch chick care. Because of this pattern, PRL has been suggested to be involved in the initiation of parental care in birds, but rarely has this hypothesis been causally tested. To begin testing the hypothesis, we inhibited PRL on the 3 days prior to hatching and the first 2 days of post-hatch care, when PRL was found to be highest in zebra finches. Breeding pairs were randomly assigned to receive either 5 daily treatments of bromocriptine, a proven PRL inhibitor, or vehicle control. Parental behavior was recorded inside the nest on days 1-2 post-hatch. Strikingly, inhibiting PRL either eliminated or drastically reduced chick brooding and feeding behavior in both males and females. This is one of the first causal studies to demonstrate that PRL is necessary for post-hatch care in a biparental songbird and is the first to show this in zebra finches. This research will provide new insight to the mechanisms of avian parental care and allow for opportunities to integrate this important group into comparative analyses. This can give us predictive power to understand how these mechanisms may function and evolve in other organisms.

Cognition, Social Learning and The Role of Testosterone in Pūkeko

Aileen P. Sweeney[1]* and Kristal E. Cain[1]

[1]School of Biological Sciences, University of Auckland, Private Bag 92019, Auckland 1142, aswe261@auckanduni.ac.nz / k.cain@auckland.ac.nz

*PhD Candidate

Traditionally, animal cognition has been studied almost exclusively in the lab, however studying cognition in the field has become more common in recent years, providing numerous benefits including reduced stress, ecologically relevant settings and a wider array of species. Pūkeko (*Porphyrio melanotus*) are cooperatively breeding rails which live in polygynandrous groups comprising of mixed-sex dominance hierarchies. This makes them excellent models for examining cognition and social learning in the wild. Adults have a red frontal shield ornament which is likely testosterone-dependent and used in dominance interactions by both sexes. We are especially interested in the role testosterone plays in female Pūkeko given that they possess identical competitive traits to males. To explore these relationships we band individuals and fit them with Passive Integrated Transponders (PIT) tags (attached to leg band). Individuals are then trained to use double-sided Chooketeria™ chicken feeders. These feeders are step-activated and each side has been colour-coded to indicate the presence (or lack of) maize inside. Using Radio Frequency Identification (RFID) technology coupled with cameras, these feeders are monitored to determine dominance interactions between individuals. Blood samples are taken from all banded individuals and testosterone levels will be related to dominance rank and cognitive ability. We predict that dominant individuals will have relatively higher testosterone levels and demonstrate greater

cognitive ability than subordinate individuals. This PhD project is in its early stages and as such we intend to discuss research plans and preliminary observations, rather than results.

Physiological indicators of sub-lethal stress in Grey-faced petrels

Edin A. Whitehead[1*], Tony J. Hickey[1], James C. Russell[1], Katie M. O'Reilly[2], Brendon J. Dunphy[1]

[1]School of Biological Sciences, University of Auckland

[2]University of Portland

[*]Student ewhi650@aucklanduni.ac.nz

Grey-faced petrels (*Pterodroma gouldi*) on Auckland's east coast have poor breeding performance relative to their west-coast conspecifics. This provides a unique opportunity to map the physiological traits indicative of sub-lethal stress in a Procellariiform species. This research assessed underlying physiological differences between these populations in key stages of the breeding season – incubation and chick-rearing. Compared to west coast birds, Grey-faced petrels on the east coast had higher initial and response levels of the stress hormone corticosterone during incubation, weighed less, and had haematological profiles indicative of poor body condition and higher energy expenditure. Utilising a less invasive measure of hormonal stress – feather samples – potential flow-on effects to chicks were investigated. On average, east coast Grey-faced petrel chicks were lighter and had higher concentrations of corticosterone than west coast chicks. The impacts of long-term sub-lethal stress for Grey-faced petrel populations are considered in the context of conservation management and future research.

The temperature characteristics of occupied fairy prion nest boxes in summer heat

Graeme Loh[1] and Sarah Saunderson[2]

[1]49 Sutcliffe St Dunedin 9012 New Zealand. gloh@earthlight.co.nz

[2]Dept. of Microbiology & Immunology, University of Otago, PO Box 56, Dunedin 9054, sarah.saunderson@otago.ac.nz

This last summer, 2017-18, has been extraordinarily warm. Temperature data loggers inside fairy prion nest boxes, primarily used to reveal box visitation, have revealed temperatures higher than 30 degrees on several occasions as the mid-afternoon sun is reflected off the cliff wall onto boxes already in direct sunshine. Despite this there were no obvious consequences for the prion chicks. These chicks were weighed most afternoons in January so their condition can be quantified and compared with data from many years. While maintaining a stable environment is assumed to be one of the reasons for burrowing by seabirds, perhaps shelter from heat in temperate regions is not a critical factor.

Rats, kiwi, and native birds: What's really in a feral cat's diet?

