Controlling rats

An excerpt from the pest animal control guidelines for the Auckland region

PEST FREE AUCKLAND

Auckland Council
Te Kaunihera o Tāmaki Makaurau

Guiding principles for pest animal control

1. Know the home range of the target animal

The home range of the target animal will help determine the distance between tools (your traps and bait stations). Usually you would put a minimum of two tools within an animal's home range, so it has more opportunity to encounter them.
Knowing the home range will also help determine the distance an animal would have to travel to reinvade an area, so will help you define the shape and size of a control area. Long thin areas are less viable than rounder areas as pest animals can more easily reinvade.

2. Use favoured habitat to choose tool placement

Placing control tools in areas that are favoured habitat of the target animal will increase the chance of that animal encountering the tool, leading to a better likelihood of successful control.
If a control area does not have suitable favoured habitat for the target animal, there may be no need to place tools there.

3. Frequency of breeding guides the frequency of control

This helps guide how often the tools need to be activated to keep up with additions to the target animal population – matching the rate of control with the target animal rate of breeding. Control is best carried out before a pest animal breeds and during fledging time to reduce the rate of population increase and benefit biodiversity.

4. Time your control to be as cost effective as possible

Good levels of control effort need to be applied over both winter and spring and there are two aspects to this timing:

- Pest animal control is often most effective in the winter months, when there is less natural food available in the environment and target animals have higher energy requirements to keep warm, making bait more attractive.
- Having pest animal numbers low in spring will be of greater benefit to the population you are trying to protect. This is because spring is when bird species are breeding, and are therefore more vulnerable.

5. Use the animal's behaviour traits against them

It is important to remember that one reason why pest animals are successful predators is their ability to quickly adapt to new situations and features in their environment.
To maintain effective control, project managers should ensure a variety of tools are used. This involves not only activating and deactivating existing tools in pulses, but also using different tools, such as alternative bait or traps.
Doing so will help counter the adaptability behaviour of pest animals, and in combination with implementing the other key principles of pest animal control, will help deliver lasting effective pest animal control to a project.

6. Do it safely

- Follow the product label, Safety Data Sheet and manufacturer's instructions.
- Always use personal protective equipment.
- In more populated areas, consider using traps in place of toxins
- All traps and toxins should be contained within lockable stations
- Where toxins are required, pulse their use

For the full explanation of these principles email biosecurity@aucklandcouncil.govt.nz

Rats

Rat species

There are two main species of rat on the New Zealand mainland - the ship rat, able to climb trees and the Norway rat, usually found near water. Both species are rapid breeders. A typical rat will be 15 to 20cm long with a further 20cm of tail

Ship rats are usually the most common rat species in Auckland forests. They come in several colours, usually black to light brown in colour with a lighter underside. In comparison to the Norway rat they are poorer swimmers, but more agile and better climbers.

The lighter belly of a ship rat

Ships rats tend to be more nocturnal and Norway rats more diurnal.

Both species are omnivorous, with a preference for grains. In a suitable environment rats will breed throughout the year, with a female producing three to six litters of up to 10 young. Ship rats live for two to three years. Social groups of up to 60 can be formed.

In New Zealand, ship rats have an unusual distribution, in that they are found everywhere through native forests, scrub, and urban parklands. Ship rats are the most frequent predator of small forest birds, seeds, invertebrates, and perhaps lizards, in New Zealand forests, and are key ecosystem changers due to this predation.

How to tell the difference:

Ship rat (*Rattus rattus*)

- Very long tail - in adult this is longer than the head and body length combined.
- Very long thin ears - when you pull the ears forward they will generally cover the eyes of the rat.
- Smaller of the two rats, weighing around 150g.

Norway rat *(Rattus norvegicus)*

- Thick tail usually shorter than head and body length.
- Small ears that can't be pulled forward over the eyes.
- Large, robust rat, weighing up to 500g.

Why is the species of rat important?

The type of rat present has implications for pest control projects. For example, having more ship rats around has implications for most tree-nesting birds including kereru and small birds. This is because they are more agile and better climbers.

Norway rats on the other hand are large and ground-dwelling, with potential impacts on ground nesting species. They also prefer wetland and other water habitats (sometimes called Water Rat). Norway rats have larger home ranges than ship rats (500m vs 150m average), which will dictate your layout of control tools if just targeting one species in your project area.

