

## Predator Control and Biodiversity monitoring

### Teacher/group leader notes

This guide outlines some of the mammalian predator and biodiversity monitoring we do on Quarantine Island/Kamau Taurua as well as ways you can be involved.

## Mammalian Predators

### Introduction

With New Zealand's isolated evolution, much of New Zealand's indigenous wildlife and vegetation evolved in the absence of land mammals (apart from a few bat species and marine mammals). With the arrival of humans and the introduction of other wildlife, including mammalian predators, many indigenous species faced population declines and extinctions.

There are many introduced mammalian predators that threaten indigenous wildlife in New Zealand. These include rats, hedgehogs, cats, mice, possums, dogs and mustelids (stoats, weasels, ferrets). These introduced mammalian predators eat the eggs, young and adults of indigenous wildlife (such as birds, lizards and insects) as well as competing for food and habitat.

There are **mice** and **Norway rats** living on Quarantine Island/Kamau Taurua. We are very lucky **not** to have many of the mammalian predators that threaten indigenous plants, birds, lizards and insects in other parts of New Zealand. Mice and rats are both omnivorous, meaning they have a broad diet, eating a range of different foods.

Rats and mice both eat birds eggs and chicks as well as lizards. Rats are also known to eat adult birds. As well as eating our indigenous wildlife, both rats and mice compete for food with our indigenous wildlife. Rats and mice eat some of the same foods that birds and lizards eat, such as seeds, fruits and insects. Mice in particular, will eat insect larvae which disrupts leaf litter breakdown and has flow on effects for nutrient cycling. Mice will also selectively eat different plant seeds, potentially altering forest composition.

Norway rats are able to climb, but they spend most of their time on the ground and are a particular threat to indigenous species that live, roost or nest on the ground. Norway rats are excellent swimmers, and can cause significant damage to seabird populations by eating eggs, chicks and occasionally adults. Rats are very cunning and suspicious of anything new (neophobic), e.g. traps. Rats can easily swim to Quarantine Island/Kamau Taurua from the mainland.

There aren't any animals living on the Island that only eat rats and mice, but they might occasionally be eaten by owls that visit, or perhaps a black backed gull. Both mice and rats reproduce very rapidly, making it difficult to manage them.

## Norway Rat

The Norway rat is the largest rat species that has been introduced to New Zealand.

### Identification:

- Tail shorter than body
- Tail thick with a pale underside
- Grey-brown or black fur
- Small ears that are lightly haired compared to ship rats.

Average body length (not including the tail): around 192mm for males and 184mm for females.

Weight: 170-270g, up to 450g.



## Mouse

Mice are found throughout New Zealand in many different habitat types including bush, pasture, towns, farms and at high altitudes above the tree line.

### Identification:

- Tail about the same length of body
- Long whiskers
- Grey-brown above with white, grey or brown belly.

Maximum body length (without tail): around 115 mm.

Weight: around 15-20g, reaching a maximum of 30g.



Retrieved from [www.pestdetective.org.nz](http://www.pestdetective.org.nz)

## Multiplying mice activity

Rats and mice can reproduce very rapidly. This activity aims for students to gain an understanding of how quickly rat and mice populations can grow, which makes management difficult.

Using the information below, see if students can calculate the answers to the following questions.

1. How many offspring can a single mouse have in a year?
2. How many offspring can a single Norway rat have in a year?
3. Draw a diagram (similar to the adjacent), write an equation, or discuss with your friends to explain how overall mice or rat numbers could increase in a year.



Example of a diagram to demonstrate population growth rates. Retrieved from: [patch.com/florida/landolakes/how-fast-a-cat-can-reproduce-please-look-at-this-chart](http://patch.com/florida/landolakes/how-fast-a-cat-can-reproduce-please-look-at-this-chart)

### Mice:

- Have a gestation period of about 19–21 days, giving birth to a litter of 3–14 young (average 6 - 8).
- One female can have 5 to 10 litters per year, and females reach sexual maturity at about six weeks of age and males at about eight weeks.
- Mice can breed throughout the year. However, in the wild mice do not usually reproduce in the colder months and only live for about a year.

