



Kororā Monitoring Protocols
Version 4 | March 2023

NZ Penguin Initiative

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.

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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.net or visit www.nzpi.nz.

3 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 both the community group and NZPI 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/>

4 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.

4.1 Tier 1 Monitoring Protocols

4.1.1 Equipment

- PIT tags (Trovan 11mm or 8mm)
- Insertion gun (Trovan IM-3000C pistol-grip implanter or reusable plastic syringe)
- Transponder reader (Gallagher HR5)
- Sharps container for used injection needles
- Alcohol wipes *or* alcohol & pipette *or* Betadine antiseptic spray
- Cotton pads
- Restraining bag ('weigh bag')
- Vernier callipers
- Pesola spring balances (2500g)
- Hand sanitiser
- Burrowscope
- Torch/headtorch
- Smartphone with NZPDb monitoring app
- Gloves
- First aid kit
- Map, GPS unit or smartphone with nest locations

4.1.2 Establishing the nest sites

At the time of first monitoring, an initial survey should be undertaken to identify nest sites and mark birds in the colony. Nests are to be numbered for identification and reference. As new nests are identified during the breeding season, number them accordingly and include them in subsequent monitoring rounds.

Nests should be clearly and **permanently** numbered. 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 (make sure not to create duplicates)
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 NZPDb monitoring app)
8. 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 reuse a number if a previously numbered nest is lost, destroyed, or nest box has been moved.

4.1.3 Marking the population

For specific handling and transpondering protocols see sections [4.3](#) and [4.4](#).

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. If nests are inaccessible, you can contact NZPI so that we can assist with the marking.

4.1.4 Timing and frequency

If no prior information exists, mid-June should be used as 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 to establish nest site fidelity of breeders beyond the breeding season and start again 2 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).

4.1.5 Personnel

Nest checks *can* be conducted by one person providing 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.

Try to ensure that one person from the previous monitoring round is present. Where there are multiple teams conducting the monitoring rounds, allow individuals to rotate between teams; this prevents divergent habits from forming and limits observer bias.

4.1.6 Nest checks

Nest monitoring represents the backbone of the monitoring effort of Tier 1 and Tier 2 programmes.

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 4.4.2](#))
9. Optional: nest contents photo (if using the NZPDb 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 [4.4.6](#) 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 per section [4.4.5](#).

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. 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. NZPI hopes to provide in-situ readers in the future where they are needed as soon as their development is completed.

4.1.7 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.

4.1.8 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 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 NZPDb monitoring app)
9. Notes

4.1.9 Other

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

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, 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.

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 [4.1.8](#)).**

Establish with your local DOC contact what protocols to follow if dead penguins are found. At any rate, check dead birds for transponders and if marked record as a recovery entry following the same procedure as re-sightings (see [4.1.8](#)).

4.2 Recording data

4.2.1 Digital data recording

NZPI have a customised database 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 database interfaces reduce 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 transcription 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.

4.2.2 Analog data recording & transcription

If digital data recording is not an option, NZPI can supply data entry sheets in the form of pre-printed field notebooks. 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.

4.3 Handling little penguins/ kororā

4.3.1 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.



*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 or on very young chicks (younger than 3-4 days). Return birds back into the nest box through the nest-box entrance.

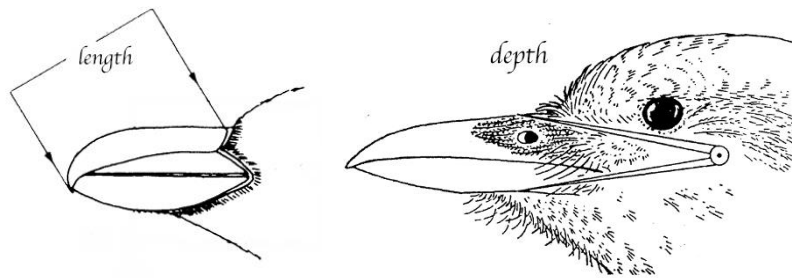
4.3.2 From natural burrows

Removing birds from natural burrows or nest boxes that do not open will require more practice and guidance from an experienced handler. Birds are removed by sliding a gloved hand along the bottom of the burrow until a bird is found. A foot should then be felt for, grabbed onto and the bird carefully pulled out of the burrow. If eggs or small chicks are felt to be in a vulnerable position, then removal of the bird shall be ceased. Once the back legs are out of the burrow, gloves should be removed (to improve dexterity) and the other foot caught. Often, this is the time where the penguins splay their flippers making it difficult to pull them out. Penguins should not be forcibly pulled out of the burrow if this happens. Instead, while both legs are being held, the penguin should gently be ‘rocked’ or ‘wiggled’ from side to side while still being pulled backwards. The penguin should soon let go. If you have observed or felt nest contents shift during the removal, then put them back into position. Avoid handling penguins by the flippers.

