



Kororā Monitoring Protocols

Version 5 | April 2024



These protocols provide a best practice guideline for community groups undertaking kororā monitoring, while ensuring consistent data collection methods are being used across the national little penguin/kororā monitoring programme. There are three tiers of monitoring to cater for the different capabilities and capacity of each group.

Table of Contents

1	Introduction	1
2	Joining the national monitoring programme.....	1
3	Cultural and Environmental Significance	1
4	Permissions and requirements for kororā monitoring	1
5	Health & Safety Considerations	2
6	Avian Disease & Zoonosis Awareness.....	2
6.1.	Disease & Zoonosis Prevention/Mitigation	2
7	Tier 1 and 2 Monitoring protocols	3
7.1	Monitoring Protocols	4
7.1.1	Equipment (Tier 1)	4
7.1.2	Equipment (Tier 2)	4
7.1.3	Determining active nests	5
7.1.4	Timing and frequency	6
7.1.5	Personnel	7
7.1.6	Nest checks	7
7.1.7	Using a burrowscope	8
7.1.8	Re-sighting of marked birds (not associated with nest site).....	9
7.1.9	Other	9
7.2	Recording data	10
7.2.1	Digital data recording.....	10
7.2.2	Analog data recording & transcription	10
7.3	Handling little penguins/ kororā (Tier 1 only).....	11
7.3.1	From nest boxes.....	11
7.3.2	From natural burrows	12
7.3.3	Taking measurements.....	12
7.3.4	Marking the population	12

7.3.5	Marking chicks	13
7.4	Transpondering protocols.....	13
7.4.1	Training and Certification.....	13
7.4.2	Minimum age and condition of penguins for transponder insertion	14
7.4.3	If the first transponder insertion fails	14
7.4.4	Recording transponder (Bird ID) data.....	14
7.4.5	Reading Transponders	15
8	Tier 3	16
8.1	Trail Camera Monitoring Protocols.....	16
8.1.1	Equipment.....	16
8.1.2	Operating	16
8.1.3	Data recording	17
8.2	Footprint Surveys.....	18
8.2.1	Equipment.....	18
8.2.2	Surveys	18
8.3	Night Counts	19
8.4	Acoustic/Automated Recorders.....	19
9	Transponder Insertion Process	20
9.1.1	Equipment.....	20
9.1.2	Insertion process.....	20
9.1.3	Potential Impacts and mitigation measures	22
9.1.4	Adult Moulting Stages.....	23
9.1.5	Chick Stages	24
	Contact information & external links.....	25
10	Review	26
11	Acknowledgments & Contribution	26

1 Introduction

Despite extensive research in Australia, little penguins/kororā (*Eudyptula minor*) remain largely understudied in New Zealand. Their general distribution is known, but there is little robust population data for most of the country. In much of their range populations appear to have declined but evidence is anecdotal or based on sporadic surveys conducted by individuals, providing insufficient data to implement conservation management actions. In locations where long-term monitoring has occurred, it mostly relies on isolated efforts of community groups. A comprehensive, investigative approach is essential to understand factors driving declines and identify and enact the management actions required to reverse declines of kororā in different parts of New Zealand.

NZPI's national monitoring programme aims to coordinate the efforts of kororā conservation groups around New Zealand with a consistent methodology, centralised database, and scientific guidance. Importantly, the ownership of the data will be retained by the groups and only available through request for conservation management and collaborative research purposes.

We are using three tiers of monitoring, allowing groups of varying capacity and experience to undertake monitoring work.

2 Joining the national monitoring programme

NZPI provides training and resource support to groups undertaking monitoring and collecting data as part of the national kororā monitoring programme. For more information on how you can get involved contact admin@nzpi.nz or visit www.nzpi.nz

3 Cultural and Environmental Significance

Kororā are a taonga (treasure) species to the people of Aotearoa. Reliant on both the land and ocean to survive, they are important indicators for the health of coastal marine environments and serve as a flagship species, where Kororā and their habitats are protected, many other species benefit.

4 Permissions and requirements for kororā monitoring

You need permission from the Department of Conservation (DOC) and local iwi to interact with wildlife or use public conservation land for reasons other than personal recreation. It is the responsibility of the community group to ensure that the necessary Wildlife Act Authority is arranged prior to undertaking kororā monitoring. More information on permitting is available on the DOC website: <https://www.doc.govt.nz/get-involved/apply-for-permits/>

5 Health & Safety Considerations

NZPI recommends groups and/or individuals undertaking fieldwork should ensure they have considered health & safety requirements and will meet their obligations to operate in a safe manner whilst undertaking kororā monitoring. NZPI also recommends expert advice be sought by a qualified health & safety professional.

NZPI has provided health & safety templates that are available via our website www.nzpi.nz that can be used as a starting reference and are to be developed further by groups and/or individuals to meet their specific requirements within their working environment.

6 Avian Disease & Zoonosis Awareness

Kororā are susceptible to an array of diseases, and some may have zoonotic potential. A zoonosis (zoonotic disease or zoonoses -plural) is an infectious disease that is transmitted between species from animals to humans (or from humans to animals). Disease and zoonoses prevention and mitigation should be incorporated into fieldwork routines and field staff should ensure they are knowledgeable around recognisable symptoms of potential diseases, to enable rapid identification and management protocols (isolation and/or treatment, notification) can be instigated if disease prevalence is suspected.