### Norway rats:

- Have a gestation period of about 21 to 23 days.
- The average female rat has 4 to 6 litters per year.
- One female can have litters of 6 to 12 young.
- While babies are hairless and their eyes are closed, they grow rapidly and eat solid food at 2 1/2 to 3 weeks.
- Norway rats become completely independent at about 3 to 4 weeks and reach reproductive maturity at 3 months of age.
- Females may come into heat every 4 or 5 days, and they may mate within a day or two after a litter is born.
- Breeding often peaks in spring and autumn, and decreases in winter.
- Female rats may successfully wean 20 or more offspring annually.

### Discussion Questions

1. What mammalian predators threaten **indigenous** wildlife and vegetation in New Zealand?
2. Which mammalian predators live on Quarantine Island/Kamau Taurua?
3. Why are rats and mice pests in New Zealand?
4. How do rats and mice affect the New Zealand ecosystem?
5. What do rats and mice eat?
6. Why is it difficult to manage (kill/reduce numbers of) rats and mice on Quarantine Island/Kamau Taurua?

### Resources

[Animal pests](#)

[Pest detective](#)

## Trapping

Since August 2016, we have mainly been using **Goodnature A24** traps to manage rats and mice on Quarantine Island/Kamau Taurua. Two advantages of these traps are that they are humane, and they are automatic (can reset 24 times). Automatic traps are very useful on the Island as they do not need to be checked as regularly as conventional (non-automatic) traps e.g. **DOC 200** and **Mouse snap traps**, especially as some of the Island terrain is difficult to navigate.



Goodnature A24 trap



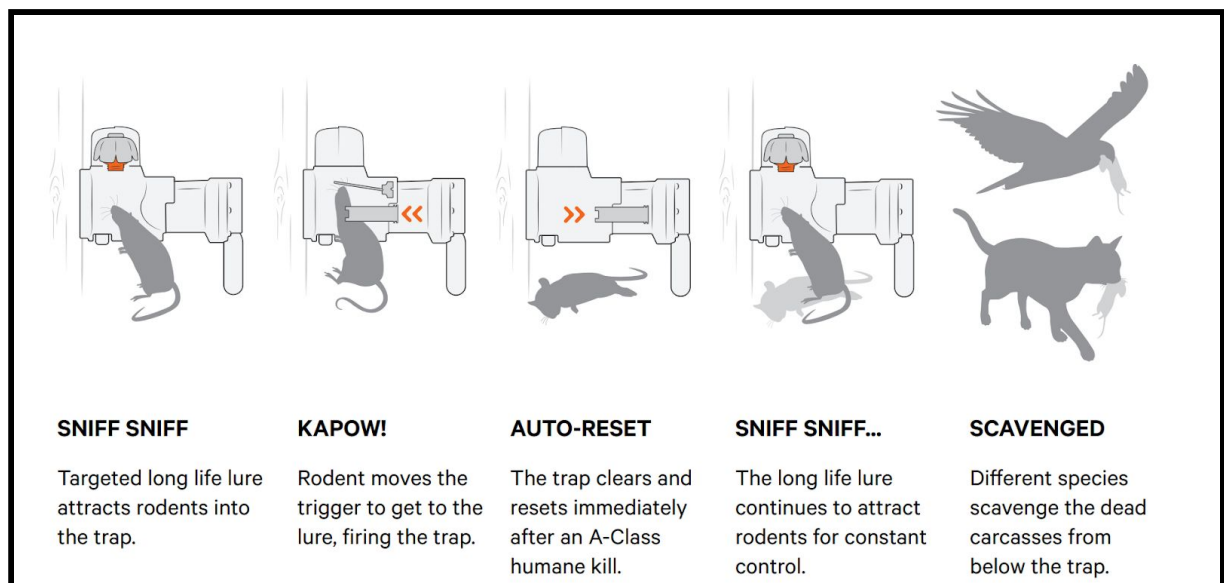
DOC 200 trap



Mouse snap trap

Source: A24 -Wikimedia Commons AnnieDick [CC BY-SA 4.0](https://creativecommons.org/licenses/by-sa/4.0/) and DOC200 -Department of Conservation. Retrieved from: [doc.govt.nz/nature/pests-and-threats/predator-free-2050/toolkit-predator-free-2050/trapping-and-poisoning/choose-traps-and-toxins/](https://doc.govt.nz/nature/pests-and-threats/predator-free-2050/toolkit-predator-free-2050/trapping-and-poisoning/choose-traps-and-toxins/)