K Strang[1], I Castro[2], M Potter[3], & N Cave[4]

[1]Wildlife and Ecology Group, P.O. Box 11222, Massey University, Palmerston North 4410. k.strang@massey.ac.nz

[2]Wildlife and Ecology Group, P.O. Box 11222, Massey University, Palmerston North 4410. I.C.Castro@massey.ac.nz

[3]Wildlife and Ecology Group, P.O. Box 11222, Massey University, Palmerston North 4410. M.Potter@massey.ac.nz

[4]School of Veterinary Science, P.O. Box 11222, Massey University, Palmerston North 4410. N.J.Cave@massey.ac.nz

There is little doubt that feral cats are a pest worldwide, being classed as one of the worst 100 invasive species. In New Zealand, we know that feral cats have high predation rates on native wildlife, however they also prey on rats, which also have negative effects on wildlife. Due to negative public attitudes towards the control of feral cats, predator control is focused on the less favourable species: mustelids, possums, and rodents. We investigated the diet of feral cats on Ponui Island, where feral cats are a top predator and mustelids are not present. The island has high densities of rats, North Island brown kiwi, and other native birds. A total of 434 scats and casts were collected for two years starting in 2014. Samples were washed through a gradation of sieves so material could be identified under a microscope. Overall, feral cats consumed birds and rats in similar frequencies. Large birds (weighing over 200g) were more frequently found in scats than birds weighing less than 200g. A high number of native birds were identified, including kiwi, morepork, pukeko, and several passerine species. There was a seasonal difference in diet, with feral cats eating rats when they are at their highest densities, and consuming less rats when they were at their lowest densities. These results suggest feral cats are unlikely to have a large impact on regulating rat densities. Feral cats are capable, and do prey on vulnerable and large-sized birds. This study provides evidence to the significant impact feral cats are likely to have on New Zealand's native bird populations.

Sight or smell: What makes 'sense' for dogs in kiwi aversion training?

Alisha A. Hobbs,[1] Clare M. Browne,[1,2] Isabel C. Castro[3] and Tim L. Edwards[4]

[1]Science and Engineering, University of Waikato, Private Bag 3105, Hamilton, aaw22@students.waikato.ac.nz (student)

[2]School of Science, University of Waikato, Private Bag 3105, Hamilton, clare.browne@waikato.ac.nz

[3]Ecology Group, Massey University, Private Bag 11-222, Palmerston North, i.c.castro@massey.ac.nz

[4]School of Psychology, University of Waikato, Private Bag 3105, Hamilton, tim.edwards@waikato.ac.nz

The use of trained detection dogs has been a key part of the protection and monitoring of many New Zealand wildlife species. However, untrained dogs can pose a risk to native animals, particularly our native ground-dwelling birds, such as kiwi. To reduce the number of kiwi being killed by dogs, an aversion training programme has been developed. Training involves presenting dogs with a range of kiwi-related stimuli such as kiwi scats (faeces), nesting materials, feathers, physical models that resemble kiwi, and kiwi sounds. When a dog approaches the stimuli, or shows 'interest' in the object (e.g., sniffing or making contact with the materials), the dog receives an electric shock via a shock collar. Dogs then develop an aversion towards these stimuli which, potentially, generalises to a live kiwi, to reduce the likelihood of kiwi fatalities by dogs.

However, the stimuli used are not standardised across operators and will vary between trainings, and the efficacy of aversion training is largely uncertain across dogs.

Presenting different kiwi stimuli in a preference assessment format, will potentially identify key training stimuli that could be most useful in the aversion training of dogs for the protection of kiwi. It is our aim to determine if specific training stimuli or combinations of different stimuli provoke different behavioural responses from dogs.

With kiwi as 'taonga' and our national icon, this knowledge will be used to improve aversion training processes and outcomes for the benefit of kiwi; to aid in their survival.

Effect of landscape in the reception of bird sound by humans and autonomous recorders

Isabel Castro[1], Stephen Marsland[2], Nirosha Priyadarshani[3] and Ngati Kuta/Patukeha Hapu [4]

[1]Wildlife and Ecology Group, P.O. Box 11222, Massey University, Palmerston North 4410. i.c.castro@massey.ac.nz

[2]School of Mathematics and Statistics, Victoria University of Wellington, P.O. Box 600, Wellington 6140. stephen.marsland@vuw.ac.nz.

[3]School of Engineering & Advanced Technology, P.O. Box 11222, Massey University, Palmerston North 4410. nirosha201@gmail.com.

[4]Te Rawhiti Marae, 221 Te Rawhiti Rd, Te Rawhiti, Hikurangi RD4, Northland 0215. http://www.terawhitimarae.maori.nz/

Five species of kiwi are endangered. In 2015 Central Government committed 11 million NZD over four years to increase kiwi at 2% per annum and the Kiwi Recovery Plan 2017–27 aims to increase the kiwi from ~68,000 to 100,000 by 2030. To ensure the delivery of these targets we need to determine whether populations are increasing, decreasing or being maintained. Monitoring of bird populations is effectively is thus vital. Birdsong is used to detect, monitor, and quantify species because it works even when the individuals are out of sight. Call surveys by humans and autonomous recorders have been done in New Zealand, by DOC, councils and community groups (e.g., kiwi) hoping to use them to estimate how many birds there are and whether pest control efforts are working. However, in the case of recorders there are no standard methods to deploy and locate recorders in the field, no efficient software to extract and analyse the recordings and no information about how a given number of vocalisations may be related to actual animal densities. One of the first steps to make this technology useful to conservation is to develop protocols. If the data is collected using humans as well as autonomous recorders, this data may also allow comparisons between data collected previously by humans alone. Here we present the results of a field experiment aiming to examine factors necessary for the development of protocols for kiwi call surveys using autonomous recorders and humans.

Is this a grey duck I see before me?