6.1. Disease & Zoonosis Prevention/Mitigation

- Maintain a heightened awareness of disease risk when working with wildlife and within their habitats.
- Maintain good biosecurity and hygiene practices to prevent spread and protect yourself.
- Scrub and disinfect all your equipment with a broad-spectrum disinfectant such as F10 or Sterigene between sites/species; including equipment used for capture, handling, marking, holding, e.g. monitoring gear, transport boxes, boots, and clothing.
- Use clean bird bags for each bird to avoid faecal contamination.
- Clean your hands and equipment between handling each bird, e.g. alcohol wipes/sanitiser.
- **Contact MPI and DOC of notifiable diseases:**
 - Biosecurity New Zealand Exotic Pest and Disease hotline: 0800 80 99 66 or online [Report a pest or disease | NZ Government \(mpi.govt.nz\)](https://www.mpi.govt.nz/report-a-pest-or-disease/)
 - Advise your local DOC office

7 Tier 1 and 2 Monitoring protocols

With all monitoring it is a prerequisite to establish what permissions are required to work with penguins in the area. This is dependent on the land status and the Department of Conservation (DOC) has provided guidelines detailing what permission is required for which activity. It is the responsibility of individual groups wishing to undertake monitoring to arrange permission and permits and determine and fulfil reporting obligations.

Tier 1 Overview

Birds will be marked using passive integrated transponders (PIT tags). Nest contents and bird IDs will be recorded during weekly or fortnightly monitoring rounds. Observations, either direct or using a burrowscope, will determine the number of adults, eggs, or chicks at the nest. Birds will be identified using a handheld transponder reader or an in-situ reader set at the nest opening. Monitoring marked populations allows us to determine breeding success, adult survival, and recruitment; the three key demographic parameters that allow robust determination of population trends. Tier 1 is the gold standard of kororā monitoring for community groups and is in line with methods used at established monitoring sites including Oamaru Blue Penguin Colony. This method is for groups with a long-term commitment, ample experience, and suitable infrastructure.

Tier 2 Overview

Nest contents (number of eggs, chicks, and adults) are recorded during weekly or fortnightly monitoring rounds at the designated colony, or colonies. Inaccessible burrow contents can be observed with a burrowscope. No handling or marking occurs. Tier 2 represents a building block towards Tier 1 monitoring, or where long-term commitment to monitoring is uncertain. The data acquired through this method is not as robust as with Tier 1 monitoring but allows us to assess trends of local populations with lower disturbance.

7.1 Monitoring Protocols

7.1.1 Equipment (Tier 1)

- Notebook & Pencil
- Smartphone with NZPI monitoring app and camera
- Map, GPS unit or smartphone with nest locations
- Torch/headtorch
- First aid kit
- Hand sanitiser
- Gloves
- Broad-Spectrum Disinfectant (F10/Sterigene) (for cleaning gear)
- Rubbish collection bag
- Hand-held microchip/RFID reader e.g. (optional)
- Burrowscope (optional)
- PIT tags (Trovan 11mm or 8mm)
- Insertion gun (Trovan IM-3000C pistol-grip implanter or reusable plastic syringe)
- Transponder Stick Reader e.g., Gallagher HR5 (nest boxes), Allflex RS420 (natural burrows)
- Sharps container for used injection needles
- Alcohol wipes *or* alcohol & pipette *or* Betadine antiseptic spray
- Tissue glue/Liquid bandage
- Cotton pads
- Restraining bag ('weigh bag')
- Vernier callipers
- Pesola spring balances (2500g)

7.1.2 Equipment (Tier 2)

- Notebook & Pencil
- Smartphone with NZPI monitoring app and camera
- Map, GPS unit or smartphone with nest locations
- Torch/headtorch
- First aid kit
- Hand sanitiser
- Gloves
- Broad-Spectrum Disinfectant (F10/Sterigene) (for cleaning gear)
- Rubbish collection bag
- Hand-held microchip/RFID reader e.g. (optional)

7.1.3 Determining active nests

At the time of first monitoring, an initial survey should be undertaken to identify nest sites and mark birds in the colony. Ensure that you search a wide area to maximise the chance of finding nest sites. Do not discount unlikely places as the penguins have great climbing ability and can be in surprising and unpredictable places, e.g., top of cliffs, on cliff faces, even below sea level, significantly uphill and inland.

Visual searches should be undertaken amongst rocks, crevices, caves, vegetation, soil, and artificial structures for any signs of paths of trampled vegetation, guano (white/grey splats or streaks), smell of guano (fishy odour), and moult feathers. Sometimes there will be a trail of guano leading the way from the ocean to the burrows. Any potential cavity should be inspected to confirm presence/absence; ideally with a burrowscope if the end is not visible to the naked eye. It's not always obvious from the outside that a burrow is active, particularly if it is near the ocean or largely soil based. Flies circling around can provide an indication of burrow activity. Cobwebs over the entrance to a burrow indicate inactivity. However, if it has never been inspected before, there may be signs of past activity e.g. an old egg. "Gates" can be used as an indicator by placing small sticks upright in the nest entrance. If the gates are down on the following visit, then it indicates burrow/nest use (however it also could have been a different species, so penguin activity needs to be confirmed).

Penguin feathers are a sign that a penguin has been moulting and is more likely to be observed between December to April. Please note penguins may undertake their moult in a location different to their breeding site and evidence of feathers or a moulting penguin does not necessarily indicate a breeding site.

Nests should be clearly and **permanently** numbered or named for identification and reference. As new nests are identified during the breeding season, number/name them accordingly and include them in subsequent monitoring rounds. Where nests are publicly accessible, ensure that nest marking is placed inconspicuously to not attract attention to the nest.