For greater extension into the burrow a ‘wire’ can be used. This device is simply a length of No. 8 wire with one end bent round to form a handle and the other end bent back to form a crook; sharp ends are then taped over with cloth tape. A wire should only be used if birds are out of reach but at least one of their feet is visible. Only try to ‘hook’ birds by one of their legs; do not target flippers or necks. Never blindly poke the wire into a burrow.

4.3.3 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

4.4 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.

4.4.1 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 which is to be linked with the DOC Banding database. A **nominated Level-3-certified trainer** would be desirable for

each community group; NZ Penguin Initiative will 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/>

4.4.2 Minimum age and condition of penguins for transponder insertion

Birds in poor condition cannot be transpondered; assessment of the condition of birds will be part of the training for transponder certification. Adults need to be at a minimum weight of 700g to be transpondered. Chicks are ideally transpondered aged 6 weeks old, providing they weigh at least 700g 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. Birds will 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.

4.4.3 For transponder insertion process see appendix ([section 9.1](#))

4.4.4 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.

4.4.5 Recording transponder (Bird ID) data

Main 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 NZPDb 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 NZPDb monitoring app)
11. Notes

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

4.4.6 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.

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 and flash when a transponder is read and turn off the beeping sound.

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. Four complete scans, of 10 seconds, are required to confirm the absence of a transponder.

Birds need not be handled or touched when reading transponders.

5 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.

5.1 Tier 2 Monitoring Protocols

5.1.1 Equipment

- Burrowscope (optional extra)
- Torch/ headtorch
- Field notebook/ NZPDb app
- Hand sanitiser
- First Aid kit
- Map/ GPS unit/ smartphone showing nest locations

5.1.2 Determining active nests

At the time of first monitoring, an initial survey should be undertaken to identify nest sites. Nests need to be numbered for identification and reference. As new nests are identified during the breeding season, number them accordingly and include them in subsequent monitoring rounds.

Nests should be clearly and **permanently** numbered¹. 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 (make sure not to create duplicates)
4. Nest type (i.e. natural burrow, nest box, open)
5. GPS coordinates

¹ If nests are not going to be permanently marked, it is recommended to use the following nest naming convention: XYEAR-NESTNUMBER where XX are initials of the monitoring site, e.g. PB21-01 for the first nest found at Pilots Beach in the 2021 breeding season.

6. Observer name
7. Nest photo including nest number (if using the NZPDb monitoring app)
8. 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 reuse a number if a previously numbered nest is lost, destroyed, or nest box has been moved.

5.1.3 Timing and frequency

Monitoring begins two weeks prior to the earliest known egg laying date in the colony; if not prior information exists, mid-June should be used as start date. Monitoring rounds occur either weekly or fortnightly. For larger monitoring programmes, nest checks at different sites or zones can occur on different days, providing the routine remains consistent throughout the breeding season. While consistency should be kept where possible, adjustments can be made to avoid adverse weather and unforeseen circumstances.

5.1.4 Personnel

Nest checks can be conducted by one person provided that the necessary safety precautions are in place, but the process is most efficient with two or three people. Where there are multiple teams conducting the monitoring rounds, allow individuals to rotate between teams; this prevents divergent habits from forming and limits observer bias. Try to ensure that one person from the previous monitoring round is present during monitoring.

5.1.5 Nest Checks

No handling will occur under Tier 2 monitoring.

Systematically move through the study colony, stopping at each nest to inspect and record nest contents. Firstly, look externally for signs of activity including faecal matter in and around the nest entrance and a strong odour; '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. Record if the nest appears active.

Inspect nest contents with minimal disturbance; speak quietly, avoid shining bright lights directly at penguins, keep the time at nests to a minimum. Do not wait for birds to shift naturally if nest

contents cannot be confirmed within 15 seconds of the interaction. Record the number of adults, eggs and/or chicks present in the nest.

Nests in deep burrows, beyond direct observation may 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. Do not 'guess' nest status if nest contents cannot be assessed.

Data to be recorded when conducting nest checks are:

1. Date and time
2. Site
3. Nest ID
4. Observer name
5. Interaction (i.e. passive, burrowscope)
6. Number of adults (i.e. 0, 1, 2, 3)
7. Nest activity (i.e. Loafing adult(s), Moulting, With eggs/chicks, Empty, Not visible).
8. Nest contents (i.e. Eggs: 0, 1, 2, unknown; Chicks: 0, 1, 2, unknown)
9. Nest photo (if using the NZPDb monitoring app)
10. Notes

5.1.6 Other

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. 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 trampled flat under a parent brooding a live sibling, may not be removable without significant upset. 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 [4.1.8](#)).**

Establish with your local DOC contact what protocols to follow if dead penguins are found. At any rate, check dead birds for transponders and if it is marked record it as a recovery entry following the same procedure as re-sightings (see [4.1.8](#)).