Murray Williams

68 Wellington Rd, Paekakariki 5034. murraywilliamsnz@outlook.com

As grey ducks have declined in both numbers and range, uncertainty of identification appears to have risen. Differentiating grey duck from hybrids with mallard, and from variably-plumaged mallard females, has proved troublesome for some. Could the natural variability of grey duck plumage also contribute confusion? The two most readily viewed features of grey duck in the field are face pattern and upper wing colour and pattern. Following evaluations of specimen skins in Australian and New Zealand museum collections (funded by Birds NZ research fund…thank you), and viewing innumerable online photos, I shall describe variability in face and wing patterns of *Anas superciliosa* from throughout its Pacific Islands, Australia and New Zealand range. I have also reviewed these characters in known captive-raised grey x mallard hybrids and will contrast these with the variability shown by, particularly, pre-1970 and post-1970 museum specimens of grey duck from New Zealand. Is this a grey duck I see before me….. sometimes that might be a difficult question.

Absent population response of a small seabird species to multiple invasive predator eradications

Johannes H. Fischer[1*], Graeme A. Taylor[2], Rosalind Cole[3], Igor Debski[2], and Heiko U. Wittmer[1]

[1]School of Biological Sciences, Victoria University of Wellington, PO Box 600, Wellington 6140, New Zealand. johannesfischer@live.nl, heiko.wittmer@vuw.ac.nz

[2]Department of Conservation, PO Box 10420, Wellington, New Zealand. gtaylor@doc.govt.nz, idebski@doc.govt.nz,

[3]Murikihu District Office, PO Box 743, Invercargill 9840, New Zealand. rcole@doc.govt.nz

* Student presentation

The eradication of invasive predators from islands is a common technique to safeguard threatened (seabird) species, but post-eradication monitoring is often lacking. The South Georgian Diving Petrel (*Pelecanoides georgicus*; SGDP), a small Procellariiform seabird, has suffered major historic declines due to impacts from invasive predators. The SGDP is currently restricted to Codfish Island (Whenua Hou), where since 2000 all invasive predators have been eradicated. However, little is known about pre- or post-eradication estimates of SGDP population size, hindering assessments of the success of the eradications. I used a combination of discontinuous burrow counts (1979-2018) and intermittent capture-mark-recapture (CMR) efforts of banded individuals (1992-2018) to estimate the past and contemporary population size of the SGDP. I then applied log-linear regression models to assess the population's growth rate (λ) before and after predator eradications. The SGDP population was estimated at 222 (201-241; CMR-based) adults in 2018. The pre-eradication (1979-1986) λ of the SGDP population was estimated at 1.030 (1.002-1.057; burrow-count-based), while the post-eradications (2004-2018) λ was estimated at 1.019 (0.990-1.047; burrow-count-based) and 1.065 (1.017-1.114; CMR-based). Therefore, there is no apparent difference between pre- and post-eradication λ, in contrast to responses of other small Procellariiformes. The lack of change between pre- and post-eradication λ, combined with the low post-eradication λ, indicates that (an)other threat(s) may be hindering SGDP population recovery, suggesting an extinction synergy. These results, therefore, underline the necessity of assessing complementary threats, even in the presence of invasive predators as a prevalent threat.

Characterisation of benthic foraging habitat for hoiho

Emily Tidey[1] and Trudi Webster[2]

[1]School of Surveying, University of Otago, 310 Castle Street, Dunedin 9016, emily.tidey@otago.ac.nz and [2]Yellow-eyed Penguin Trust, 265 Princes Street, Dunedin 9016, science-advisor@yeptrust.org.nz

Hoiho are predominantly benthic foragers, using coastal waters up to 50km offshore and to depths of 150m. A recent review of scientific literature by the Yellow-eyed Penguin Trust (YEPT) highlighted our limited understanding of the benthic habitats used by hoiho.

Tracking work by the Zoology Department at the University of Otago has examined the foraging distribution of individual birds from breeding sites along the east coast of the South Island. Investigation of the benthic environment in areas visited by the birds is required to complement this research. This will develop our understanding of what makes an area important for foraging.

The School of Surveying at the University of Otago and YEPT recently conducted trials off the Otago Peninsula testing a Multibeam Echosounder (MBES) as a tool for investigating the benthic environment used by tracked penguins. A MBES uses acoustics to create high-resolution geo-referenced maps and images of the seabed, providing information on substrate and bathymetry. The trials comprised an area off Boulder Beach covering 22.3km^2 (depths 55-80m) and an area off Aramoana covering 11.9km^2 (depths 25-35m). Following the success of these trials, we plan to extend mapping efforts off the Otago coast, characterising benthic habitat types of specific importance to penguins. As well as helping to establish why hoiho forage in particular areas, we can also examine the data for any evidence of anthropogenic impacts on the seabed (e.g. dredging, bottom-fishing methods) and use these to inform effective marine protection based on preferred foraging habitat and any measurable human impacts.

Human disturbance on subantarctic yellow-eyed penguins - what is the impact and how can we reduce it?

Rebecca K. French[1], Chris G. Muller[2], B. Louise Chilvers[2] and Phil F. Battley[1]

[1]Wildlife and Ecology Group, Massey University, Palmerston North 4442, New Zealand. rebecca.french@outlook.co.nz, p.battley@massey.ac.nz
[2]Wildbase, School of Veterinary Science, Massey University, Palmerston North 4442, New Zealand. c.muller@massey.ac.nz, B.L.Chilvers@massey.ac.nz

Enderby Island (part of the Auckland Island archipelago, in the New Zealand sub-Antarctic) is thought to have the highest density of Yellow-eyed Penguins (Megadyptes antipodes, hōiho) in the world. It is also the only place in the subantarctic where tourists regularly come into contact with Yellow-eyed Penguins. Restrictions and guidelines for tourism are in place on Enderby Island, but there has been little study on the efficacy of these. We quantified behavioural responses of the Yellow-eyed Penguin on Enderby Island to human presence by documenting movement patterns and behaviour of penguins in the presence and absence of humans, through both controlled approaches and monitoring penguin behaviour in the presence of tourists. We used these data to model the effective approach distances for reducing disturbance. In this talk, we discuss the behavioural impact of human presence, and compare this to the natural disturbance caused by the New Zealand sea lion (Phocarctos hookeri). We will also present ideas on how regulation of tourism in the subantarctic could be improved to reduce anthropogenic impact on this vulnerable species.