In addition to their impacts on birds, rats also have impacts on invertebrates and lizards and can also limit seedling germination, by eating fruit, seeds and young plants. Rats have a relatively small home range (about 1ha for ship rats) and this combined with their rapid breeding means that reinvasion of rats in a controlled area is generally very rapid.

All rats eat a wide range of foods, are quick to find bait stations and communicate their location to other rats. They are capable of detecting some poisons, especially cyanide and cholecalciferol, if not used appropriately. A dominant rat will protect a large food supply such as a station of baits, and if baits are not fixed in stations, rats may stockpile the baits in or on the ground, which means only a few rats will be taking most of your bait.

Control using toxin

Pelletised toxin typically looks like this and is blue / green

Which toxin is best for your programme?

Toxins are an effective way to knock down and control rat populations. There are two main toxin types covered in this guide, *first generation* multi-feed and *second generation* single-feed. Deciding which toxin to use is determined by site characteristics and risk to non-target species. These two toxins are anticoagulants and work by stopping the blood from clotting, leading to haemorrhage. Both have antidotes (vitamin k1), which not all other toxins have.

Other toxins work in different ways. Cholecalciferol works by calcifying the blood and reducing the animal's ability to filter it, leading to cardiac arrest. 1080 works by preventing cells from producing energy, resulting in either cardiac arrest, or respiratory failure.

Toxins come in both block and pellet forms. The form you use will determine which bait stations should be used (more on bait stations below).

Bromadilone and Diphacinone are the only toxins recommended for community group use on smaller Auckland Council Parks and Reserves. Community groups should get in contact with their Community Park Ranger.
For information on other toxins please contact the Auckland Council Biosecurity team.

When should you use the toxin?

For the maximum benefit to birdlife, rat control is best concentrated just before and during the bird breeding season, which for most species runs from August to about January. Rats are attracted to a range of food sources eating almost anything, but have the ability to become bait shy from a sub-lethal dose, degraded poison or continual baiting year-round by not pulsing.

What is pulsing?

To reduce the risk of rats becoming bait-shy or over-eating bait when the lethal dose has already been consumed; pulsing is the most efficient way for toxin use in pest animal control. Pulsing is important because whatever has eaten the bait in the first fill will have died by the second fill date of the pulse, so control will be more effective. Rats can consume many times the lethal dose of anticoagulants in bait before death, wasting toxin.

Rodent single feed toxin example: *Bromadiolone*

For a second generation (single-feed) anti-coagulant toxin such as bromadiolone you only need to pulse it four times a year (August, November, January and April).

- In this pulse you fill the bait station on day one, and refill on day five and day 14. Remove bait at the end of week four.
- When ending the pulse make sure you remove all bait in stations and dispose of it correctly, degraded bait can make animals bait shy as it is not as attractive.
- As it is a single-feed toxin, a lethal dose will be consumed during a single feed event.
- The antidote is vitamin k1.
- While bromadiolone is an effective toxin and is less labour intensive, it has a higher risk (than diphacinone) for accumulation of the toxin in the environment, and possible secondary poisoning, but less risk than brodifacoum.

Small parks and reserves: ✓

Private property and large parks: ✓

Bromadiolone bait pulsing programme for rats

Month	August				September				October				November				December				January				February				March				April			
Week	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Bait fill days 1 and 5																																				
Bait refill day 14																																				
Remove bait																																				

Rodent multi- feed toxin example: *Diphacinone*

- For a first generation toxin like diphacinone (which is a multi-feed anticoagulant toxin), you only need to pulse it four times a year (August, November, January and April).
- In this pulse you fill the bait station on days one, three and five then refill on day 14. If less than half the bait from the previous fill is present on the day 14 fill, consider filling again on day 17. Remove bait at the end of week four.
- When ending the pulse make sure you remove all bait in stations and dispose of it correctly. Degraded bait can make animals bait-shy as it is not as attractive.
- As it is a multi-feed toxin it is very important that it is available for five consecutive nights for the rat to be able to consume a lethal dose.
- This toxin is really only suitable to maintain low rat populations following a knockdown, and while it is more labour intensive, it has lower risks for accumulation in the soil and secondary poisoning than brodifacoum & bromadiolone.
- The antidote is vitamin k1

Small parks and reserves: ✓

Private property and large parks: ✓

Diphacinone baiting programme for rats

Month	August				September				October				November				December				January				February				March				April			
Week	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Bait fill on days 1, 3 & 5																																				
Bait refill day 14 & 17																																				
Remove																																				

Further toxin considerations:

- There is a legal requirement that toxin is distributed in bait stations and not spread on the ground. Some toxins and methods of application other than in stations require a CSL, and approval from the local Medical Officer of Health.
- Ensure appropriate signage is displayed at every normal entry point for the required period of time, and information correct (for parks and reserves contact your Community Park Ranger).
- Always read a toxin's label and Safety Data Sheet before distributing
- Ensure stock (withholding for slaughter) and domestic animal precautions are followed. Grazing stock should not have access to bait.
- Ensure you know the antidote and if you suspect poisoning in non-target animals or yourself contact your vet or doctor immediately.

