

Welcome to the 13th Ōamaru Penguin Symposium

**3-4 May 2023
Ōamaru Opera House**



Manaaki Whenua
Landcare Research

Programme

Day One: Wednesday, 3rd May

08:45 – 09:20	Registration – Ink Box Room, Ōamaru Opera House	
09:20	<i>Welcome</i>	
09:30 – 09:40	Opening remarks <i>Thomas Mattern</i>	
09:40 – 10:00	Wildlife Response in Coastal Otago <i>Richard Seed</i>	Page 6
10:00 – 10:20	Banding Office discussion: Best Practice, Certification and Data Submission <i>Michelle Bradshaw</i>	Page 7
10:20 – 11:00	Morning tea	
11:00 – 11:25	Bad New News from the Trail Cameras <i>Graeme Loh & Tia Scott</i>	Page 8
11:25 – 11:45	New penguin fossil discoveries from Aotearoa New Zealand <i>Alan Tennyson</i>	Page 9
11:45 – 12:05	Non-breeding patterns of brown skuas: insights from geolocators, stable isotopes and moult <i>Hendrik Schultz</i>	Page 10
12:05 – 12:25	By land and sea: On the quest for kororā conservation at the Pōhatu colony <i>Rachel Hickcox</i>	Page 11
12:25 – 13:25	Lunch	

13:25 – 13:45	Risks, resources, and refugia: Spatial overlap between yellow-eyed penguin foraging distribution and prey, commercial fisheries, and marine protected areas <i>Rachel Hickcox</i>	Page 12
13:45 – 14:05	Predicting avian malaria conditions to aid in penguin conservation efforts in New Zealand <i>Chris Niebuhr</i>	Page 13
14:05 – 14:25	Finding the causative agents of infectious diseases affecting hoiho (yellow-eyed penguins) in New Zealand <i>Janelle Wierenga</i>	Page 14
14:25 – 14:45	Yellow-eyed Penguin/Hoiho Hand-rearing at Dunedin Wildlife Hospital <i>Emma Chen</i>	Page 15
14:45 – 15:25	Afternoon Tea	
15:25 – 15:45	Sizable Waddle, a critical reflection of rehabbing Hoiho <i>Jason van Zanten</i>	Page 16
15:45 – 16:05	Post-guard and pre-moult tracking of hoiho on Motu Ihupuku <i>Mel Young</i>	Page 17
16:05 – 16:25	Are Pinging Penguins Promising? Acoustic telemetry of African Penguins <i>Michelle Bradshaw</i>	Page 18
16:25 – 16:45	Penguins as vectors for contaminant transport in pristine Antarctic environments <i>Megan Reaves</i>	Page 19
17:00 – 18:30	Field trip to Ōamaru Blue Penguin Colony	
18:30 – onwards	Dinner: Loan and Merc Building	

Day Two: Thursday, 4th May

08:45 – 09:05	Foraging ecology of Tawaki (Fiordland penguin) in Doubtful Sound <i>Blake Hornblow</i>	Page 20
09:05 – 09:25	Voyage to the sub-Antarctic islands: Heritage Expeditions True Young Explorer Scholarship <i>Henry Elsom</i>	Page 21
09:25 – 09:45	Indications of continued population decline in erect-crested penguin numbers at the Antipodes <i>Dave Houston</i>	Page 22
09:45 – 10:05	A rock and a hard place – Are the subantarctic Bounty Islands becoming the new species stronghold for Erect-crested penguins? <i>Thomas Mattern</i>	Page 23
10:05 – 10:45	Morning tea	
10:45 – 11:05	PenguCams reveal flexible foraging behaviour in Humboldt penguins – good news for population resilience? <i>Ursula Ellenberg</i>	Page 24
11:05 – 11:25	Protecting port penguins: management strategies for nesting kororā during Port Marlborough development <i>Shannon Ritter</i>	Page 25
11:25 – 11:45	Microplastics in Little Penguin gastrointestinal tract from two Victorian colonies <i>Tia Scott</i>	Page 26
11:45 – 12:05	NZPI Kororā National Monitoring programme update <i>Hiltrun Ratz</i>	Page 27
12:05 – 13:05	Lunch	

13:05 – 13:25	The growth and successes of Places for Penguins Wellington branch <i>Places for Penguins team</i>	Page 28
13:25 – 13:45	Looking back on a disastrous breeding season in Canterbury <i>Thomas Stracke</i>	Page 29
13:45 – 14:05	Kororā Conservation in the Bay of Plenty <i>Melissa McLuskie</i>	Page 30
14:05 – 14:25	Analyses of moult in kororā from automatic weigh platforms <i>Philippa Agnew</i>	Page 31
14:25	Closing	