The first author is a student, and a recipient of the Birds New Zealand research fund (2017).

The Drone Ranger – a VHF-equipped drone to improve yellow-eyed penguin nest-finding

Chris G. Muller [1], B. Louise Chilvers[2], Zane Barker[3], Kelvin P. Barnsdale[4], Phil F. Battley[5], Rebecca K. French[6], Josh McCullough[7] and Fred Samandari[8]

[1]Wildbase, School of Veterinary Science, Massey University, Palmerston North 4442, c.muller@massey.ac.nz

[2]Wildbase, School of Veterinary Science, Massey University, Palmerston North 4442, b.l.chilvers@massey.ac.nz

[3]Spatial Engineering Research Centre, University of Canterbury, Christchurch 8140,

[4]Spatial Engineering Research Centre, University of Canterbury, Christchurch 8140,

[5]Wildlife and Ecology Group, Massey University, Palmerston North 4442, P.Battley@massey.ac.nz

[6]Wildlife and Ecology Group, Massey University, Palmerston North 4442, Rebecca.French@outlook.co.nz

[7]Spatial Engineering Research Centre, University of Canterbury, Christchurch 8140,

[8]Spatial Engineering Research Centre, University of Canterbury, Christchurch 8140, fred.samandari@canterbury.ac.nz

Endangered yellow-eyed penguins (Megadyptes antipodes) nest individually underneath thick coastal scrub up to 1 km from the sea, making nests difficult and time-consuming to find by ground searching. 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 fitted a multi-frequency VHF receiver to a UAV (the Drone Ranger) to track penguins to their nests on Enderby Island in the New Zealand subantarctic. The receiver simultaneously tracked multiple VHF transmitters operating on individual frequencies. In this talk 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 those hidden under thick vegetation, underground, or cryptic species which are difficult to see.

Penguin-cams – gaining a whole new perspective on the foraging ecology and marine habitat of Yellow-eyed penguins

Thomas Mattern[1,2], Richard Seed[1], Ursula Ellenberg[2,3], Yolanda van Heezik[1], Phil Seddon[1]

[1]Department of Zoology, University of Otago, Dunedin, New Zealand

[2]Global Penguin Society, Puerto Madryn, Chubut, Argentina.

[3]Department of Ecology, Environment and Evolution, La Trobe University, Melbourne, Australia

For the past decades, Yellow-eyed penguin has always been the problem child of all the New Zealand penguin species. On the New Zealand mainland, the species had its ups-and-downs with years of catastrophic adult die-off events and sequences of years with poor breeding success. Reflecting this, recent population models suggest that the species may even disappear from the New Zealand mainland by 2060. And this despite the cat that Yellow-eyed penguins have received substantial scientific attention since the early 20th century. For many years this research was confined to the penguins' terrestrial habitat, simply because it was impossible to study the birds in their marine habitat. With the dawn of modern tracking technologies, we learned first about the penguins' foraging movements and their largely benthic diving behaviour. But what exactly affects the birds while they are out at sea or determining which marine factors may be responsible for the species ongoing decline largely remained a matter of speculation. The dawn of animal-borne cameras represents a paradigm shift for the study of the foraging ecology of yellow-eyed penguins. These devices not only allow it to literally observe what the penguins are doing while at sea, but also provide visual information about the state of the marine environment they forage in - in the case of the Yellow-eyed penguin, the seafloor habitat. We will present a summary of our findings of three two years of camera deployments on Yellow-eyed penguins from the Otago Peninsula, the Catlins and Stewart Island. We will highlight how cameras help us to gain new insights into how the penguins fit into the marine ecosystem and how the species may be affected by rapid changes be it as a result of climate change or human impacts.

Population size and trends in Giant Petrel and albatross species breeding in the Chatham Islands

Mike Bell[1], Peter Frost[2], and Graeme Taylor[3]

[1]Wildlife Management International Limited, PO Box 607, Blenheim 7201 (mike@wmil.co.nz)

[2]Science Support Service, 87 Ikitara Road, Whanganui 4500 (pghfrost@xtra.co.nz)

[3]Department of Conservation, PO Box 10-420, Wellington (gtaylor@doc.govt.nz)

The Chatham Islands support almost the entire global populations of Chatham Island Mollymawk, Northern Buller's Mollymawk, and Northern Royal Albatross, and a globally significant proportion of the Northern Giant Petrel population. Given mounting evidence of gradual warming and other ecosystem-wide changes in the Southern Ocean, including those due directly to human activities, tracking the population trends of these species is needed. In 2016 and 2017 field teams visited and camped on The Pyramid/Tara Koi Koia (November 2016), The Forty Fours/ Motuhara (December 2016) and The Sisters/ Rangitatahi (December 2017) where they undertook ground-based censuses of seabirds breeding on these islands. In addition, to supplement this work, and because these islands are relatively inaccessible, we carried out aerial surveys of Motuhara and Rangitatahi in Nov 2016, July 2017 and Dec 2017 with a view to establishing long-term monitoring of these species. This research has enabled us to update the population size estimates of all four species and assess their population trends, results that we present in this talk.