Goodnature A24 traps can be checked less often than conventional traps, reducing labour involved in resetting compared to conventional traps. Goodnature A24 traps have a long-life lure that attracts rats and mice into the trap. Goodnature modified our traps so the opening to reach the lure is narrower because we need to control mice, which are smaller than rats and stoats -the predators A24s are designed for. When the animal moves the trigger, the trap fires. The striker is strong and quick. As the trap resets, the rat or mouse drops to the ground. However, we may not know what or how many rats or mice the trap has caught as other predators can scavenge



the dead bodies. This means we may not know how effective the traps themselves are at catching rats and mice.



Images depicting how the Goodnature A24 trap works. From the Goodnature A24 Quick Start Guide Product Manual, retrieved from <https://goodnature.co.nz/pages/support>

Since we can't use Goodnature A24 trap captures to know if these traps are effectively reducing rat and mice numbers, we must use other methods. We can use captures in conventional traps such as mouse snap traps and DOC 200 traps to give us an idea of numbers killed. These are non-automatic traps so need to be checked and cleared more regularly than the A24's.

On Quarantine Island/Kamau Taurua, we also use **tracking tunnels with tracking cards** to determine how effective the traps are. Tracking tunnels and tracking cards have a lure that encourages animals to walk into the tunnel and across the tracking card. Tracking cards have an ink pad so animals leave their footprints which we can interpret to find out which species of animal visited. Tracking tunnels can give us an indication of rat and mice activity levels and location. They don't necessarily give us an indication of how many rats and mice are there, but they could be used as a rough index of relative abundance (the average percentage of tracking cards that contain footprints versus those that don't). Many other conservation projects throughout New Zealand also use chew cards to monitor mammalian predator activity. Chew cards are corflute (plastic) cards filled with a lure (non-toxic bait) that animals chew and leave bite marks. We don't usually use chew cards on Quarantine Island/Kamau Taurua as they can introduce plastic waste into the environment.

We can also use biodiversity monitoring such as **bird** and **skink monitoring** to determine how effective our traps are as reducing rat and mice numbers on the Island. If there are fewer rats and mice on Quarantine Island/Kamau Taurua, over time we should see increases in biodiversity. For example, we may detect greater numbers of skinks during our monthly **Artificial Cover Object (ACO)** checks, and greater numbers of birds during our **5-minute bird counts**.

We would also expect to see fewer rat and mice footprints when we use the tracking tunnels and tracking cards. We should also find less captures in our conventional traps.

## Discussion Questions

1. What are some differences between a Goodnature A24 and DOC 200 trap?
2. Why might Goodnature A24 traps be an advantage to mammalian predator management on Quarantine Island/Kamau Taurua?
3. Why might Goodnature A24 traps be a disadvantage for mammalian predator management?
4. What tools can we use to monitor rats and mice on Quarantine Island/Kamau Taurua?
5. Why might we use some tools (e.g. tracking cards) on Quarantine Island/Kamau Taurua over others (e.g. chew cards)?
6. What other indicators could we use to monitor if the Goodnature A24 traps are effective?
7. What can we expect to **increase** if rat and mice numbers reduce?
8. What can we expect to **decrease** if rat and mice numbers reduce?

## Resources

[Good nature A24 traps](#)

## Lizards

### Introduction

In New Zealand, there are only two families of endemic lizards, skinks and geckos. On Quarantine Island/Kamau Taurua, we have only detected the **southern grass skink** (*Oligosoma* aff. *polychroma* Clade 5). Skinks have sleek shiny scales and resemble a snake with legs. They do not have a distinct head/body, have longer bodies and overlapping scales.

The Southern grass skink is endemic to New Zealand and is small and brown with a spine stripe that extends down the tail. Southern Grass skinks have plain stripes, and no extra speckling down the tail. Southern Grass skinks are diurnal, meaning they are most active during the day.

Southern grass skinks in particular love living among grassy habitats with rocky outcrops in scrublands, rather than in forests. On hot days on Quarantine Island/Kamau Taurua, you may see many lizard tails rushing off into the long grass in the paddocks!