Wildlife Response in Coastal Otago

Richard Seed, Jim Fyfe, Julia Reid and Jim Watts

Department of Conservation, Coastal Otago District Office, Dunedin, New Zealand

The Department of Conservation (DOC) responds to calls from the public about sick and injured native wildlife. Wildlife response can be resource intensive and often impedes on a busy program of planned work. However, it provides opportunities to save threatened species, enact animal welfare obligations and advocate for wildlife with callers who may never otherwise engage with conservation. This is an opportunity to share details of DOC's wildlife response with many of the conservation groups and individuals who offer their time to assist with responses. Here we take a deep dive into wildlife response in the Coastal Otago Operations District to discuss: 1) The process and purpose behind DOC's wildlife response; 2) The patterns we see across species and seasons; and 3) Opportunities to improve data collection and make use of this dataset.

Banding Office discussion: Best Practice, Certification and Data Submission

Michelle Bradshaw

Department of Conservation, Wellington, New Zealand

The Banding Office administers the New Zealand Bird Banding Scheme (NZNBBS) in accordance with Department of Conservation's statutory responsibility to manage marking of wildlife. This includes processing and data curation of marking records and recoveries, managing the operator certification system, advising on Wildlife Act Authorities, sourcing and providing marking equipment and overseeing revisions of Best Practice Guidelines and Standard Operating Procedures.

The [FALCON System](#) has been designed to hold and manage mark-recapture and ancillary data, including information relating to projects and competency of operators involved in bird capture and marking. This includes the use of transponders as a marking technique.

The discussion will outline how to engage with the Banding Scheme to provide input into developing best practice, apply for competency assessment and submit marking data.

Bad New News from the Trail Cameras

Graeme Loh and Tia Scott

Automatic cameras monitoring nest have revealed conclusive evidence of predator prey interactions. Recent monitoring by the Yellow-eyed Penguin Trust in the Catlins has revealed rats injuring large chicks at the nest on successive days while “guarded” by their parents. The parent bird appeared oblivious to the rat activity. This led to the chick’s death from injuries.

Trail camera monitoring of sooty shearwater nests at Sandfly Bay, on Otago Peninsula, by Forest and Bird reveals frequent close inspection of burrows by brush-tailed possums. On Maria Island in Tasmania these possums have been recorded killing fledging short-tailed shearwaters. So far direct attacks by possums on shearwaters here have not been revealed. The Sandfly Bay monitoring has also shown death of a chick after a hedgehog visit and stoats visiting an active burrow with no harm to the chick. Perhaps the abundant mice are a ‘buffer’.

Monitoring in St Kilda, Australia has identified a native Australian water rat, the Rakali (*Hydromys chrysogaster*), killing and feeding on a Little Penguin chick, providing the first visual evidence of this predatory behaviour.

Some tips on managing cameras and data will be discussed.

New penguin fossil discoveries from Aotearoa New Zealand

Alan J.D. Tennyson

Museum of New Zealand Te Papa Tongarewa, P.O. Box 467, Wellington 6011, New Zealand

Over the past six years I have contributed to the description of seven new extinct penguin taxa from Aotearoa New Zealand: *Kupoupou stilwelli*, *Petradyptes stonehousei*, *Kumimanu biceae*, *K. fordycei*, *Eudyptes atatu*, *E. warhami* and *Megadyptes antipodes richdalei*. The oldest date to ca 60 million years and are among the most archaic forms yet described, for example, with flipper bones that are notably less flattened than those of modern penguins. They reached sizes far greater than that of the extant emperor penguin (30 kg) and included the largest penguin ever known: *K. fordycei*, weighing roughly 150 kg. The three million-year-old crested penguin *E. atatu* is a very early member of the genus and differs from its living relatives in having a thinner beak (and, thus, feeding ecology). The youngest taxa, *E. warhami* and *M. antipodes richdalei*, both lived on Rēkohu / the Chatham Islands and fell victim to humans. Together, these fossils further illuminate New Zealand's position as the cradle of global penguin evolution.

Non-breeding patterns of brown skuas: insights from geolocators, stable isotopes and moult

Schultz et al.