Trial of three methods to obtain population estimates of light-mantled sooty albatross at Campbell and Auckland Islands, New Zealand

Parker, G.[1], Walker, K.[2], Elliott, G.[2], Baker, G.B.[3], Debski, I.[4], Jensz, K.[3], Sagar, P.[5], Thompson, D.[5], Rexer-Huber, K[1,]

[1]Parker Conservation, 126 Maryhill Terrace, Dunedin, g.parker@parkerconservation.co.nz, k.rexerhuber@parkerconservation.co.nz

[2]Albatross Research, 549 Rocks Rd, Nelson, gelliott@doc.govt.nz, kwalker@doc.govt.nz

[3]Latitude 42 Environmental Consultants, Kettering, Tasmania. Barry.Baker@latitude42.com.au, Katrina@latitude42.com.au

[4]Department of Conservation, Conservation Services Programme, Wellington, idebski@doc.govt.nz

[5]National Institute of Water and Atmospheric Research, Wellington, paul.joy.nz@gmail.com, David.Thompson@niwa.co.nz

Light-mantled sooty albatross (LMSA) Phoebetria palpebrata breeds on nine subantarctic island groups. In New Zealand LMSA is classified as 'At Risk - Declining'. Globally, few data exist for LMSA, and there are no quantitative estimates of population sizes at the three New Zealand breeding islands (Campbell, Auckland and Antipodes islands).

Since 1999, annual counts of a small number of LMSA nests on Adams Island, Auckland Islands, have shown a decline in the number of nests. The trend is similar to that for another biennially-breeding albatross on Adams Island, the Gibson's wandering albatross Diomedea antipodensis gibsoni.

Driven by the lack of quantitative population-size data for LMSA in New Zealand, we trialled three methods to obtain baseline breeding population estimates suitable for estimating trends over time: boat-based, ground and aerial counts.

Boat-based counts of LMSA proved inaccurate due to vessel movement when trialled at Campbell Island. Ground counts could access a sufficient sample of nests despite difficult terrain. Ground counts revealed that few loafing adult LMSAs were sitting on nest pedestals, suggesting that loafers are a relatively small source of error when interpreting aerial photography. Comparing ground and aerial counts in the Auckland Islands, aerial photography over-estimated the number of nests by 19.2%. Aerial survey is an effective method for counting LMSAs on Adams Island, if calibrated for apparent breeders.

Connectivity for conservation of Southern Ocean seabirds: the case of white-chinned petrels

Kalinka Rexer-Huber[1, 2], Graham Parker[2], Andrew Veale[3], Bruce Robertson[4]

[1]University of Otago Department of Zoology, 340 Great King St., Dunedin. kalinka.rexer-huber@parkerconservation.co.nz

[2]Parker Conservation, 126 Maryhill Terrace, Dunedin. g.parker@parkerconservation.co.nz

[3]Environmental and Animal Sciences, UNITEC Institute of Technology, Auckland. andrew.j.veale@gmail.com

[4]University of Otago Department of Zoology, 340 Great King St., Dunedin, bruce.robertson@otago.ac.nz

White-chinned petrels are caught as fisheries bycatch more than any other seabird. Species management efforts, however, are hobbled by taxonomic uncertainty, where the boundaries of taxa in the New Zealand region remain unclear. We assessed the population-genetic structure of white-chinned petrels to test whether any NZ colonies (Antipodes, Auckland, and Campbell Islands) are distinct from each other, or distinct from colonies around other sectors of the Southern Ocean. Following range-wide comprehensive sampling (all eight breeding islands across three oceanic basins), we applied cutting-edge genomic methods (genotyping-by-sequencing or GBS; 60,709 loci) and standard mitochondrial-marker approaches (cytochrome b and 1st domain of control region). Standard mitochondrial data and whole-genome GBS data both confirmed the NZ regional taxon seen in other studies, but GBS revealed unexpected differentiation within the NZ region. Specifically, Antipodes and Campbell Island white-chinned petrels are distinguishable from Auckland Island birds. Globally, we found three ocean-basin scale genetic management units for white-chinned petrels, instead of the two detected by traditional methods. Along with the NZ regional grouping, we saw a previously unsuspected split between colonies in the South Atlantic (South Georgia and Falkland Islands) and those in the southern Indian Ocean (Marion, Crozet and Kerguelen Islands). Genomic data were the key to revealing three ocean-basin level genetic management units for white-chinned petrels, and to show that bycatch petrels can be identified to source population in our region. The challenge: to manage the vast fisheries bycatch problem according to biologically relevant boundaries that span political boundaries.

Urban Bird Composition at Different Spatial Scales

[1]**Heggie-Gracie, S.,** [2]Krull, C. & [3]Stanley, M.

[1]105 Carlton Gore Road, Newmarket, Auckland. sheggie-gracie@tonkintaylor.co.nz

[2]cherylrkrull@gmail.com

[3]Tamaki Building 733 – Bldg 733 Tamaki Campus Gate 1, 261 Morrin Road, St Johns, Auckland, mc.stanley@auckland.ac.nz

Over 50% of the world's population live in cities, and the rate and intensity of urbanisation continues to increase globally. This has resulted in the decline of a number of 'common' bird species

overseas, including sparrows and starlings. Bird responses to urbanisation can be highly variable, and birds are often categorised into urban 'avoiders', 'adaptors' or 'exploiters' depending on their ability to thrive in urban environments. The proliferation of 'exploiters' has resulted in global homogenisation of bird fauna in cities. Moreover, consequences of urbanisation such as noise pollution and land use change impact bird species composition and movement dynamics. Wildlife habitats in cities are fragmented and heterogeneous, so assessing how birds respond to the impacts of urbanisation at different scales may untangle key environmental drivers of bird communities. Using 10 minute bird counts and Distance Sampling, we investigated avian composition in relation to environmental drivers at: 1) a large scale across an urbanisation gradient in Auckland City, and 2) a smaller spatial scale, within urban forest fragments. Bird species richness declined with urbanisation, while density peaked in suburban zones. Native bird communities benefited from higher tree and shrub cover in the urban matrix, and higher pest control and connectivity in urban fragments. At both scales, higher urban noise affected native bird communities negatively. Understanding how birds utilise urban environments not only allows us to measure changes as a result of intensification and other threats, but also allows for management of cities to improve the status of urban bird communities.