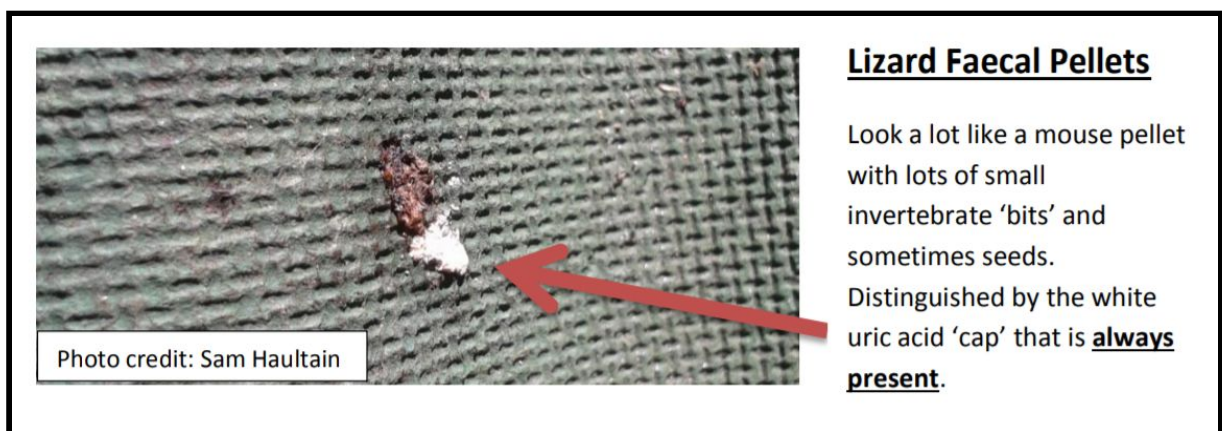
Skinks have a diet mostly made up of different invertebrates (beetles, spiders, and caterpillars) and a small amount of seeds and fruit. We have planted special plants (e.g. *Coprosma*) that provide yummy food for lizards as well as protection from predators. Skinks also carry out an important ecological function by spreading seeds they eat in their poo (known as seed dispersal). Unfortunately, skinks compete for the same food (berries, seeds, insects) as rats and mice and skinks can **be** food for rats and mice!

Skinks are cold-blooded (**ectothermic**), so will spend their days during the warmer months and warm days basking (sunning themselves) to stay the right temperature. Skinks love living among rock piles and log piles that have lots of small spaces to

hide in if a predator comes by. Rocks are very important for skinks during the winter as they can hold the heat and keep skinks warm.

All of New Zealand's native lizard species are protected under the **Wildlife Act 1953**, which means the Quarantine Island/Kamau Taurua Community had to apply for a permit from DOC to be able to 'disturb' them as part of this study and there are strict protocols (rules) to follow. We were permitted to set up lizard hotels or '**artificial cover objects**' (ACOs), which are made from corrugated sheets called Onduline. The Onduline sheets hold the heat, keeping lizards warm. When two sheets are placed together, there is a small gap which skinks may move into, allowing us to monitor (count/observe) them more easily. We are only permitted to check the ACO's once per month and only over the warmer months. This is considered "disturbance" - it's like having the roof of your house lifted up so someone can peer in!

We also keep a look out for lizard faecal pellets (poo) as these can give an indication of skink activity. Sometimes, we may also find lizard (and/or insect) footprints in the tracking tunnels.



### Discussion questions

- What is the equipment called that we can use to monitor lizards on the Island?
- Why are skinks an indicator of rat/mice control?
- What could be difficult about using skinks as indicators of rat and mice control?
- What does 'ectothermic' mean?
- What kinds of habitat do skinks like to live in?
- Why do skinks like living in these kinds of habitats?
- What important ecological function do skinks provide?
- Why can we only check the equipment/monitor skinks once per month in the warmer months?
- Why is it important to record skink poo?

## Resources

[Southern grass skink](#)

[Attract lizards to your garden](#)



# Birds

## Introduction

There are quite a few different species (types) of birds living on Quarantine Island/Kamau Taurua. Not all of these birds are **native** or **endemic** to New Zealand, some birds have been **introduced** here.