Seabirds are often studied during their breeding period when birds are accessible at their nests, but relatively little is known about the non-breeding proportion of their annual cycle. Here, we used a combination of geolocation tracking, tail feather stable isotopes ($\delta^{13}\text{C}$ and $\delta^{15}\text{N}$), and modelling of primary feather moult to describe the non-breeding patterns of brown skua (*Stercorarius antarcticus lonnbergi*), a large predatory seabird breeding on the Chatham Islands. Tracking of 27 individuals across two winters revealed that, on average, skuas departed the colony on 13 February for a relatively short mean duration of 146 days. Both geolocation tracking and stable isotopes from feathers suggested a wintering distribution throughout mixed subtropical–subantarctic and shelf waters. Furthermore, a comparison with stable isotopes from museum feathers indicated that neither the latitudinal distribution nor diet have changed substantially over the past 145 years. Interestingly, our moult model shows that the primary feather moult partly overlapped with breeding occurring on average on 2 January, which is five days earlier than the average chick fledging date and 42 days before adult birds departed the colony. The temperate conditions within and around the Chatham Island archipelago may alleviate the need for brown skuas to leave their breeding grounds for long periods, allowing for moult to partly overlap with breeding. We suggest that similar analyses are needed for other populations of brown skua to better understand variation within and among populations.

By land and sea: On the quest for kororā conservation

Rachel P. Hickcox

Helps Pōhatu Conservation Trust

The Helps Pōhatu Conservation Trust embarked on a quest to establish a long-term monitoring and research programme of little penguins/kororā (*Eudyptula minor*) at Pōhatu/Flea Bay on Banks Peninsula. Our aim is to develop effective conservation strategies and better understand the population dynamics of one of the largest New Zealand mainland colonies of the white-flipped penguin, a colour morph of the little penguin, while assessing penguin habitat use, foraging behaviour, diet, and threats at sea. Along the way, we had to (1) conceptualise and define objectives, (2) create the initial project plan, (3) apply for permits and funding, (4) refine protocols and methodologies, (5) prepare for field work, (6) organise training, (7) conduct annual monitoring and research, (8) analyse data, and (9) share results and conservation success. We review the breeding and moult season of 2022-2023, during which we monitored over 200 nest boxes weekly. We marked 269 adults and chicks, GPS tracked 15 penguins during guard and post-guard stage, and rehabilitated 90 underweight chicks and 10 adults. Our hope is that this collaborative project provides a model for the establishment of similar long-term projects for other penguin and marine species and will support future conservation of little penguins at Pōhatu and around New Zealand.

Resources, risks and refugia: assessing the spatial overlap between yellow-eyed penguin foraging distribution, prey, commercial fisheries, and marine protected areas

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Conservation of yellow-eyed penguins (*Megadyptes antipodes*) focuses on managing terrestrial threats, while little is being done to understand and prevent marine threats. More specifically, it is unknown if penguin foraging areas overlap with resources (i.e., prey), risks (i.e., commercial fisheries interactions, bycatch), and areas of refugia (i.e., marine protected areas, MPAs). First, we determined if suitable penguin foraging habitat, predicted by maximum entropy or Maxent species distribution models (SDMs), also supports a high diversity of seven key prey species using stacked Maxent SDMs. Then we created a novel index to predict areas of likely interactions between penguins and commercial gillnet/trawl fisheries. Lastly, we established a baseline measure of overlap between penguin foraging distribution, current MPAs, and the proposed South-East Marine Protected Area (SEMPA) network. In general, areas along the middle of the continental shelf had the highest probability of penguin presence, prey diversity, and overlap with gillnet and trawl fisheries. However, less than 1% of the total range of yellow-eyed penguins overlaps with a marine reserve or MPA, and the proposed SEMPA network will only protect 3.6% of their range. By assessing threats to yellow-eyed penguin survival, these findings can be used to inform ongoing conservation management decisions and marine spatial planning aimed to prevent the predicted localised extinction of this species.

Predicting avian malaria conditions to aid in penguin conservation efforts in New Zealand

Chris N. Niebuhr and Simon Howard

Manaaki Whenua – Landcare Research

Avian malaria is a mosquito-borne disease that can negatively impact avifauna in New Zealand and globally. Recent studies in NZ report populations of hoiho/yellow-eyed penguins (*Megadyptes antipodes*), the rarest penguin in the world, are declining rapidly due to reduced food abundance and impacts from disease, including avian malaria. In 2018 an increase in malaria mortalities was observed in wild hoiho populations, and as a result, various vector control & monitoring options are being considered. Here we present our work on the development of a real-time avian malaria warning system that identifies and predicts conditions conducive for parasite transmission. The output of which is a free, web-based tool used to predict mosquito vector presence and emergence, as well as conditions suitable for avian malaria transmission. The tool uses existing epidemiological models that incorporate minimum threshold temperatures for vector and pathogen development as well as automatically updated temperature data from local weather stations near penguin nesting sites. Mosquito emergence is predicted by using temperature forecast data (e.g. 30 days), which is estimated using both current and historical data. We hope that by using A) historical temperature data, especially from years that have seen impacts to hoiho from avian malaria, we may be able to identify certain trends, or even predictors of high vector presence or transmission and B) projected temperature data, we may be able to predict mosquito emergence, which could aid in overall management and conservation efforts of the species, especially during more vulnerable times of the year (e.g. fledging or moulting).