What bait stations should I be using?

Bait stations provide protection to bait from rain and moisture, protect non-target species from accessing the bait and present the bait in a way that is attractive and effective for the target animal.
Bait station recommendations are determined by site, risk to non-target species and whether they are on private or public property.

Above: A Protecta Ambush bait station
Below: Typical bock baits – also usually blue or green

Small public parks and reserves

- Lockable bait stations are the only stations permitted to ensure risks are managed to non-target species such as park users.
- Access is only with a key and they are tamper-resistant for kids and dogs.
- The bait is in block form, which is secured in the station via pins. This ensures the bait can only be consumed in the station and not removed and stored.
- Bait in the form of Contrac (bromadiolone) and Ditrac (diphacinone) are recommended for use in these stations.

Private property and large parks

- Depending on risks with non-target species both lockable and open-faced bait stations (as shown below) are recommended.
- Bait in open faced stations is usually in pellet form, with the option in some stations for a pin fixture (Philproof bait stations). Bait fixed on pins means that the animal needs to eat the bait to remove it, ensuring control. Non-fixed baits may be stored instead of eaten (by rats in particular).

Tips for baiting stations:

- Always wear gloves
- Remove any degraded or old toxin before refilling the station
- Ensure there is no toxin spilled on the ground outside the station
- Pelleted bait should be in weighed plastic bags (150g, 200g, 300g etc depending on station capacity and your programme's planned toxin use)
- Ensure the bait station remains secured to its tree / platform (or pinned to the ground).

How many bait stations do I need?

With your bait station placing you should aim to have two per hectare for rats, to achieve effective control. Using the area under management as a guide you can work out the stations needed for effective control in your area, for example 20ha x two stations per hectare = 40 bait stations. See the guide to laying out bait stations below – note trap layout and location is site specific.

Bait station and trap layout

Ideally, trap lines should be 100m apart. Along these trap lines, traps or bait stations should be 50m apart where habitat allows (see examples below with red dots). Perimeter traps or bait stations should be 25m apart. This will create a network of traps or bait stations.

Urban golf course, limited habitat.

Scenic reserve, abundant habitat in area.

It is important to consider the ease of checking and maintaining the equipment. Use existing tracks where possible.

When setting up bait stations or traps, look for evidence of rats being present i.e. fresh droppings, rub marks, gnawing, or feeding activity. Pick trap sites that are naturally attractive, such as near good food sources. Rats often nibble on seeds and fruits of native trees including nikau, karaka, taraire and kohekohe. Look out for fallen berries with the outer layer chewed away on the forest floor. Rats prefer areas with water and good food sources. Auckland forests with the large number of different types of fruiting native trees and numerous stream systems are ideal for rats.

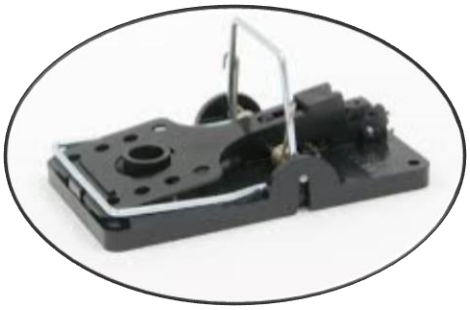
Your bait station set-up will vary. Depending on the project goals, time and resources, a grid may not be an option. Use existing tracks in an area as a guide especially in parks and reserves.

Consider placing extra rat traps or bait stations where:

- There is a particularly heavily fruiting tree that attracts rats, i.e. lots of rat gnawed berries nearby
- You have observed nesting or breeding behaviour in a species you are trying to protect
- There is a tree favoured by native birds, i.e. a taraire tree in which you often see kereru
- There is a confluence where two streams intersect. Be sure to position traps and bait stations so that they are not easily accessible by children or stock, and that they are above high flood water marks. (Bait stations and traps should not be placed in water).