Patterns of feeder use by urban birds – not all are equal

Josie A. Galbraith[1,2], Darryl N. Jones[3], Jacqueline R. Beggs[2], Katharina Parry[4] and Margaret C. Stanley[2*]

[1]Auckland Museum, Private Bag 92018, Auckland, JGalbraith@aucklandmuseum.com

[2]Centre for Biodiversity and Biosecurity, School of Biological Sciences, University of Auckland, Private Bag 92019, Auckland

[3]Environmental Futures Research Institute, Griffith University, Nathan, Qld 4111, Australia

[4]Institute of Fundamental Sciences, Massey University, Private Bag 11222, Palmerston North

Recent studies have revealed the potential for detrimental impacts of garden bird feeding. However, information on the ubiquity of these impacts among and within feeder-visiting species is scarce. Individual birds and species that make frequent use of feeders are more likely to experience both the benefits and detrimental impacts of supplementary food. We investigated patterns of feeder use by garden birds visiting experimental feeding stations in Auckland, New Zealand, with the specific aim of determining whether use of supplementary food was consistent or variable among individuals and species. We also considered whether supplementary food use is modified by interspecific interactions or seasonality. We used camera traps as well as Radio Frequency Identification (RFID) technology to examine intra- and interspecific feeder visitation patterns and to discern species associations. Eleven bird species were detected using feeding stations, however, two introduced species (house sparrow Passer domesticus and spotted dove Streptopelia chinensis) dominated visitation events. Significant associations were detected among a number of species, suggesting interspecific interactions are important in determining feeder use. We also found within-species differences in feeder use for all focal species, with individual variation greatest in house sparrows. Exploitation of supplementary food by a few species and by a subset of individuals within species has important implications at both the population and community levels.

Roost sites and density of common mynas in the region surrounding upper Whangarei, Northland.

A J Beauchamp, 17 Bellbird Ave, Onerahi, Whangarei 0110, wekaman@xtra.co.nz

Some New Zealand populations of common myna use communal roost sites. In some regions mynas are considered a nuisance, but control of them at roost sites has sometimes been unsuccessful. Previous studies of mynas have been too short to understand if this is related to how mynas use roost sites. In winter 2012 I established the location, distribution, size of 13 roost sites around Whangarei (5733 ha). I then followed these roosts at varying levels of intensity, but no less than annually during winter, to establish if the roost sites changed in location or size, and the drivers for that change. I observed the flight direction of mynas at key catchment boundaries to establish if pairs were using multiple sites. At two of the sites I used fixed counts to establish how quickly mynas were detected and map the stability in the urban environment.

Long-term changes in the breeding biology of the New Zealand bellbird on Tiritiri Matangi Island

Michelle M. Roper[1,2], Aaron M.T. Harmer[1,3] and Dianne H. Brunton[1,4]

[1]Behavioural and Conservation Group, Institute of Natural and Mathematical Sciences, Massey University, Private Bag 102904, Auckland.

[2]m.roper@massey.ac.nz

[3]a.harmer@massey.ac.nz

[4]d.h.brunton@massey.ac.nz

First author: Student

Ecological restoration projects provide excellent opportunities to study how animals adapt their behaviour in response to a changing environment. A key way an animal can optimise reproductive success in changing conditions is to alter the breeding system. The New Zealand bellbird (*Anthornis melanura*) has a long history on Tiritiri Matangi Island (Tiri), from a degraded agricultural past to recent restoration. We studied the breeding biology of the NZ bellbird to assess how their breeding parameters have responded over time to the restoration on Tiri. We compared the current breeding biology (2012-2017) of the bellbirds with data collected from 2001-2010, and a study from 1977-78 (Anderson & Craig, 2003), prior to the island's restoration. We also tested what abiotic and biotic factors could affect aspects of reproductive success. Our main finding was that clutch size reduced over time from a mean of 3.6 to 2.4, most likely due to the population becoming density-dependent. Laying dates in early breeding seasons advanced to late August and in delayed years, could extend to January, with all chicks fledged by the end of February. Variation in the timing of breeding was likely due to annual variation in food resources. We found little effect of year, weather, or parental age and morphometrics on aspects of reproductive success. These results and comparisons with the breeding biology on other populations suggest that the bellbird breeding system is adaptive to local conditions and that food resources are a limiting factor.