Data to be recorded when marking new nests are:

1. Date and time
2. Site (e.g. Pilots Beach)
3. Unique Nest ID
 - Minimum of 3 characters
 - Not excessively long
 - As unique as possible
 - It can be helpful to abbreviate the location at the start of the ID
4. Nest type (i.e. natural burrow, nest box, open)
5. GPS coordinates
6. Observer name
7. Nest photo including nest number (if using the NZPI monitoring app)
8. Once Nest IDs are recorded into the monitoring app, their location can be viewed on a map.
9. Notes

Nest numbers should be retained indefinitely, i.e. do not reassign new numbers to the same nests in the following season (hence, permanent marking of nests).

Do not re-use a number if a previously numbered nest is lost, destroyed, or nest box has been moved.

It can also be helpful to record the GPS Co-ordinates of any “potential burrows” that are currently empty and revisit them throughout the season to confirm if they are being utilised by kororā.

7.1.4 Timing and frequency

If no prior information exists, mid-June can be used as the start date. Monitoring rounds occur either weekly or fortnightly. If resources allow it, continue with the same frequency throughout the year to improve chances of finding unmarked birds. In case this is not possible, monitoring should continue until completion of the moult (annual replacement of all feathers) to establish nest site fidelity of breeders beyond the breeding season and start again two weeks before the earliest egg laying date in the colony.

For larger monitoring programmes, nest checks at different sites can occur on different days, providing the routine remains consistent throughout the breeding season, e.g. Site A is done on

Saturday, Site B is done on Sunday. (Consistency should be kept where possible but adjustments can be made to avoid adverse weather and unforeseen circumstances).

7.1.5 Personnel

Nest checks can be conducted by one person provided the necessary safety precautions are in place, but the process is most efficient with two or three people. Two people are always required for transpondering.

It is advisable to ensure that one person from the previous monitoring round is present to facilitate familiarisation with the habitat, nest site positions and using the monitoring app. Where there are multiple teams conducting the monitoring rounds in the same colony, allow individuals to rotate between teams; this maximises learning, prevents complacency and limits observer bias.

7.1.6 Nest checks

Nest monitoring represents the backbone of the monitoring effort of Tier 1 and Tier 2 programmes. If the NZPI monitoring app (Memento) is used, there will be prompts to facilitate this (for more details see 7.2). Data to be recorded for each nest check are as follows:

1. Date and time
2. Site
3. Nest ID
4. Observer name
5. Interaction (i.e. passive, burrowscope, transponder scanned, measurements, marking, device deployment/recovery, uplifted)
6. Number of adults (i.e. 0, 1, 2, 3)
 - a. Identities of adult birds (transponder numbers); any unmarked adults should be transpondered
7. Nest activity (Loafing adult(s), with eggs/chicks, moulting, empty, not visible)
8. Nest contents (i.e. Eggs: 0, 1, 2, unknown; Chicks: 0, 1, 2, unknown).
 - a. Identities of chicks (transponder numbers); any unmarked chicks over 6 weeks should be transpondered (see [section 7.3.5](#) - Tier 1 only)
9. Optional: nest contents photo (if using the NZPI monitoring app)
10. Notes

Systematically move through the study colony, stopping at each nest to inspect and record nest contents. Inspect each nest with minimum disturbance; keep disturbance interval as short as possible. Record the number of adults, eggs and/or chicks present. If a bird appears to be incubating

but you cannot see eggs, then experienced handlers may gently lift the bird with the transponder reader to see underneath; do not wait until bird shifts on its own as this unduly increases disturbance time. Record the ID of each adult bird by scanning with the transponder reader (see [section 7.4.5](#) for scanning procedure). After scanning, record 'transponder scanned' as interaction **even if the penguin turns out to be unmarked.**

If breeding is confirmed it is vital to identify both adults of the pair. If the same individual is encountered on subsequent monitoring rounds, extra effort should be made to identify its partner before the end of the season. Record chick data as detailed above.

7.1.7 Using a burrowscope

Nests in deep burrows, beyond direct observation will require inspection with a burrowscope. Take great care when using the burrowscope so as not to damage nest contents. Note that when using a burrowscope it will not always be possible to confirm nest contents.

Kororā burrows come in a variety of structures, shapes, lengths, depths and can sometimes be challenging to monitor accurately. Burrowscopes (a camera on the end of a long cable) provide a means of easily and accurately detecting nest contents, with minimal disturbance to the birds if they are used appropriately, and the operator has been trained in their use. Please do not attempt burrowscoping if you have not undertaken any formal training as you may pose risk of causing harm to adults, eggs and/or chicks.

Guidelines:

- Use a torch to briefly get an understanding of burrow layout and where birds may be positioned.
- Gently and slowly feed the cable along the bottom of the burrow, keeping a close eye on any potential movements.
- If adults are present, a hint of blue is normally the first visual cue. Chicks with black or brown down can be harder to detect because they camouflage against burrow surfaces.

Detecting eggs/young chicks:

Approach very slowly and try to guide the camera lens towards the belly of a bird lying down, this may either be front on or from the side and will depend on the birds' position inside the burrow. Once close, the birds have a tendency to move slightly, and this provides the opportunity to see eggs/chicks underneath the bird. Adults tend to lay prone if they are on incubating eggs or guarding young chicks but will often move or stand up if nest contents are empty.

A very focused eye for detail is sometimes required with a fraction of an eggshell noticeable or a small amount of black indicating a young chick. Very small movements around an adult's belly/chest generally indicates chick movement underneath. As chicks get older, they are often 'beside or behind the adult/s. Sometimes it can be hard to distinguish between two chicks if they are huddled close together, so a slight adjustment in angle is required to count beaks, flippers, or feet. If you struggle to see anything, gently reposition the scope and quietly wait for 10-30 seconds, natural movement inside the burrow will often reveal nest contents.