Some endemic birds (only found in New Zealand) you are likely to see or hear on the Island include bellbirds, paradise shelducks and spotted shags. Some native birds (naturally found in New Zealand) you are likely to see or hear on the Island include red billed gulls, white faced herons and black-backed gulls. It's hard to count the shags that nest on the rocky shoreline without disturbing them as boats are required! Some introduced birds (brought to New Zealand by people) you are likely to see on the Island include chaffinches, dunnocks, house sparrows and redpolls.

With New Zealand's long isolated evolution, many of New Zealand's birds have evolved particular structural, behavioural or physiological adaptations. **Bellbirds** for example, have evolved long curved beaks perfect for probing into flax flowers and drinking the sweet, delicious nectar. In exchange, bellbirds get their heads covered in pollen, carrying out an important ecological service: pollination. Birds are also important seed dispersers, by eating fruit and berries.



Many of the birds you can find living in the paddocks and bush areas of the Island, you may find in your own backyard! As Quarantine Island/Kamau Taurua is situated within the Otago Harbour, we also have different species of coastal birds.

On the Island, we use five-minute bird counts to estimate the number of birds on the Island. There are several different bird count stations on the Island, with each station likely to have a different assemblage of birds! Doing bird surveys can be difficult as birds are very mobile! We also won't often know whether birds are just 'passing through' or living on the Island. Identifying and counting birds that breed on the island would be a better indicator of the success of rat/mice control, e.g. counting chicks/fledglings, but practically this is difficult!

The results of the five-minute bird counts can give us an indication of the species of birds on the Island and the success of our ecological restoration (e.g. planting for habitat restoration and particularly, rat and mice control). However, we have no baseline data (that being data recorded before we started trapping). We can start building a more accurate picture of island birdlife by recording as many observations as possible. There are identification flashcards and recording sheets on our website.

## Discussion questions

- What's tricky about using birds as indicators of the effectiveness of our rat/mice control?
- What are the differences between endemic, native and introduced species?
- What are two important ecological services birds provide?

## Resources

[NZ birds online](#)

[NZ garden bird surveys](#)

# Monitoring activities

## How you can be involved!

One of the challenges for us on the Island is that we do not have good baseline data about biodiversity from **before** we started trapping. However, if we collect data over time, we should eventually be able to see trends. You can help us with biodiversity data collection for our monitoring!

There are three different monitoring activities you can be involved with on Quarantine Island Kamau Taurua: tracking tunnels, skink surveys and bird surveys. The skink monitoring, however, can only be done at certain times. Bird surveys and tracking tunnel monitoring can be done often, and on day or overnight trips. Even if your group can't do all the activities, you can talk to the group about what is happening and use the discussion questions and information in this guide.

## Tracking Tunnels

Tracking tunnels are best for overnight groups as you can put out the tracking cards, and bring them in the next day. However, the Keeper could also put out the cards the night before for day visitors.

While we have tracking tunnels placed all over the Island, some of these are difficult to access. The tracking tunnels on the west side of the Island, along the bush track, labelled W1-10, are the easiest to access for groups to check. You will need to find the tunnels and place the tracking cards inside them.

The Keeper may have some lure stored in the lodge.



## Equipment

- Tracking cards
- Map showing tunnels
- Plastic bag to put cards in
- Pencil
- Paper
- Lure (either chocolate paste, peanut butter or lard)