Finding the causative agents of infectious diseases affecting hoiho (yellow-eyed penguins) in New Zealand

Janelle Wierenga^{1,2}, Kerri J. Morgan.¹, Stuart Hunter¹, Harry Taylor^{3,4}, Lisa S. Argilla⁵, Trudi Webster⁶, Laura Burga², Mihnea Bostina², Lynette Lim², Jeremy Dubrulle J.², Edward C. Holmes⁷, Kate McInnes³, Jemma L. Geoghegan^{2,8}

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Hoiho/yellow-eyed penguins (*Megadyptes antipodes*) are predicted to become extinct on mainland Aotearoa New Zealand in the next few decades, with disease being a significant contributor to their decline. Diphtheritic stomatitis (DS) has resulted in significant mortality and in 2022 was identified in over 75% of all monitored chicks. Although *Corynebacterium* species have been inconsistently isolated from DS oral lesions, an alternate primary causative pathogen is suspected. In addition, a new disease termed respiratory distress syndrome (RDS) causing lung pathology has been identified in very young chicks with a high mortality within the first week of life, however no causative pathogens have been identified. This project aimed to identify possible pathogens responsible for diseases impacting hoiho. Using a metatranscriptomics approach, we discovered a novel and abundant gyrovirus in tissue samples from chicks with RDS, sharing only 40% amino acid identity within other gyroviruses discovered in diseased birds. Due to its high abundance and absence of other pathogenic organisms, it is highly likely that this novel gyrovirus is associated with RDS. In oral and cloacal samples taken from chicks with DS, we identified a novel and highly abundant picornavirus, most closely related to other penguin megriviruses. On evaluation of pre-symptomatic, symptomatic and antibiotic-treated penguins, we found no other obvious pathogens associated with the disease, although variable bacterial abundances were identified that could contribute to opportunistic secondary bacterial infections. Overall, we show how metatranscriptomics can provide a rapid, genomics-informed diagnosis for wildlife disease investigations and identify likely viral candidates that require further scrutiny.

Hand rearing sick Hoiho/yellow-eyed penguin chicks as a new conservation management tool

Lisa Argilla, Angelina Martelli and **Emma Chen**

Dunedin Wildlife Hospital, Dunedin

Yellow-eyed Penguins/hoiho (*Megadyptes antipodes*) are nationally endangered and predicted to become extinct on mainland New Zealand in the next few decades. Infectious diseases such as Avian Malaria, Diphtheritic Stomatitis (DS) and a more recent disease called Respiratory Distress Syndrome (RDS) are all playing a significant role in their ongoing decline, in particular in chicks. Dunedin Wildlife Hospital (DWH) has been involved with conservation efforts of hoiho since opening in January 2018. Since that time just over 900 hoiho have received veterinary care with 587 of these admissions being chicks.

In 2019 a small number of hoiho chicks with severe DS or other ailments were admitted to hospital. Necropsies on a small number of deceased hoiho chicks showed signs of a severe respiratory disease. Histology was inconclusive. The mortality rate in the wild was low so the disease was noted as something to monitor however the bigger concern was still the impact of DS on chick survival. During the 2020/2021/2022 seasons, due to the ongoing decline of the species and increased severity of DS in chicks and difficulty treating them in the wild, the Department of Conservation adopted a new strategy of temporarily removing young chicks from the wild to be treated for DS and hand reared at DWH for a short period of time.

In 2020 and 2021 we observed a very high mortality occurred in young chicks due to respiratory disease. Gross necropsy and histopathology findings were similar to 2019. MPI investigation ruled out Avian Influenza, Chlamydia and Mycoplasma. The mortality rate of affected chicks was close to 100% with many of them dying within 12 hours of showing respiratory disease. The age spread of affected chicks was around 5 to 12 days with a few outliers. Interestingly chicks that were admitted to hospital for hand rearing before 5 days of age and kept in hospital for 7-10 days before returning to the nest did not develop RDS.

There is no correlation between infection with DS and RDS. There is promising research into the aetiology of RDS with a novel Gyrovirus identified as a potential cause of the disease.