NB: *If an adult bird becomes agitated or appears distressed, gently but promptly remove the scope to prevent chicks and/or eggs being crushed.*

Birds in these burrows may be beyond the reach of handheld transponder readers or burrowscope; in this case an in-situ transponder reader placed at the nest entrance for a few nights may be required.

7.1.8 Re-sighting of marked birds (not associated with nest site)

Any birds encountered while doing monitoring rounds not associated with any nest (e.g. loafing, wandering through colony, roosting) should still be identified if possible and recorded as a re-sighting in the app but only if it is safe to do so. Avoid unnecessary stress to the penguin such as causing it to flee in a panic as it could injure itself. Re-sighting data consists of the following:

1. Bird ID (transponder number)
2. Date and time
3. Site (e.g. Pilots Beach)
4. Observer name
5. GPS coordinates
6. Bird status (i.e. dead, loafing, commuting, moulting, injured/ill, roosting on/near nest, on eggs, with chicks, in rehab)
7. Interaction (i.e., Transponder scanned, flipper band read (Passive), measurements, uplifted)
8. Photo (if using NZPI monitoring app)
9. Notes

7.1.9 Other

Wash penguin bags and soiled clothing in a solution of F10 or Sterigene (previously known as Trigene) between sites and at the end of each day. Other monitoring equipment should be wiped down using alcohol wipes and disinfected with F10 or Sterigene.



Remove any hazardous items from the nest (litter, sharps or any item that poses a risk of entanglement) if you can do so without causing harm or undue stress to the penguin(s) and keeping disturbance to a minimum. If dead chicks are found in an active nest, it is advisable to remove the carcass to prevent fly infestation. Only do so if it is safe or practical, e.g. a very small chick that is found dead under a parent brooding a live sibling may not be removable without imposing significant disturbance. Use common sense and keep the impact on the adult and surviving chick in mind.

Report any sick or injured wildlife to the Department of Conservation hotline (0800 362 468), or your local DOC contact if prior agreed. **Make a re-sighting record for every injured penguin that is marked (see [section 7.1.8](#)) in the Bird ID library.**

Establish with your local DOC contact what protocols to follow if dead penguins are found. At any rate, check dead penguins for transponders and if it is marked, record it as a recovery entry following the same procedure as re-sightings (see [section 7.1.8](#)).

7.2 Recording data

7.2.1 Digital data recording

NZPI have a customised app that runs on smart phones/tablets and allows digital recording of monitoring data. Currently NZPI are providing teams with a designated smart phone set up specifically for collecting monitoring data, along with a user manual. The advantage of digital data entry is that it interfaces with the NZPI Penguin Database reducing data entry errors (e.g. typos when recording nest or bird IDs). Data can be easily synchronized with the NZ Penguin Database once connected to Wi-Fi. This also means no transcribing or double handling of recorded data is necessary. Date, time and GPS positions are recorded automatically, and photos can be directly associated with the recorded entry.

7.2.2 Analog data recording & transcription

If digital data recording is not an option, all the information detailed in [section 7.1.6](#) for nest checks and [section 7.1.8](#) for penguin re-sightings are noted in a field notebook. Recorded data then needs to be transcribed to a designated Google Sheet (cloud-based spreadsheet) at the first opportunity. The designated Google Sheet will automatically synchronize with the NZ Penguin Database. Note that use of Google Sheets requires an active internet connection.

7.3 Handling little penguins/ kororā (Tier 1 only)

7.3.1 From nest boxes

When removing penguins from a nest box, open the lid and remove the bird carefully but confidently through the top of the nest box. Control of the bird is gained by gently yet firmly placing a gloved hand or weigh bag on the back of neck, with a thumb near the base of the bird's skull and fingers splayed down the front. Once there is control of the head, another hand must be placed under the bottom of the bird to fully support it before it is lifted. Once the penguin is removed from the nest it is placed in a cloth or canvas bag for weighing and bill measuring for sexing.



*How to hold a little penguin/ kororā, ensuring the head is under control.
Photo supplied by **Phillip Island Nature Parks**.*

A bird must never be lifted by the neck alone. The nest box lid should be placed back immediately after the bird has been removed. Removal of kororā from nest boxes must be done quickly (under 10 seconds) to reduce the stress. Removing the bird from its nest should be avoided, if possible, when brooding very young chicks (younger than 7 days).

Return birds back into the nest box through the nest-box entrance. It is advisable to return the penguin by hand to its nest or where it was caught if that is nearby rather than placing it into the weigh bag again as this increases handling time. If the penguin has to be carried some distance to

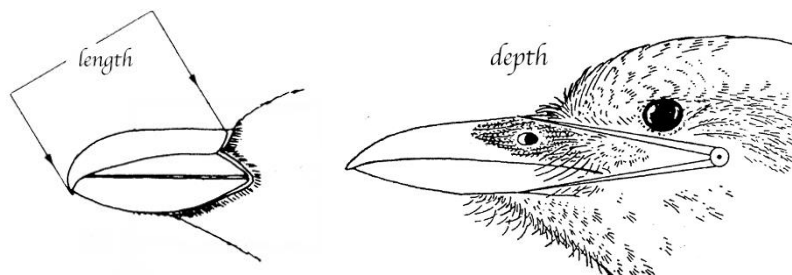
return it to its nest or where it was caught, it would be safer for the penguin and personnel to transport them in a bag.

7.3.2 From natural burrows

Removing birds from natural burrows or nest boxes that do not open will require more practice and guidance from an experienced handler. Do not attempt to remove a penguin from a natural burrow without having observed and practiced it in the presence of an experienced handler.

7.3.3 Taking measurements

Bill measurements of adults can be taken to sex individuals. Use vernier callipers to measure **bill length** (exposed culmen) and **bill depth** at the nostrils. To determine bill length, measure the distance from the tip of the bill to where the upper bill meets the skin (see diagram below – left). To determine bill depth, measure the distance between upper and lower bill at the nostrils (see diagram below – right).



