‘Teacher/group leader’ notes to introduce biodiversity monitoring on the island

1.0 Pests:

*What pests threaten **indigenous** wildlife and vegetation in N.Z.?*

Which of the mammalian pests do we have on Quarantine Island Kamau Taurua?

The island has mice and Norway rats. We are very lucky **not** to have many of the pests that threaten native plants, birds, lizards and insects in other parts of NZ.

Why do you think rats and mice are pests? How do they affect the ecosystem? What do they eat?

Mice and rats both compete for food with our indigenous animals, for example they eat some of the same foods that birds and lizards (skinks) eat, such as seeds and fruits.

They also eat lizards and insects.

Norway rats are able to climb, but they spend most of their time on the ground making them a particular threat to indigenous species that live, roost or nest on the ground. They are excellent swimmers, and can cause significant damage to seabird populations by eating eggs, chicks and occasionally adults.

The Norway rat is the largest of the rat species in New Zealand. Its tail is shorter than its body, and thick, with a pale underside. It has grey-brown or black fur and small ears that are lightly haired compared with ship rats.

Size: Average body length, without tail, c.192 mm for males and 184mm for females. Weight 170-270 g, up to 450 g.

Retrieved from www.pestdetective.org.nz

Why is it difficult to control (kill/reduce numbers of) rats and mice on the Island?

Rats are very cunning and suspicious of anything new, such as traps and they can swim.

Rats and mice might occasionally be eaten by owls that visit the Island, or perhaps a black backed gull, but we don’t have any animals living on the Island that only eat rats and mice.

Both mice and rats reproduce very rapidly.

1.1 Can you do the maths....?

Mice have a gestation period of about 19–21 days, and they give 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. They can breed throughout the year, however, in the wild they 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 Litters of 6 to 12 young are born, and while babies are hairless and their eyes are closed, they grow rapidly and eat solid food at 2 1/2 to 3 weeks. They 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. The average female rat has 4 to 6 litters per year and may successfully wean 20 or more offspring annually.

Can you draw a diagram, write an equation, or discuss with your friends to explain how mice or rat numbers could increase in a year?

2.0 Trapping:

Goodnature A24s are the main traps we are using to control rats and mice (since August 2016). One of the advantages of these traps is that they reset.

Why might traps that reset be an advantage?

Difficult terrain, labour involved in resetting conventional traps.

Other predators can scavenge the dead bodies, so how can we know if the traps are effective?

What other indicators could we use to monitor if the traps are effective?

What should we see more of if rat and mice numbers reduce?

More biodiversity: skinks, insects, birds, seedlings. Fewer rat and mice footprints when we use the tracking tunnels/ink cards, and fewer teeth marks on the chew cards.

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 this!

3.0 Activities:

Split students/visitors into groups of 4-5 if possible to help with biodiversity monitoring and tracking tunnels/chew cards, each with a 'leader'. There are 5 different activities; some can only be done at certain times (skinks/moths). Others can be done often, and on day or overnight trips (birds, seedlings, tracking tunnels, chew cards).

3.1 Tracking tunnels (best for overnight groups as then they can put out the ink cards, and bring them in, however, the Keeper could also put out the cards the night before for day visitors).

Putting out ink cards: Each group is assigned several of the 30 tunnels (5-6, depending on size of the group). Groups are given map and written directions for tunnels. **Before** the group sets out, trim the cards (some are too wide for our tunnels). Correctly label their ink cards, eg QI/KT, date, tracking tunnel no, lure (½ teaspoon of peanut butter in the centre of the card).

Use the map/written directions and keen observation to locate your group's tunnels.

Place a card in each tunnel and ensure the card is flat at the bottom of the tunnel.

Bringing in: Collect the cards, analyse your footprints and record on the spreadsheet. Compare with previous results. Also, note weather conditions (there seems to be a lot more mice activity on warm still nights).

Equipment: Tracking cards, map showing tunnels & written directions, plastic bag to put cards in (guide for identifying footprints back at Lodge).