The 2022 season mortality due to RDS in hospitalised chicks was extremely low due to prompt uplift of chicks for handrearing. This year eggs were also uplifted from 9 nests on Green Island. Half the chicks were incubated in hospital and the other half in foster nests. Out of the 9 artificially incubated, 8 successfully hatched. The sibling of the failed hatch egg in hospital also failed to hatch in the wild. Only one chick that hatched in hospital showed clinical signs of mild DS and none of them developed RDS. This is exciting and important information as it has started to help us develop more of an understanding of how these diseases are potentially transmitted.

Dunedin Wildlife Hospital, with the assistance of experts at SANNCOB, has developed a robust hand rearing and management protocol to care for young hoiho chicks in hospital. As a result there is a very high success rate of returning young chicks back to foster or natal nests in the wild once they have been treated for DS and a much lower incidence of RDS occurring as long as chicks are uplifted early enough for hand-rearing.

Sizable Waddle, a critical reflection of rehabbing Hoiho

Jason van Zanten

Penguin Place, Dunedin

Penguin Place is a private conservation project dedicated to helping the critically endangered hoiho, as well as other taonga species found along the Otago coastline. Rehabilitation is currently a critical aspect of hoiho conservation, with half of the mainland population needing care each season. This presentation will highlight the importance the rehabilitation centre has to the population's survival, as well as delve into how Penguin Place manages to care for up to one hundred captive individuals simultaneously.

Post-guard and pre-moult tracking of hoiho on Motu Ihupuku

Melanie J. Young, Hendrik Schultz, Leith Thomson, Jim Watts, and Katharina L. Manno

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Motu Ihupuku/Campbell Island is the southernmost breeding area for hoiho/takaraka (yellow-eyed penguin, *Megadyptes antipodes*). Consequently, opportunities to understand the marine distribution and ecology of hoiho resident on Motu Ihupuku are rare. We deployed satellite tags on nine adult hoiho at Middle Bay in February 2023. Deployments overlapped the post-guard and pre-moult periods, with up to seven weeks of tracking data being obtained. The results indicate differences in foraging locations and home range sizes during both periods. Pre-moult foraging occurred up to c. 125km NNE of Motu Ihupuku, well beyond the limits of the Moutere Ihupuku/Campbell Island Marine Reserve. Our study is the first to document the at-sea spatial distribution of hoiho resident on Motu Ihupuku.

Are pinging penguins promising? Acoustic telemetry of African Penguins.

Michelle Bradshaw

Department of Conservation, Wellington

The Endangered African penguin, *Spheniscus demersus*, is endemic to Namibia and South Africa, breeding on 25 islands and 4 mainland sites. The current population of ca 14,000 breeding pairs represents 1% of population estimates from the early 1900s. Conservation decision-making can be improved through knowledge of dispersal and foraging of penguins at sea, to complement mark-recapture studies on land. An existing extensive array of ultrasonic acoustic telemetry receivers around the South African coastline provided the opportunity to test the feasibility of tracking penguins at sea using this technology. Captive penguins did not change their behaviour in response to the 69 kHz signal (ping) in air or underwater, and attachment of the transmitter (pinger) using cloth tape lasted up to 11 months. Pings from pingers attached to a model penguin and a live bird were detected by receivers up to 300 m at sea. Three rehabilitated penguins released wearing pingers were detected up to 350 km from the release site three months later – pinging penguins are promising as a method to track at-sea movements.

Penguins as vectors for contaminant transport in pristine Antarctic environments

Megan Reaves

School of Physical and Chemical Sciences, University of Canterbury, Christchurch

Antarctica, due to its isolation and low human activity, has long been considered pristine. However, elevated levels of contaminants such as plastics, persistent organic pollutants, and metals have been documented in the Antarctic region; some even before the first humans stepped foot onto the Antarctic continent. Ocean circulation and long-range atmospheric transport serve as major pathways by which globally sourced pollutants enter the Antarctic environment. While seabirds are known to biotransport pollutants from the ocean to land, the role of Antarctic penguins in this process remains largely unknown. As vectors, Adélie penguins may form a natural archive for contaminant levels by returning to the same site each breeding season since the colony location was first occupied. The aim of this research is to determine if Adélie penguins function as vectors by transferring contaminants through their breeding and foraging activities. Additionally, it aims to create a chronology of pollutant levels through time and pinpoint specific sources based on contaminant signatures. Active and abandoned nests will be excavated, contaminants will be measured at each level, and biological remains can be radiocarbon dated to form a chronology of contaminant levels through time. The target contaminants for this study are microplastics, Σ DDT (an insecticide), polycyclic aromatic hydrocarbons (PAHs), and mercury and lead (indicators of the Industrial Revolution and Great Acceleration). This project will be one of many that contribute to the much-needed change in how we handle, produce, and dispose of pollutants on both a global and local scale.