Source: Adapted from Baldwin et al. 1931 and Warham 1975

7.3.4 Marking the population

For specific handling and transpondering protocols see [section 7.3](#).

A concerted effort should be made to transponder all adult birds found at the time of the first monitoring round. The remaining unmarked birds will be transpondered through the season. Marking adult birds as they are discovered on the nest is most efficient and lifting birds off eggs or young chicks should be avoided. Adults may also be captured coming ashore to mark and may be more efficient when working with natural burrow colonies to reduce handling stress on the birds.

7.3.5 Marking chicks

Chicks should be marked at 6 weeks after hatching. All chicks that are accessible should be marked and transponder data recorded as outlined under 3.4.5. **When marking chicks, it is vital that Nest ID is recorded** otherwise family lineage cannot be determined.

7.4 Transpondering protocols

The term ‘Transponder’ refers to a passive integrated transponder (PIT tag), commonly called a microchip. This method of marking negates the need for impactful external attachments and reduces handling in the long run. It is recognised as the gold standard for penguin monitoring. For transponder insertion process, see [section 9](#).

7.4.1 Training and Certification

Before you can insert transponders, compulsory training is required. There are 3 levels of certification, as per the DOC Banding Office requirements.

Level 1 trainees may only operate under the direct supervision of a Level 3 operator certified for the species group or marking method. Level 1 operators are required to log their capture, marking and handling experience using the NZNBBS training log, to be signed by the Level 3 trainer.

Level 2 operators are considered competent to capture/mark birds independently, but still need to operate under the general supervision of a Level 3 operator. The Level 3 operator retains responsibility for all capturing and marking conducted by the Level 2 operator. Level 2 operators are required to log their capture, marking and handling experience using the NZNBBS training log.

Level 3 operators have extensive experience for the species and marking methods listed on their certificate. Responsibilities include supervising Level 2 and training Level 1 operators, signing training logs, overseeing projects, and ensuring that the necessary Wildlife Act Authorisation / permits are in place.

Note that flipper banding certification does not translate to transponder certification.

Each community group needs to have a nominated **principal operator** for transponder insertion. This person shall be trained to Level 2 or 3 and will generally be the project leader. This person is responsible for ensuring that all transponder data is recorded into the NZPI Database and reported to DoC’s FALCON as required by their Wildlife Authority Permit. A **nominated Level-3-certified trainer** would be desirable for each community group; NZPI can act as the nominated trainer until community groups have a member with a Level 3 certification.

More information about transponder certification can be found on the DOC Banding Office website:

<https://www.doc.govt.nz/our-work/bird-banding/how-to-become-a-certified-bander/>

7.4.2 Minimum age and condition of penguins for transponder insertion

Penguins in poor condition should not be transpondered; assessment of the condition of penguins will be part of the training for transponder certification.

Adults need to be at a minimum weight of 600g for New Zealand clade penguins and 700g for the Australia/Otago clade penguins to be transpondered. Birds should not be transpondered through the peak of the moult (as handling will cause significant feather loss), but may be transpondered in the early stages, i.e. in the first week of the moult, prior to feathers dropping with a minimum weight of 1200g; or in the late stage, i.e. in the last few days of the moult with a minimum weight of 700g.

Chicks are ideally transpondered aged 6 weeks old, providing they weigh at least 600g and there is an adequate longitudinal pinch of skin and subcutaneous fat at the insertion site. At this stage, their plumage should be half brown down and half blue.

All adults and chicks that have been rehabilitated and are ready for release should be transpondered.

7.4.3 If the first transponder insertion fails

If the first transponder insertion fails, do not attempt to insert another straight away. You must wait a minimum of 5 days before inserting a second transponder to minimise trauma and risk of infection. You must record the 15-digit number of the failed transponder as a 'Lost Band' and keep record of why this injection failed.

If you have inserted a transponder but it does not scan, proceed as follows:

1. Ensure that the transponder reader is on and working.
2. Double check if the transponder has popped out of the wound.
3. Check if the transponder is still in the needle. If it is, dispose of the needle into a sharps receptacle and record it as a failed transpondering attempt as described above.

7.4.4 Recording transponder (Bird ID) data

The data to record when inserting a new transponder are as follows:

1. Date and time
2. Site (e.g. Pilots Beach)
3. GPS coordinates

4. Tagger name
5. Age (i.e. chick/ adult)
6. Transponder number (scanned in if using the NZPI monitoring app)
7. Nest ID (if attached to nest)
8. Weight
9. Measurements of bill depth & length (culmen) for sexing
10. Side portrait of head or 'mug shot' (if using NZPI monitoring app)
11. Notes

Make sure you also add a Nest check entry for each tagging event.

7.4.5 Reading Transponders

The Gallagher HR5 reader is recommended for its universal transponder reading capacity (for cases where other researchers or rehabilitators have used non-Trovan transponders), it also has a large LCD display, it is robust, and it allows for auxiliary data (sex, date of first capture etc.) to be displayed. Allflex RS420 Stick Reader is a good alternative for natural burrow monitoring.

Turn the transponder reader on before approaching any penguins or nests. Ensure the reader is configured to scan for 10 seconds from a single push of the trigger and set the reader to vibrate when a transponder is read and turn off the beeping sound and the flashing light.

To read transponders, pull the trigger and scan 1-5cm above the bird's neck. Change the alignment of the reader as you pass it over the neck. Birds need not be handled or touched when reading transponders.

A hand-held reader capable of reading FDX-B certified transponders can be used to read the transponder if the penguin is either in the hand (for transponder insertion) or dead.