3.2 Chew cards: (best for overnight groups as then they can put out, and bring in, the cards, however, the Keeper could also put out the chew cards the night before for day visitors). The chew cards have the same lure as the goodnature traps.

Mark where each chew card has been placed on the map (or record co-ordinates with GPS on your phone).

Collect the chew cards after they have been out for at least one day. Look for chew marks and identify whether they were made by rats or mice (refer to guide). Record data (date/site) on the map for compilation in a spreadsheet.

Equipment: cards, hammer, nail, map, pen, guide (for identifying chew marks back at Lodge)

3.3 Seedling monitoring.

How can seedlings indicate whether our rat/mice control is effective? One of the changes we expect to see as we reduce predator numbers, is an increase in native tree seedlings.

To test this hypothesis, ecologist Dr Jillian Hetherington, has helped us set up rat proof 'seedling cages' in 6 different locations. Right next to the rat proof cage you will see two wooden pegs, these mark the non-caged comparison site. Initially, we are observing closely, and recording, how many different small seedlings we can see in each cage and in the non-cage site.

Use the map/directions to find 'your' cages. Use the plant recording sheet to record the number of seedlings and what is different/ similar between seedlings in the cage/non-cage. Note down any environmental factors (e.g. sun light, shade, lots of trees above - or not, lots of leaf litter - or not, damp ground or dry ground, windy) which might influence results for 'your' site. Use the plant ID guide to identify seedlings if possible.

Bring back your record sheets so they can be compiled with other groups and added to our data.

What did you expect to see?

What did you actually see?

What did other groups find?

How did their site differ from yours?

Was there anything difficult about collecting accurate data?

How could you improve the reliability of data collection?

Equipment: recording sheets, pens, photos of plants

Cage 1: As you walk along the path through the bush on the southern side of the Island, keep your eyes peeled for a gap in the canopy, a sign that talks about invasives and a slope on the track. To the left there is a cage and the pegs are slightly hidden in the trees.

Cage 2: As you walk down to the hermits' cave you will see a sack on the side of the path - you need to head off track and carefully make your way through the flax and hebes. The cage can be found under a large lemonwood (crush the leaves and smell citrus)

Cage 3 and 4: Opposite the path down to the hermits' cave is an area with no understory plants, on this bank are two cages/non-caged spots.

Cage 5: On the edge of the cliff, just over the fence (you can stay on this side of the fence).

Cage 6: On the bank below the Married Quarters, be careful not to stand ***in*** the non-caged plot; it is just a little bit further away from the cage than the other sites.

3.4 Moth monitoring

(Background information below from https://www.landcareresearch.co.nz/information-for/citizen-science/shedding-light-on-the-night/about-moths)

How could monitoring moths help us get an insight into rat and mice numbers? What other variables affect moth numbers?

Moths play an important role in the ecosystem, as food for native birds and pollinators for plants.Moths and butterflies (Lepidoptera) are the third largest group of insects in New Zealand with over 2000 known species. Most New Zealand moths are found nowhere else in the world (92% endemic). Their largely nocturnal behaviour means moths are often overlooked, but they make great subjects for environmental monitoring. Their short life-cycle and good mobility mean their distributions often show clear geographic relationships with measurable environmental factors.

We know relatively little about the distribution of moths across New Zealand or moth ecology. They have never monitored on the Island as far as we know, until we began this project.

What determines which moths are where?

Which moths are where depends on many things, including the environment, climate, season, what phase the moon is in, and the effects of light.

Environment & climate

Each moth species has specific food and environmental requirements that it needs to survive. Important environmental factors for moths are food-plants, nectar sources, temperature, humidity, and wind speed.

We can use the information about the environment where we find moths to better understand the ecology of moths. However, can you see why monitoring them and making comparisons is difficult?

Identifying moths: Many moths look very similar! One of the strategies scientists use to identify moths, is to collect a sample. With the help of Dr Barbara Anderson and university student James Tweed, QIKTC have a sample of moths collected on the Island in…2017 (Autumn). Making a 'sample' involves humanely killing the creatures and we wrestled with whether to do this.

Can you think of some of the reasons we thought about (for and against)?