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 investigated 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 tawaki breeding in the fiord compared with coastally breeding birds. We will report on the foraging plasticity across the three islands colonies ranging 40km from the entrance to the head of the fiord.

Voyage to the sub-Antarctic islands: Heritage Expeditions True Young Explorer Scholarship

Henry Elsom

Each year Heritage Expeditions offers its True Young Explorer Scholarship. An opportunity for those who are passionate about our marine environment to experience New Zealand's sub-Antarctic region. Through their experience, recipients of the scholarship can then inspire others to appreciate the region and take action to protect it.

I was fortunate to embark on this journey with Heritage Expeditions, sailing from Bluff, through to the Snares, Macquarie, Auckland Islands and Campbell Island. Whilst isolated, these islands are home to an abundance of life, including a plethora of penguins. However, this region is not without a storied past. Exploitation and pest species introduction have both had significant impacts on biodiversity. Populations on some of these islands are fortunate in that work has begun to undo the damage of the past. However, many penguin species in New Zealand's sub-Antarctic region are still vulnerable. Be it due to the ongoing challenge of mammalian predators or the pervasive threat of climate change. Here, I share some of my experiences aboard this expedition and describe some of the challenges our sub-Antarctic penguins face.

Continued population decline in erect-crested penguins at the Antipodes.

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¹⁰ CONICET (National Research Council), Argentina

The erect-crested penguin (ECP) is one of four crested penguins that breed in New Zealand, and the least studied. Endemic to the subantarctic Bounty and Antipodes Islands, it is classified as ‘At risk – declining’ in the NZ Threat Classification System.

The first attempt to map the penguin colonies at the Antipodes was undertaken in 1978 and provided a population estimate of 115,000 breeding pairs, although the reliability of this estimate has been questioned. The next estimate in 1995 only found around 52,000 pairs. Ground counts in 2011 saw the population estimated at 34,266 breeding pairs, a decline of 23% on the 1995 estimate. The loss of some colonies was noted, along with the fragmentation of some larger colonies. Partial counts noted a further decline (-19%) in 2014. We visited the Antipodes in November and December 2022 and carried out drone surveys and ground counts. Preliminary results indicate a loss of 21 colonies since 2011 and comparison with satellite imagery suggest a population decline of up to 50% in the past 15 years. This puts the current population size at less than 25,000 pairs.

A rock and a hard place – Are the subantarctic Bounty Islands becoming the new species stronghold for Erect-crested penguins?

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The Erect-crested penguin (ECP) is the least known penguin species. It is endemic to New Zealand's subantarctic Bounty and Antipodes Islands, the latter generally considered the species' stronghold. There is only patchy information about population trajectories and even less is known about ECP's ecology. Despite being one of four penguin species classified as 'endangered' by the IUCN red list, ECP have received surprisingly little scientific attention. This ranking assumes that since the 1970s ECP numbers have declined by 75% on the Bounty Islands alone. However, a partial drone survey of the archipelago in 2019 and a review of historic data cast doubt on the veracity of this assumption. In November and December 2022, we conducted a complete survey of the breeding population of ECP using drones on the Bounty Islands. Our data indicate that the species has remained stable at around 26,000 pairs at least since the 1990s, and that the reported population decline for the archipelago probably resulted from extrapolation errors. Yet, on nearby Antipodes Island are indeed subject to substantial population decline. And, by the looks of it, a degree of decline that may render the Bounty Islands the new and in the long run last stronghold for the species.

PenguCams reveal flexible foraging behaviour in Humboldt penguins – good news for population resilience?

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Humboldt penguins are threatened by human activities. The Humboldt Archipelago in Northern Chile is a population stronghold for the species. Recently, two major mining projects have been proposed in the vicinity of the islands. During 2022/23 we studied the marine habitat use and foraging ecology of Humboldt penguins breeding on Isla Choros, an island situated in the centre of the archipelago. GPS dive logger data confirmed that some birds foraged immediately adjacent and most within 10km downstream of any pollution that would be associated with the proposed mining ports and major shipping lanes. Deployments of PenguCam loggers revealed new insights into the foraging behaviour of Humboldt penguins. The productive waters near the coast often had a green tinge with comparably poor visibility at depth. Some areas contained high quantities of jellyfish that penguins routinely checked for small commensal fish hiding within the tentacles. Half of the penguins foraged solitary and exclusively pelagically near the surface for individual fish or small/juvenile swarm fish and squid, remaining penguins foraged in groups of sometimes more than 50 individuals herding demersal fish. This latter behaviour leads to increased risk of bycatch mortality, since a single net could catch an entire group of birds hunting together. Their surprisingly flexible foraging strategies may enable Humboldt penguins to adapt to climate change as long as the many other anthropogenic threats are being reduced. Our work illustrates the importance of obtaining robust data to inform marine spatial planning to reduce anthropogenic impacts on threatened species.