8 Tier 3

Overview

Trail cameras can be used as a minimal impact method to gauge the size and trends of local populations. This method will be used by community groups that are establishing new kororā monitoring projects or when school groups are leading the project.

Footprint surveys are another monitoring option at sandy beach sites. This method is considered the least reliable and should be reserved for projects where education and advocacy is the primary objective.

Night counts of kororā coming ashore can help provide an indication of presence/absence and population numbers.

Acoustic/Automated recorders can detect calls made by kororā, which can help provide an indication of presence/absence, population numbers and trends overtime.

8.1 Trail Camera Monitoring Protocols

8.1.1 Equipment

- Trail cameras
- SD cards (min. 32GB; 2 per camera)
- Rechargeable Eneloop AA batteries (16 per camera)
- AA battery charger
- Stakes (optional, for trail camera placement)
- Security/Lock box (optional)
- Empty pest control tunnel to disguise camera (optional)
- First aid kit
- Hand-held reader for dead birds
- Rubbish collection bag

8.1.2 Operating

Cameras should be set up to record access paths, where penguins travel between the sea and the colony. Multiple cameras can be used to cover multiple access paths.

Strap the cameras securely to existing structures such as a branch, trunk, or rock, or attach it to a stake in the ground. Number the cameras and record their GPS position. Ensure cameras are not easily visible from public access paths to prevent theft; alternatively, cameras can be secured with steel cable and padlocks or a security box (e.g., an old trap box).



Set cameras to record 20 seconds of video each time they are triggered, with a 5 second trigger interval. Alternatively, set up the camera for photos with a 5 second trigger interval.

Batteries and memory cards need to be replaced every 7-14 days; preferably in the middle part of the day to avoid encountering penguins. The cameras run on 8x AA batteries; an allocation of 16 batteries per camera will be enough to allow for rotation of charged batteries and keep the cameras running. 2x SD cards should be allocated to each camera and marked accordingly, e.g. camera #1 should have SD cards #1A and #1B.

8.1.3 Data recording

Data is to be recorded when reviewing trail camera footage and should include the following:

1. Date (visible on the video footage or photo)
2. Time (visible on the video footage or photo)
3. Species
4. No. coming ashore
5. No. going to sea
6. Same animal? yes or no (Was this the same animal observed on the previous clip or photo?)
7. Notes (e.g., same penguin preening; anything else visible on the photo/video)

The data can then be summarised by date: add all individuals going in one direction (either coming ashore or going to sea) – do not count those that were allocated “yes” in the column “same one?”. The graph provided should fill out automatically. Click on the bars in the graph and then expand the data range by dragging the corners of the highlighted columns.

It is optional to record anything other than penguins especially on photos/videos that were triggered by nothing obvious or swaying grass/vegetation.

Sort the photos or videos by day into folders and keep for future reference. You can upload them onto your NPZI google account if you wish as long as there is storage space there.

8.2 Footprint Surveys

This method is considered the least reliable and should be reserved for projects where education and advocacy is the primary objective.

8.2.1 Equipment

- Ruler/ tape measure
- Footprint guide
- Smartphone/camera
- Field notebook or recording sheet
- First aid kit
- Hand-held reader for dead birds
- Rubbish collection bag

8.2.2 Surveys

Sandy beach footprint surveys are best undertaken in the early morning before footprints weather and become less visible. On shallower beaches survey times must coincide with low tides before footprints are washed away.

Repeat sandy beach surveys monthly (or more frequently) from the beginning of June until the end of February. **Record the number and direction of tracks.**

Kororā footprints are identified as follows:



Source: <http://nztracker.org/> | Photos by Emily Roberts (Taranaki Regional Council)

- 5.5cm in length
- Chunky toes/claws
- Visible heel
- Angle of all toes less than 75°
- Usually tracking straight up and down the beach

8.3 Night Counts

Night counts of kororā coming ashore can help provide an indication of presence/absence and population numbers. To undertake night counts, scoping your site during the day is recommended to understand habitat characteristics and identify suitable survey locations. Returning at night to listen for penguin calling and watching where they come ashore enables the identification of penguin access points. Trail cameras may be used to help determine suitable observation points for monitoring kororā activity and movements.

Guidelines:

- Set observation time, duration e.g. start 30 minutes after dusk or when you spot the first penguin arrive and survey for a nominated duration (2 hours has been used as a common survey length).
- Set dates - Peak breeding and low/outgoing tides to maximise visibility (site landing/beach access). It is important to consider the natural life cycle of kororā, as activity levels that will influence count results.
- Set observation points (it may be helpful to break down your site into grids and set points within those) - Ideally you want to have clear view of the birds e.g. a landing beach to prevent double counting or missing birds (again need some site familiarity) and ensure points allow distance between observers and landing sites.
- Observers are set in position at or before dusk, are camouflaged, remain still, quiet and use red light torches (minimising researcher disturbance).
- Record environmental factors- Swell, Moon, Tide, Weather etc, also any other observations e.g. predators.
- Set a nominated number of people per observation point (survey effort) - a minimum of two people is recommended as they can be difficult to detect and move quickly.

8.4 Acoustic/Automated Recorders

There is growing interest for use of acoustic/automated recorders, to provide an indication of presence/absence of kororā colonies, particularly in remote or difficult to access areas and provide broad population estimates and trends overtime. This could be a good option when other monitoring methods are unachievable, or there is interest in understanding acoustic dynamics of kororā communication.