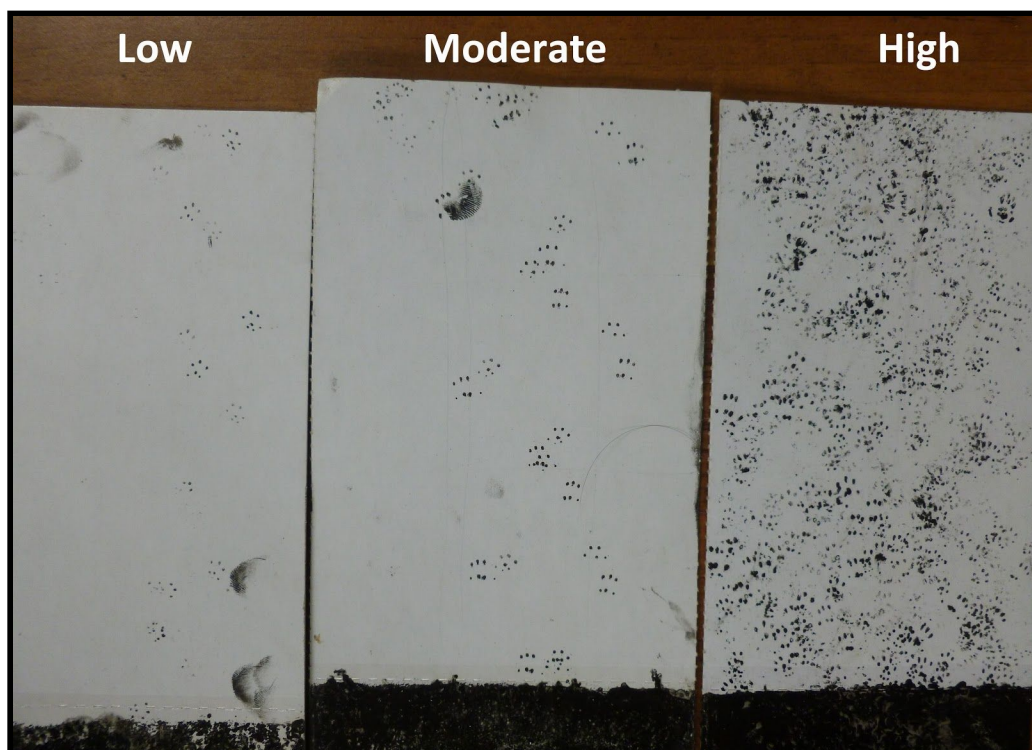
## What to do

1. **Before** the group sets out, label the tracking cards with QI/KT, the date, the tracking tunnel number, and lure (this could be chocolate paste, peanut butter or lard)
2. **Putting out tracking cards:** Walk from the lodge into the bush, you will be placing cards into the “W” series of tunnels along the bush track.
3. Give the group a map of the tunnel locations ensuring they are looking for the tunnels in the bush labelled “W”.
4. Add roughly ½ a teaspoon of the lure to the middle of the card. The lure is placed in the middle of the card so the animals are forced to walk over the inkpad to leave their footprints.

5. Place a tracking card in each tunnel and ensure the tracking card is flat at the bottom of the tunnel.
6. If the tunnel has pegs, ensure the tunnel is secure.
7. Note weather conditions (there seems to be a lot more mice activity on warm still nights).
8. **Bringing in:** Collect the cards and analyse the footprints by identifying the culprit and level of activity (none/low/moderate/high) using the photos below.
9. You can also calculate the relative abundance using the formula below.
10. Please leave the cards in the “storage cupboard” in the Lodge.

### Interpreting footprints

These are mice footprints. They are thought to resemble a starry sky. These are the most common footprints you will see on Quarantine Island/Kamau Taurua. These tracking cards show different levels of mouse activity: low, moderate and high activity.

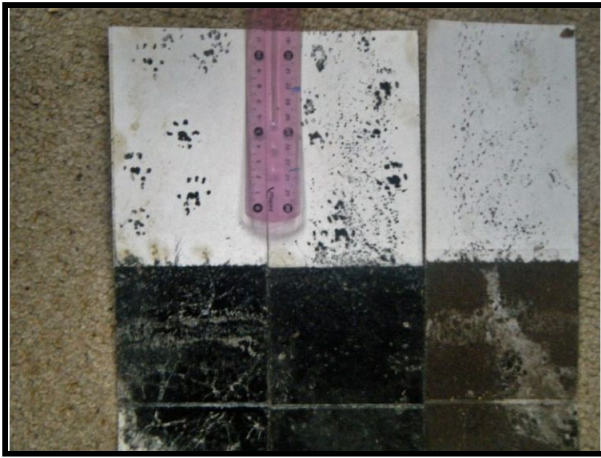


### Calculating the relative abundance

We can't use the level of mouse activity to find out how many mice there are on Quarantine Island, as we don't know if the tracks are made by the same mouse or different mice. We can however, calculate the relative abundance - the percentage of cards that have tracks versus the total number of cards we placed.