Recognition of the significance of birds at the Port of Tauranga: an example of the value of OSNZ bird surveys

John F. Cockrem[1] and Julian Fitter[2]

[1]School of Veterinary Science, Massey University, Palmerston North. J.F.Cockrem@massey.ac.nz

[2]Maketu Ongatoro Wetland Society, 21 Ngaparapa Drive, Maketu. julianfitter@xtra.co.nz

The Tauranga harbour in the western Bay of Plenty provides feeding, roosting and breeding areas for large numbers of birds. The harbour is also the location of the Port of Tauranga which is New Zealand's busiest port. At least 18 species of coastal birds are found at the Port of Tauranga,

including one species classified by the Department of Conservation as nationally critical. Data collected since 1984 during twice yearly counts for the OSNZ National Wader Census show that the Tauranga Harbour is the fifth most important site for wading birds in New Zealand. Sulphur Point in Tauranga, an area of land used by the Port, was originally estuary. Detailed records for bird counts at locations around the harbour from 2010 to 2017 show the importance of Sulphur Point as a roosting site for waders and as breeding site for black-billed gulls, red-billed gulls, white-fronted terns, New Zealand dotterels and variable oystercatchers. A breeding colony of red-billed gulls on Port land at Mount Maunganui holds one third of the breeding pairs of red-billed gulls that were counted in the Bay of Plenty during the recent OSNZ national red-billed survey. Planned expansion of the operations of the Port of Tauranga would lead to the loss of the important bird breeding and roosting areas at Sulphur Point and Mount Maunganui. Information from the OSNZ surveys has been critical to identifying the significance of these areas and hence to discussions with the Port on how to either vary their plans or to provide equivalent alternative habitat for the birds.

Wading into genomics for threatened species recovery

Natalie Forsdick[1], Richard Maloney[2], Tammy Steeves[3], Michael Knapp[1]

[1]Department of Anatomy, University of Otago, PO Box 56, Dunedin 9054.
natalie.forsdick@postgrad.otago.ac.nz (student), michael.knapp@otago.ac.nz

[2]Department of Conservation, 15 Wairepo Road, Twizel 7901. rmaloney@doc.govt.nz

[3]School of Biological Sciences, University of Canterbury, Private Bag 4800, Christchurch 8140.
tammy.steeves@canterbury.ac.nz

The 2017-2018 summer has been a bumper breeding season for one of the world's rarest waders, kakī or black stilt (*Himantopus novaezelandiae*). The population has grown from a low of approximately 23 birds in 1981 to over 100 wild adults today. As kakī underwent such an extreme bottleneck, genetic information has become an essential resource for the Department of Conservation Kakī Recovery Programme to determine the best actions to maximise genetic diversity and minimise inbreeding. One concern for the current population is the impact of past hybridisation between kakī and poaka/pied stilts (*H. himantopus leucocephalus*) on the kakī genome. When kakī numbers have been historically low, interbreeding between the two species has occurred resulting in fertile hybrids with intermediate plumage morphology and reduced fitness. Previous research using a small number of genetic markers indicated that hybridisation has had no detectable impact on the kakī genome, but this may not be indicative of genome-wide effects. We first used whole mitochondrial genome sequencing to establish more clearly the evolutionary history of kakī within the Australasian stilts. Recent advancements in DNA sequencing technology have enabled the sequencing and assembly of a draft kakī genome. From this, we generated a high resolution genomic marker set for interspecific comparisons, allowing investigation into whether hybridisation may have produced any signature on kakī diversity and fitness. This genomic assessment will be used to determine best-practice conservation management for kakī, and to measure impacts of hybridisation in other threatened species.

What do we really know about Kiwi genetics?

Malin Undin[1], Simon Hills[2], Peter Lockhart[3], Doug Armstrong[4] and Isabel Castro[5]

[1] PhD candidate, Ecology Group, Massey University, Private Bag 11-222, Palmerston North,
malin.undin@gmail.com
[2]Ecology Group, Massey University, Private Bag 11-222, Palmerston North,
s.f.hills@massey.ac.nz

[3]Institute of Fundamental Science, Massey University, 11-222, Palmerston North, p.j.lockhart@massey.ac.nz
[4]Ecology Group, Massey University, Private Bag 11-222, Palmerston North, d.p.armstrong@massey.ac.nz
[5]Ecology Group, Massey University, Private Bag 11-222, Palmerston North, i.c.castro@massey.ac.nz

Research on Kiwi (*Apteryx* spp.) took a large step forwards when genetics entered the scene 30 years ago. Thanks to this we are now able to sex juveniles, we know that not all *Apteryx* species are strictly monogamous and most strikingly Rowi has been identified as its own species. DNA technology is evolving fast, enabling identification of more subtle genetic differences, generating inflation in the number of distinct taxa identified. Genetics will have a crucial role in *Apteryx* conservation, however here we want to highlight issues that impact findings: (i) how, where and when *Apteryx* spp. are sampled, (ii) how results are compared, (iii) what detecting genetic differences really mean, and (iv) how to best interpret genetic information. One of the main concerns is making decisions about translocations. Modern genetics can aid in identifying suitable source populations and populations in need of genetic rescue; potentially even in identifying individual birds suitable for translocation or birds that carry unwanted genes or pathogens. For informed decision making there is a need to (a) quantify genetic diversity, inbreeding and its consequences on a finer geographical scale and (b) increase our understanding of the underlying causes of genetic differences among populations. Until we have this information it will be impossible to predict the outcome of any *Apteryx* translocations. Because of this we stress the need for patience; mistakes we commit today can have irreversible effects, and long lived species like *Apteryx* spp. have time to wait for us to do this right.