9 Transponder Insertion Process

(Adapted from DOC's best practice for transpondering Yellow-eyed penguins)

9.1.1 Equipment

- PIT tags (Trovan 8 or 11mm)
- Insertion gun (Trovan reusable plastic syringe)
- Transponder reader (Gallagher HR5)
- A sharps container for used injection needles
- Alcohol wipes *or* alcohol & pipette *or* Betadine antiseptic spray
- Cotton pad
- Instant skin or Opsite (Smith & Nephew Medical Ltd)
- Restraining bag ('weigh bag')
- Pesola spring balances (1000g & 2500g)
- Vernier callipers for morphometric measurements
- Hand sanitiser
- Band aid/First aid kit
- NZPI monitoring app/ notebook
- Twink (if marking birds ashore)

9.1.2 Insertion process

Certification	1. Two competent and certified people are required, one to hold the bird, the other to do the insertion.
Hygiene	2. Clean and cover any bites or scratches on your hands.
Site Preparation	3. Set a suitable work area before handling the bird. Ensure that equipment will be within arms-reach and everything ready to be used including the insertion gun: attach the needle to the insertion gun and using your hands gently pre-loosen the sheath from the needle so that it can be easily accessed. Place the needle with loosened sheath on a clean, stable surface to your dominant side. Check that the transponder works prior to insertion.
Handling	4. Using the supplied barcode stickers, scan the barcode into the NZPI monitoring app.
Measurements	5. Birds should be held in a restraining bag. Set up so the head of the bird is facing the dominant hand of the person doing the insertion.
Check for existing transponder	6. Ensure that all measurements and samples are taken before transponder injection.
Assess skin folds	7. Before inserting a transponder, use a transponder reader to check that one is not already present in the bird. Scan the bird with four complete passes of the transponder reader (i.e. four 9-10 second sweeps) to maximise the chances of detection.
Assess skin folds	8. The transponder will be inserted under the skin in the fold of tissue on the back of the neck, so undertake a pinch of the skin to ensure that there is an adequate fold of tissue to insert into.











	9. Pinch the skin longitudinally (i.e. with fold running along length of bird).
	10. If the pinch of skin remains taut after release, the bird is too dehydrated for a transponder. This may happen during incubation or the moult. Do not attempt to insert a transponder into a bird that is dehydrated.
Prepare insertion site	11. Expose a patch of skin, clean the area with an alcohol wipe / alcohol / betadine (which will also clear the feathers), and remain holding the pinched fold of skin with your weaker hand. Loosen the needle sheath completely from the needle using your dominant hand, and then insert the needle, bevelled side upwards, from the head end of the neck towards the rear of the bird, along the length of the pinched fold.
Needle insertion	12. Make sure that the needle is inserted between the bases of adjacent feathers. Avoid pushing parts of feathers or feather shafts into the skin with the needle, as this is likely to increase the chance of infection and complicates the needle insertion.
	13. Make sure that the needle does not come out through the skin on the other side of the pinched skin.
Needle removal	14. Close the trigger gently but steadily, hold the tag in place with thumb and finger while retracting the needle. Secure the needle by re-sheathing or sticking into the ground as a temporary measure.
Wound pressure & treatment	15. Apply pressure with a sterile cotton pad to the injection site if bleeding. Once bleeding stops, use instant skin or Opsite to seal the wound. If the transponder pops out of the injection hole, see section 7.4.3 .
Check insertion site	16. Check after insertion by ruffling the feathers or down adjacent to the insertion site after injection.
Dispose of needle	17. Dispose of the sheathed used needle into a sharps receptacle.
Scan transponder	18. Check that the transponder can be read. Check the full 15-digit number against the barcode number recorded in the NZPI monitoring app. If the transponder will not scan, see section 7.4.3 .
Check data is recorded	19. Check NZPI monitoring app to ensure all information has been recorded.
Apply twink if applicable	20. If capturing and marking multiple birds coming ashore, the bird should be marked with a small amount of twink on top of its head, in the direction of the feathers to prevent recapturing the same bird twice.
Release bird	21. Release the bird. (Release the bird directly into its nest site or a safe place on the foreshore and don't place it back in the bag post-chipping because this increases the risk of microchip loss – for more details see section 7.4.3)
Clean hands & equipment	22. Clean your hands and all equipment that has come into contact with penguin blood and/or faeces with sanitiser to prevent transmission of bloodborne diseases between penguins.
Report marking data to Falcon	23. Ensure data is recorded and uploaded to DOC's Falcon Database maintained by the banding office.