Protecting port penguins: management strategies for nesting kororā during Port Marlborough development

Shannon Ritter and Dan Burgin

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Wildlife Management International Ltd. (WMIL) has been contracted to assist with the ongoing monitoring and management of kororā/little penguin (*Eudyptula minor*) during the development of the Picton ferry terminal through Port Marlborough and Kiwi Rail. Preliminary surveys performed from May 2021 – May 2022 provided a baseline of kororā numbers, activity level, and possible nest sites. Starting August 2022, monthly surveys resumed with an increased frequency to one day and two night surveys, to better verify known, and any new, sites of interest. A 50m buffer zone has been given to active kororā breeding and/or moulting sites found in the proposed construction footprint while a mix of trail cameras, conservation dog surveys, day/night surveys, and RFID microchipping are used to monitor breeding and/or moulting progress. The key aim of the monitoring is to provide up to date information on kororā activity to all stakeholders, to ensure kororā stay out of harms way before, during and after construction. Measures to deter kororā from returning to known breeding sites have been implemented to mitigate the risk of kororā breeding and/or moulting within an active construction zone next season. Collaboration with the nearby Kaipupu Sanctuary team has been pivotal to provide safe alternative nesting sites that kororā can utilise within a fenced sanctuary with active predator control being undertaken. WMIL, on behalf of Port Marlborough and Kiwi Rail, hopes to share our knowledge of the monitoring and management techniques that have proven effective so far in order to keep kororā safe in future development of coastal areas in Aotearoa New Zealand.

Microplastics in Little Penguin gastrointestinal tract from two Victorian colonies

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Plastic pollution is one of the most pressing environmental issues facing wildlife today. Once in the environment, plastic breaks down into small fragments, termed microplastics (<5mm). Microplastic particles can be ingested by animals from all trophic levels. Documenting the ingestion of microplastics from a variety of species is necessary to complete current understanding of the extent and impact of microplastics in the environment. This study examined the concentration of microplastics in stomach and intestine contents of Little Penguins (*Eudyptula minor*) from two colonies in southern Victoria, Australia; Middle Island and St Kilda. Using ultraviolet light detection, this study is the first to document that Little Penguins are ingesting microplastics, with particles detected in the digestive tract of all individuals analysed. A higher abundance of microfibrils was identified in Little Penguins from metropolitan St Kilda relative to regional Middle Island. This may be explained by the difference in surrounding urban populations and industries impacting the type of microplastics present. In the Middle Island colony, no difference in mean microplastic concentrations between stomach and intestines were identified. However, in St Kilda penguins stomach contents contained higher mean concentrations of microplastics than intestine, and higher mean concentrations of fragments than fibres. The relationship between loading in the stomach and intestines in animals from both colonies, highlights that environmentally available microplastic particles are passing through the digestive tracts of Little Penguins. These findings provide insights into the presence and transference of microplastic particles in coastal waters surrounding Victoria, Australia.

NZPI Kororā National Monitoring programme update

Hiltrun Ratz

New Zealand Penguin Initiative

The New Zealand Penguin Initiative (NZPI) was established in 2019 as an independent, privately funded penguin conservation organization with the aim to enhance and protect all New Zealand species and habitats. Supporting individuals and groups, NZPI facilitates primarily monitoring of Little penguins/ Kororā that enables volunteer groups to gather valuable data to assess the size of their local populations, breeding success and survival. These parameters are unknown for many parts of New Zealand, and anecdotally Kororā numbers appear to be declining but little data on numbers and trends are available. NZPI advocates for Kororā and by collaborating with the Department of Conservation and local councils to protect and enhance local populations. Volunteer groups can commit to three levels of monitoring intensity of Kororā: Tier 1, the highest commitment, includes micro-chipping adults and chicks and a regular and long-term monitoring commitment (weekly or fortnightly); Tier 2 groups commit to regular monitoring of their unmarked population; and Tier 3 deploy trail cameras and count footprint on beaches to determine presence and number of penguins. There are five Tier 1 groups, two Tier 2 groups with one group aspiring to Tier 1 monitoring; and eight Tier 3 groups with four aspiring to Tier 1 monitoring; a total of 15 groups working with NZPI. A further four groups have expressed interest in joining. NZPI provides support through expertise, assists with permit applications micro-chip certification, advocacy, standardise methods of data collection, a network of like-minded groups for feedback and exchange of ideas, resources and a centralised database culminating in a website accessible dashboard providing basic population parameters working towards an overview of the Kororā population in New Zealand.