To calculate relative abundance, use the formula: Number of tracking cards with tracks divided by total number of cards placed x 100.

For example, we place 10 cards out and collect them the following day. When we analyse the cards, we find that there are low, moderate or high levels of activity (footprint tracks) on 4 of the cards. We would calculate the relative abundance as:  $4/10 \times 100 = 40\%$ . We can use these relative abundance values to compare across seasons or years.



**Previous monitoring and the importance of good labelling:** We found these cards showing rat and mice prints. They are labelled 'Nov.' Quarantine Island. But no year is given! A good reminder to us about the importance of full and accurate labelling!

## **Skink Monitoring**

We only check the ACO's once a month from October - April and only in good weather (i.e. on warm sunny days as checking in rain will not provide useful results), so if you are interested in monitoring skinks, please let us know.

**ALL 13 ACOS have to be monitored on the same day and within the same time period. However, some of these are in areas with poor access for visiting groups and will need to be checked by a Quarantine Island/Kamau Taurua volunteer.**

**ACO's should not be disturbed until it is time to check them for the formal counts. Any disruption by early lifting could scare away lizards and skew results.**

**If we are not currently undertaking skink monitoring, keep a look out for skinks in the long grass and record your observations to our iNaturalist project.**

Mid-morning checks are best as the equipment will have the chance to warm up and attract residents. Use the provided recording sheet to ensure that all useful variables are recorded. For the checks we will be carrying out, only the number of individual lizards seen under each ACO will be recorded, with juvenile and adult counts included if possible.

## **Equipment**

- Recording sheet (ask the Quarantine Island/Kamau Taurua volunteers for this sheet)
- Pencil
- Phone/camera to take photos (phones with ability to record slow motion video can also be helpful!)
- Clipboard or card