9.1.3 Potential Impacts and mitigation measures

Tier	Impact type	Impact effect	Mitigation measure
1,2 and 3	Stress caused by human presence	Cowering in the corner of the box, vocalising (growling), pulsing iris, being agitated and/or aggressive	Keep noise to a minimum when in the colony. Avoid groups of more than 4 people at nest sites. If working at night do not shine bright a light at penguins - dim torch light or use red light when penguins are present.
1,2 and 3	Disease transfer	Little is known about diseases affecting little penguins	Maintain heightened awareness and strict hygiene protocols. Wash and sanitise hands after working with penguins and/or their habitats. Disinfect all equipment, boots and handling equipment with a broad-spectrum disinfectant such as F10 or SteriGENE after each monitoring round and between sites. Report any notifiable symptoms to DOC and MPI Biosecurity.
1,2 and 3	Trampling sensitive habitat	Collapse of burrows burying penguins or other seabirds, damage to sensitive flora	Those working in sensitive ecosystems must have an awareness and appreciation for other species present in the colony. Repeated monitoring rounds in sensitive habitats should follow the same safe route.
1 and 2	Damage to nest contents	Eggs could crack, roll out of the nest, or nest box, chicks are trampled by parents or are injured by beak, feet, or flippers	All persons interacting with birds must have experience with working with penguins or be working under direct supervision of an experienced researcher. Interactions must be carried out so the risk of beaks, flippers or feet damaging eggs or chicks is avoided. If birds appear unduly agitated or aggressive when approached, do not handle them. If eggs or chicks are kicked out of the nest, they must be returned into the nest bowl.
1 and 2	Permanent nest abandonment	The attending adult leaves the nest (box/burrow) and does not return.	Keep nest observation and handling time to the absolute minimum. The risk for nest abandonment as a result of monitoring or handling is likely to be low. Once eggs have been laid, penguins show a strong attachment to nest contents making permanent abandonment unlikely. However, if a bird shows exceedingly stressed behaviour, keep the time at the nest to a minimum.
1	Heat stress	Fast breathing, panting, agitated	Birds should not be handled if the outside temperature is above 30°C.
1	Injury or infections because of transponder injection	Infection at the injection site with swelling and puss.	Follow the DOC best-practice guide when inserting transponders. Only personnel with L2 or L3 NZBBS certification to perform transponder injections. Injection points will be disinfected. If the injection site presents a significant infection, contact DOC or your local vet for advice.
1 and 2	Loss of insulation during the moult	Handling penguins at the peak of moult may cause significant feather loss and reduced insulation during an energetic stressful time.	All persons handling birds will be experienced with handling penguins or be working under direct supervision of an experienced handler. Handling time will always be kept to the absolute minimum. Feathers will be taken during the initial phase of the moult without removing the bird from the nest, if possible.






9.1.4 Adult Moult Stages







Imagery and descriptions supplied by Phillip Island Nature Parks.

<p>M1 The flippers are swollen, and old feathers are beginning to stand up, but none are actively falling out yet.</p>		
<p>M2 Old feathers are beginning to fall out</p>		
<p>M3 1/3 to 2/3 of the new feathers are visible.</p>		
<p>M4 More than 2/3's of the new feathers are visible</p>		
<p>M5 All new feathers but the bird has not been out to sea yet. Feathers may feel powdery and have a deep blue colour.</p>		

9.1.5 Chick Stages

Imagery and descriptions supplied by Phillip Island Nature Parks.

<p>A stage chick. 1 - 7 days old and eyes are closed or only eye slits visible. They are sparsely covered in first down which is dark grey, and the bill is black.</p>		
<p>B stage chick. 2 – 3 weeks of age, have a second down that is thicker and chocolate coloured. The iris is dark grey in colour; the region between the nostrils and eyes (the lore) and around eye is bare until 3rd week.</p>		
<p>C stage chick. 4 – 5 weeks old. Sheathed feathers appear at 4 weeks, down is shed from underneath flippers and iris changes to pale grey at 5 weeks, which is similar to adults.</p>		
<p>P1 Chick. Blue feathers are predominately seen only on the flippers and bottom.</p>		

<p>P2 chick. More adult feathers are visible on the body but at least two thirds of the body is still covered in down.</p>		<p>P2</p> <p>- 1/3 blue or adult plumage</p> 
<p>P3 chick. Only one third of the body is still covered in down.</p>		<p>P3</p> <p>- 2/3 blue - generally have 'ruff' around neck</p> 
<p>P4 chick. All the down has been lost. Chicks can be distinguished from M5 adults due to their thin beaks, bright blue feathers and high pitched, 'squeaky' voices.</p>		<p>P4</p> <p>- all blue - bills smaller, blue brighter and voice squeakier than adults</p> 

Contact information & external links

- For any correspondence about these kororā monitoring protocols please contact admin@nzpi.nz
- Report any sick or injured wildlife to the Department of Conservation hotline (0800 362 468), or your local DOC contact or wildlife rescue organisation if prior agreed.

These protocols along with the abridged 'cheat sheets' are available for download at www.nzpi.nz

10 Review

These protocols will be reviewed throughout each breeding season and updated annually by NZPI with input from community groups, iwi and the Department of Conservation.

11 Acknowledgments & Contribution

We would like to thank Dr Thomas Mattern and Richard Seed for establishing and leading the New Zealand Penguin Initiative that was founded in 2019. We are very grateful for their great work towards creating a national programme that coordinates community science and conservation action. They continue to conduct extensive research on several penguin species around Aotearoa.

We would like to thank the Department of Conservation for providing us with their best practice guidelines for transponder use in Yellow-eyed penguins, particular thanks to the authors Bruce McKinlay and Marcus Simons from DOC, and Mel Young from the University of Otago.

We would like to acknowledge Philip Island Nature Parks for sharing their fantastic penguin monitoring protocols. We are very grateful for their contribution of handling instructions as well as photos, illustrations and descriptions of moult and chick stages.

Thanks to Wellington Forest & Bird branch's 'Places for Penguins' project for sharing their monitoring protocols, this allowed us to align our protocols to the community groups'. Further thanks to Emily Roberts of Taranaki Regional Council for sharing their wonderful footprint identification resources.

Thanks go to the following individuals and organisations that have contributed to this protocol: Philippa Agnew (Oamaru Blue Penguin Colony), Pablo Garcia-Borboroglu (Global Penguin Society), Andre Chiaradia (Philip Island Nature Parks), Peter Gaze (independent conservationist), Paul Sagar (NIWA), Phil Seddon (University of Otago) and Kerry-Jayne Wilson (West Coast Penguin Trust), John Stewart (Supporters of Tiritiri Matangi & Motuora Restoration Society), Melissa McLuskie (Western Bay Wildlife Trust), Elise Smith and Michelle Bird (Ngā Motu Marine Reserve Society), Kerry Shaw (Places for Penguins), Matt Charteris (West Coast Penguin Trust) and Shona Sangster (Stewart Island Rakiura Community & Environment Trust).