5.2 Recording data

5.2.1 Digital data recording

NZPI have a customised database 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 database interfaces reduce 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 transcription 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.

5.2.2 Analog data recording & transcription

If digital data recording is not an option, NZPI can supply data entry sheets in the form of pre-printed field notebooks. 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.

6 Tier 3

Overview

Trail cameras will 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.

6.1 Trail Camera Monitoring Protocols

6.1.1 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)
- First aid kit

6.1.2 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.

Set cameras to record 20 seconds of video each time they are triggered, with a 5 second trigger interval.

Batteries and memory cards need to be replaced every 7-14 days; do so in the middle part of the day to avoid the most active penguin times. 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.

6.1.3 Data recording

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

1. Date (visible on the video footage)
2. Time (visible on the video footage)
3. Species observed
4. Number of individuals
5. Same animal Y/N (Was this the same animal observed on the previous clip?)
6. Direction of travel (down to the sea or up, away from the sea)
7. Observer name (the individual reviewing the footage)
8. Notes

6.2 Footprint Surveys

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

6.2.1 Equipment

- Ruler/ tape measure
- Footprint guide
- Field notebook or recording sheet
- First aid kit

6.2.2 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 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

7 Review

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

8 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.

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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.

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9 Appendix

9.1 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
- Restraining bag ('weigh bag')
- Pesola spring balances (1000g & 2500g)
- Vernier callipers for morphometric measurements
- Hand sanitiser
- Band aid/First aid kit
- NZPDb monitoring app/ notebook

9.1.2 Insertion process

1. Two competent people are required, one to hold the bird, the other to do the insertion.
2. Clean and cover any bites or scratches on your hands.
3. Set a suitable work area before handling the bird. Ensure that equipment will be within arms-reach.
4. Using the supplied barcode stickers, scan the barcode into the NZPDb monitoring app.
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.
6. Ensure that all measurements and samples are taken before transponder injection.
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.
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.

11. 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.
12. 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.
13. 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.
14. Make sure that the needle does not come out through the skin on the other side of the pinched skin.
15. 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.
16. Apply pressure with a sterile cotton pad to the injection site if bleeding. If the transponder pops out of the injection hole, see [Section 4.4.4 \(If the transponder insertion fails\)](#).
17. Check **after insertion** by ruffling the feathers or down adjacent to the insertion site after injection.
18. Dispose of the sheathed used needle into a sharps receptacle.
19. Check that the transponder can be read. Check the full 15-digit number against the barcode number recorded in the NZPDb monitoring app. If the transponder will not scan, see [Section 4.4.4 \(If the transponder insertion fails\)](#).
20. Check NZPDb monitoring app to ensure all information has been recorded. Release the bird.
21. 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.


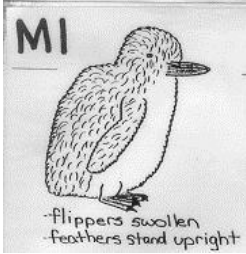








9.2 Potential Impacts and Mitigation measures

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	Heat stress	Fast breathing, panting, agitated	Birds should not be handled if the outside temperature is above 30°C.
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	Permanent nest abandonment	The attending adult leaves the nest (box) and does not return.	Keep handling time to the absolute minimum. The risk for nest abandonment as a result of 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	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	Disease transfer	Little is known about diseases affecting little penguins	Wash hands and all equipment thoroughly after each monitoring round and between sites. Weigh bags need to be washed in steregine.

9.3 Adult Moulting 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>		

9.4 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>P1 -blue flippers only -ready to band (6 wks old)</p>
<p>P2 chick. More adult feathers are visible on the body but at least 2/3's of the body is still covered in down.</p>		 <p>P2 - 1/3 blue or adult plumage</p>

<p>P3 chick. Only 1/3 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 and high pitched, 'squeaky' voices.</p>		<p>P4</p> <p>- all blue - bills smaller, blue brighter and voice squeakier than adults</p> 

9.5 Contact information & external links

- For any correspondence about these kororā monitoring protocols please contact admin@nzpi.net.
- Report any sick or injured wildlife to the Department of Conservation hotline (0800 362 468), or your local DOC contact if prior agreed.
- These protocols along with the abridged 'cheat sheets' are available for download at <https://www.nzpi.nz/korora-little-penguin-conservation>