A peek into the past and future of the New Zealand Kaka

Denise Martini[1], Neil Gemmell[1], Bruce Robertson[2], Michael Knapp[1]

[1]Department of Anatomy, University of Otago, 270 Great King street, 9016 Dunedin, denise.martini1406@gmail.com

[2]Department of Zoology, University of Otago, 340 Great King street, 9016 Dunedin

The Kaka (*Nestor meridionalis*) is a forest parrot endemic to New Zealand. At the time of European colonization, the Kaka was abundant on both main islands and the morphological variability in size and plumage colour between individuals was such that multiple distinct varieties were first described rather than a single species. Kaka populations have been declining over the past 150 years, following habitat loss and interactions with invasive pest species. Their distribution is fragmented and limited to areas of active pest control. Additionally, the North Island Kaka and the South Island Kaka are currently recognised as different subspecies because of their morphological and behavioural differences.

The present study uses genomic techniques to fill the gaps in our knowledge about this species and its present and past interactions with the environment. We are studying the modern population with samples collected across the Kaka's geographical range, using genomic markers to clarify the population structure and to identify potential local adaptation to the diverse biota that this species encounters across New Zealand.

We are also using ancient DNA to peek into the past of this species. We have sourced historical skins and subfossil material from museum collections in NZ, to investigate how this species has already coped in the past through two waves of human colonisation and the ecological challenges associated with climate change during the last glacial periods. Knowing how Kaka survived these crises in the past might help us to better anticipate management requirements in the face of future change.

BirdSearch, encouraging birding in New Zealand.

Dayna P. Davies

Student at Whangarei Girls High School, Founder of Hinemanu, 23 Pacific Bay Rd Whangarei. daynadavies@gmail.com

BirdSearch is a free online game designed as a competitive application to stimulate interest among younger people in finding birds. On the BirdSearch website you are able to browse a map of New Zealand and decide where to go based on the birds that are in that location. BirdSearch locations are in public spaces and focus on a specific trail or area. BirdSearch provides a description of birds specific to those particular habitats. Points are awarded for each listed species, and birds that are rare or harder to find have higher points. You can compete by sharing your score with your group or everybody who has been on that trail using social media. BirdSearch is being developed by Hinemanu, a not-for-profit organisation. Our future plans include incorporating QR codes and app development.

Bird banding: closing the loop

Michelle Bradshaw[1] and Sandy Taylor[1]

[1]Banding Office, Department of Conservation, 18-32 Manners Street, Wellington, 6011. bandingoffice@doc.govt.nz

In 1946, the Ornithological Society of New Zealand (OSNZ) established a Ringing Subcommittee that launched a national bird banding scheme, which was inaugurated in 1950. Since then, Society members and others have made an immense cumulative contribution to bird research, conservation and monitoring through bird banding and reporting sightings of banded birds. The Scheme is currently administered by the Department of Conservation, which is in the process of designing a new central repository of all national bird banding data (some 2 million records). An important aspect of this process will be to collate all outstanding banding records, and to encourage more reporting of band resights. The long-term datasets held by national banding schemes represent an invaluable resource for threatened species management, and each band reported contributes to building the bigger picture. Anecdotes, graphs and band stories will be used to highlight the value not only of bird banding, but of having the data standardised, curated and accessible. Every band tells a story – but only if we can close the loop in terms of banding and resighting data.

Identifying conservation actions required to protect Little Penguins in New Zealand

Kerry-Jayne Wilson[1] and Thomas Mattern[2]

[1]West Coast Penguin Trust, P.O. Box 70, Charleston 7865, West Coast. Kerryjayne1@hotmail.com

[2]The Tawaki Project, Global Penguin Society, Department of Zoology, University of Otago. T.mattern@eudyptes.net

Little Penguins breed in most coastal regions of New Zealand. Although their numbers are in decline in most parts of their range Little Penguins are listed as 'least concern' by the IUCN red list; nationally, however, they are ranked as 'at risk'. Recent genetic research indicates that there may be two species, one found in southern Australia and Otago (*E. novaehollandiae*), the other, (*E.*

minor) endemic and found elsewhere in New Zealand. If correct this is likely to raise the threat status of the New Zealand Little Penguin.

We are in the process of reviewing what we know and what we need to know about Little Penguins throughout New Zealand and from that, recommending conservation actions that are required to prevent further declines and allow populations to recover. In this presentation we will briefly outline the major gaps in our knowledge then present our interim ideas on conservation actions required. We invite other people present to alert us to conservation work under taken by individuals or groups we are not aware of and their views on conservation needs for the penguins.

This project is supported by the Birds New Zealand Research Fund.

Identifying conservation actions required to protect Tawaki in New Zealand

Thomas Mattern[1] and Kerry-Jayne Wilson[2]

[1]The Tawaki Project, Global Penguin Society, Department of Zoology, University of Otago. t.mattern@eudyptes.net

[2]West Coast Penguin Trust, P.O. Box 70, Charleston 7865, West Coast. Kerryjayne1@hotmail.com

The Fiordland penguin or Tawaki breeds only along the southern section of the West Coast, Fiordland and the Foveaux Strait region. The species has one of the smallest breeding distributions of all penguins (behind Snares and Galapagos penguins) which makes it particularly susceptible to regional threats. The IUCN lists Tawaki as ‘vulnerable’ mainly as the population is thought to be in decline. However, until recently the species was one of the least known and least studied penguin species, which makes it difficult to put any population decline into an environmental context. The lack of knowledge is a substantial stumbling block for any attempts to develop appropriate conservation strategies and management actions.

We are in the process of reviewing what we know and what we need to know about Tawaki and from that, recommending conservation actions that are required to prevent declines and work towards a stabilisation of the population. In this presentation we will briefly outline the major gaps in our knowledge then present our interim ideas on conservation actions required. We invite other people present to alert us to conservation work under taken by individuals or groups we are not aware of and their views on conservation needs for the penguins.

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