Entomologists (people who study insects) collect samples for a variety of reasons:

To describe and classify new species: Every new species requires the designation of a type specimen. The name of the species is hinged on the type specimen. Future revisions and identifications can then be compared with this specimen.

To make a reference collection: A reference collection makes it easier to identify the different species and study them.

To catalogue species: It's important to ensure that when we talk to other entomologists we can check we are all calling the same species the same name. Sometimes two species look very similar and scientists need a specimen to be sure of the species identity. Other times species are very variable and two individuals of the same species may look very different. Therefore we need a range of specimens to know the variability of a species.

To compare variation traits: To understand the ecology and evolution of species we often need to study the variation between individuals within a species and between closely related species.

To detect changes over time: Sometimes we don't know what will be important in the future. Historical collections allow entomologists to compare species traits over time and detect the effect of environmental change or predict future changes

Logging the data ensures we get the most information from a specimen.

3.4.1 Activity - day visitors:

Compare the identification guides with the collection and see if you can identify the species,

How easy is it to identify different species?

What are some of the differences?

- **For groups having an overnight stay:**

Assemble the Heath traps according to the instructions and place in the monitoring sites before dusk on a warm, dry evening.

In the morning, collect the moths, as per the instructions and bring back to the MQ.

Carefully place moths in the bug viewers and observe them. If possible, identify them using the collection or identification guides. (We have made one collection, which involved humanely killing the moths we caught, however, in general, just want to catch, observe, then release).

Record which moths you think you have caught and where on the Island the trap had been placed that you caught the moths in.

3.5 Skink monitoring (only once per month checking ACOs; next check second or third week of November on a sunny warm day).

Why are skinks an indicator of rat/mice control? (because they compete for the same food (berries, seeds, insects) and they can ***be*** food for rats and mice!)

What's difficult about using skinks as indicators?

They are only active over the warmer months/days. They are good at hiding.(Where do they usually live? (Under rocks).

No one is allowed to catch them as they are protected as NZ wildlife. (The QIKT Community had to apply for a permit from DOC to 'disturb' them as part of this study and there are strict protocols (rules) to follow. We were permitted to set up 'artificial cover objects' (ACOs), which are made from corrugated sheets, similar to roofing iron, but the material it is made from does not get as hot/cold. Placed together, there is a small gap which skinks may move into, allowing us to monitor (count/observe) them more easily.

Why might skinks decide to move into this habitat?

Warm, small gap

We are only permitted to lift up the ACOs once per month to see if anything has moved in.

Why only once per month?

It's like having the roof of your house lifted up so someone can peer in!)

If your group is chosen to monitor skinks, you will be assigned 2 ACOs. Take a recording sheet. Approach very slowly and quietly and stop at least 2 metres away- skinks may be sunning themselves beside/on top of the ACO. Observe. Move to the ACO. Be ready to observe/count/identify. Someone could try to take a photo as the covers are lifted. if there are skinks there, they will run away very quickly! Carefully remove the rocks that weigh down the covers/prevent them from blowing away. Carefully lift off the first cover and observe. Then the second cover. Record your findings. Check for any distinctive skink poo and record this also (*Why?*)

Bring your data back to the Lodge for collation in our spreadsheet.

3.6 Bird surveys

What's tricky about using birds as indicators that our rat/mice control is effective?

Doing bush bird surveys is difficult as birds are very mobile! We also won't often know whether birds are just 'passing through'. 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 likely to be difficult!

It's hard to count the shags that nest on the rocky shoreline without disturbing them (boats required!)

We have no baseline data (that being data recorded before we started trapping).

However, we can start building up a more accurate picture of island birdlife by recording as many observations as possible.

Use the '5 minute count' bird survey form. Each group (very quietly!) goes to 2 stations (shown on map). Observe, listen, count, identify, using the recording sheet for 5 minutes. Move to the next station. Back at the Lodge, enter your observations in e-Bird (or leave it in the 'bird observations' box). Make sure you have filled in all the information about date, site, number of observers, whether you saw or heard the bird, and what it was doing etc (*Why is this important?)*