The Growth and Successes of Places for Penguins – a Forest & Bird Wellington Branch Project

Kerry Shaw, Shannon Ritter, Katherine Smith, Brittany Florence-Bennett, Kirsten Anderson and Olivia Rees.

Forest & Bird Places for Penguins, Wellington

Forest & Bird Places for Penguins - Wellington Branch was established in 2007 with the goal to restore coastal habitats and protect kororā (little blue penguins, *Eudyptula minor*) around Wellington's southern coast. Over the past 16 years, the group has grown significantly in volunteer numbers and scope, with the project now nest-box monitoring a total of fourteen sites around the coast, including eight sites which are also PIT tagging individual kororā. Outside of regular nest-box monitoring, the group facilitates community events such as native planting workshops and beach clean ups. The data gained from this project offers a clearer picture of kororā breeding success and the threats Wellington populations face. While starvation is a significant cause of kororā death, community reporting and a partnership with the Wellington Zoo has revealed other causes such as vehicle strike and dog attacks. Collaborating with Wellington City Council, we are able to work towards more coastal signage and stricter leash regulations along coastal breeding sites. As a fully volunteer run organisation, we rely especially on an engaged community, and with over 70 volunteers giving their time to protect this valuable species, we are very proud of the work that Places for Penguins has accomplished in Wellington.

A look back at a disastrous breeding season 2022/23

Thomas Stracke

CHCH Penguin Rehabilitation, Christchurch

The last breeding season was challenging for us as the number of admissions was up by 150% and the length of stay increased significantly. A few "firsts" for us with extensive PICU treatments, dealing with "Kindergarten" for weeks and hot temperatures. Different factors seem to have played a role (such as food availability, predators and flood events due to climate change). Without help the breeding season would have been a complete failure from the onset as it started very late and the chicks were in poor condition with adults abandoning them or one of them missing out. Somehow the success rate was surprisingly good at an 89% release rate.

Kororā Conservation in the Bay of Plenty

Melissa McLuskie

Western Bay Wildlife Trust

Everyday Mount Maunganui kororā colonies are continuously facing a multitude of threats from domestic pets, predators, rapidly growing rock pigeon populations and back-to-back La Niña events over recent years. Starvation, predation, egg abandonment and tidal inundation are likely primary causes of breeding failure and declining breeding success from 2019-2022. Increased Sea Surface temperatures were likely linked to reduced chick masses and body condition in 2020-2021 and increased kororā rescues. Starvation was the leading cause of mortality in kororā retrieved from Bay of Plenty coastlines 2020-2023. A small number of kororā have been found with avian poxvirus, including 2 chicks from Moturiki Island. Rena Oil Spill survivors recovered 6-10 years post spill showed a higher proportion of unoiled to oiled-rehabilitated birds found. Restoration of kororā habitat has been critical to reduce human disturbance and has led to increased occupancy by other native species. Ongoing education and increased rescue/rehabilitation efforts have been key to improving positive outcomes for kororā.

Analyses of moult in kororā from automatic weigh platforms

Philippa Agnew and Tia Scott

Ōamaru Blue Penguin Colony, Ōamaru

A weekly monitoring programme of the kororā (little penguins, *Eudyptula minor*) nesting at the Ōamaru Blue Penguin Colony has formed a core part of the operation for 30 years. Analyses have documented trends in breeding success and survival and identified key environmental variables influencing the population. Further research will aim to examine seasonal and annual variation in individual body mass, with a goal to identify triggers for the onset of egg-laying. Key to the research, is the development of weigh platforms placed where the majority of penguins enter and leave the colony. The platforms, fitted with Radio Frequency Identification readers, will automatically record date, time, microchip number and body mass.

Following a marine heatwave at the end of 2022, we used data collected from the platforms to examine the duration of moult, and the body mass of the penguins prior to and following the moult, to begin to establish long term trends in moult patterns and potential environmental impacts. Immediately prior to the moult, male penguins were heavier than female penguins, and both took 18 days on average to complete the moult. Analyses of a sample of penguins indicates that the majority survived the moult, however further analyses is required to determine whether the result is representative of the population.