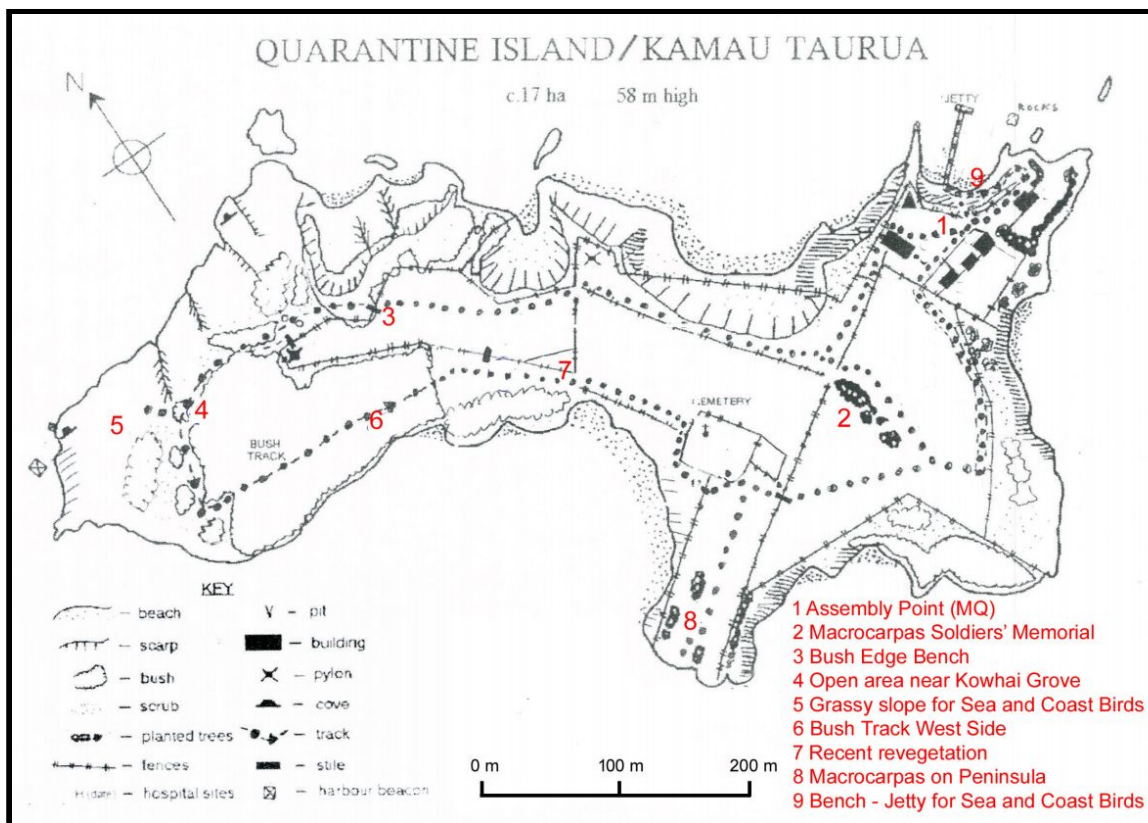


## What to do

1. Approach the ACO very slowly and quietly and stop at least 2 metres away - skinks may be basking beside or on top of the ACO.
2. Move to the ACO and be ready to count and identify the skinks - they can move very quickly!
3. Someone could try to take a photo or slow motion film as the Onduline sheets are lifted.
4. Carefully remove the rocks that prevent Onduline from blowing away and keep an eye out for escaping lizards.
5. Carefully lift off the first cover and count what you see.
6. Carefully lift off the second cover.
7. Check the grass and debris under the bottom cover to ensure no lizards are harmed and replace the ACO's and rocks back to their original position.
8. Record the number of skinks you saw and if possible if they were adults or juvenile.
9. Record environmental variables such as cloud cover, wind speeds and temperature - this will help to explain variations between, and within, years of checks.
10. Check for any distinctive skink poo and record this also.
11. Bring your data back to the Lodge and place it in the "Education Resources" box in the Lodge storage cupboard for collation in our spreadsheet.

## Bird Surveys

The red numbers on this map represent the nine bird count sites on the Island. The bird surveys we carry out on the Island are called '5-minute bird counts' as birds are looked for and listened for five minutes at each site.





## Equipment

- '5 minute count' bird survey form (find hard copies in the "Education Resources" box in the storage cupboard in the lodge - ensure your copy has the "observers" option)
- Pencil
- Binoculars
- Bird Identification charts (found in the "Education Resources" box in the lodge storage cupboard or print from the link on our website)
- Timer/clock

Observers:	Start time:	Contact:		
Date:		End time:		
Weather (circle):				
wind: calm light breeze moderate breeze strong wind				
wind direction: S SW W NW N NE E SE				
cloud cover: clear skies partly cloudy overcast				
precipitation: fog drizzle showers rain				
Species	Paddocks and Bush	Tick if seen or heard	Count	Notes
Count sites	1,2,3,4,6,7,8			
Kahu Harrier				
Putangitangi Paradise Shelduck				
Mataku Moana White-faced Heron				
Spur-winged Plover				
Karoro Black-backed Gull				
Kereru NZ Pigeon				

## What to do

1. Use the map to find the stations.
2. Fill in the information about date, count site, names of observers, number of observers, and weather conditions on the 5 minute count bird survey form. These are all 'variables' that may affect the data **Note: there are two different bird survey forms, one for paddocks and bush count sites (1,2,3,4,6,7,8) and one for coastal count sites (5,9).**
3. Quietly approach the station.
4. If in a group, arrange the group in a circle or line (depending on the bird count site), with students facing different ways so the group will have a 365-degree view of the area.
5. Listen for bird calls and use the binoculars or the naked eye to observe, count and identify the birds within roughly 100 metres using the identification guide for five minutes.
6. Record the largest number of each type of bird you see at any one time. For example, if you see two bellbirds, record two. If you later see a single bellbird, the count stays at two. If you later see three bellbirds together, the count increases by one to three. If we count a single bird that comes and goes, we may think there is a larger population of birds than there actually is.
7. Record the bird species you find, whether you saw or heard the bird species, and what it was doing on the 5-minute count bird survey form.
8. Move to the next station and repeat steps 1 - 7 with a new 5-minute count bird survey form.
9. Back at the Lodge, return your completed sheet to the "Education Resources" box and/or add your observations to our iNaturalist project.

## Discussion Questions

- What other animals could we find leaving their tracks on the tracking card?
- Why is it important to label the tracking cards?
- Where is the best place for the lure on the tracking cards and why?
- Why is it important to record information about the date, weather, observers?
- Why do we count birds in groups?