There should be at least one trap or bait station within each rat's home range. Home ranges are generally reported by length. Ship rats have an average range length of 100-200m during the breeding season. Non-breeding ship rats have larger home ranges. Norway rat home ranges are between 218-916m in length.
At high rat densities, trap or bait station spacing may have to be reduced further to maximise control. If you have a large quantity of traps or bait stations, it can help to number each one. This can help to reduce the risk of missing one during checking and allows capture data to be related to each site.

Above: The T-rex rat trap
Below: The Snap-E rat trap



Trapping

In areas with high rat numbers, trapping may be time consuming, expensive and ineffective in actually reducing the rat population, despite plenty of rats being caught in traps. A toxin may have to be used
first to reduce rat numbers. Trapping can then be used to keep rat numbers low.

Commonly used rat traps include the Snap-E and Victor snapback. Kill traps must be set in a tunnel or under a cover.
Trapping should also be pulsed to target control prior & over the bird breeding season.

Rat trapping tips:

- Traps need to be cleared regularly – a trap with a dead rat in it is not available to catch others.
- Regular maintenance of traps is essential, including checking for worn pivots, weakened springs and broken trigger mechanisms.
- Victor snapback traps require periodic retreating with preserving agent.
- When checking Victor snapback traps the trapper should carry spare traps, treadles and pegs. Treadles may be lost when the traps are sprung.
- Traps should be cleaned regularly with a wire brush – remove fur and remains of dead animals.
- Rats are nervous creatures. Ensure rat tunnels have good clearance above the trap
- There should be a 200mm gap between the end of the rat tunnel and the trap treadle to avoid catching kiwi.
- Ensure traps are stable and do not rock around as this will deter rats.

Traps can be deployed in lockable bait stations or tunnels. The tunnel has three functions:

1. orientate the animal relative to the trap,
2. disguise and protect the trap, and
3. keep out non-target species, such as kiwi.

A wooden tunnel box suitable for placing rat traps in.

Tunnels or covers should:

- Be at least 500mm long if accessible from both ends to prevent non-target animals accessing the trap
- Have an entry hole of no more than 45mm x 45mm to exclude non-target animals
- Allow easy access for checking traps
- Be able to be secured to the ground with wire to prevent traps being disturbed and removed by pigs and possums
- Fully enclose the trap and be stable, so the trap cannot be dragged out of the cover
- Keep the traps off the surface of the ground to keep the trap dryer, and extend the life of the trap.

Initially traps should be checked every one-two days. Once catch rate drops (after about 5-10 checks), traps only need to be checked once every two-three weeks. When rat numbers increase, the frequency at which traps are checked will also need to increase.

A Goodnature A24 trap

Goodnature A24self-resetting rat trap

The Goodnature A24 rat (and stoat) trap is powered by a C02 gas canister and can reset itself up to 24 times. Long-life lures have been developed to accompany the trap and ensure rats remain attracted to the trap.
For more information visit: http://www.goodnature.co.nz/products/rat-stoat

Baits and lures

To attract rats into your traps, use highly palatable lures such as chunky peanut butter, peanut butter mixed with rolled oats and white chocolate. These lures have been proven to be very attractive to rats and are easy to use and cheap. Baits or lures may need to be altered over the duration of a control programme in order to attract rats with different preferences.

Always wear gloves when handling rats and rat traps as their urine carries the disease leptospirosis.

Limitations

- Constant re-invasion and rapid breeding means effective long-term control must be ongoing. Rat numbers are likely to return to pre-control densities within months after control stops.
- Pig and possum interference with covers can be a problem.
- Mouse numbers may increase after rat control.

Pulsing with traps

- Trapping is through snap traps (T-Rex or similar) in lockable bait boxes on parks & reserves.
- Trapping will be pulsed four times per year, with each pulse being six weeks long.
- Traps should be checked every one-three days.

Small parks and reserves: ✓

Private property and large parks: ✓

Annual trapping programme for rats																																								
Month	August				September				October				November				December				January				February				March				April				May			
Week	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

Timing of rat control operations

Timing is critical and depends on what is being protected. For species protection, timing is dependent on when the species being protected is most vulnerable. For example, to protect native birds such as kereru or tomtits during the breeding season, rat numbers must be low while the birds are on the nest until the chicks fledge. This is usually from early spring to late summer, but the timing will differ between different species and different localities. To protect invertebrates and lizards, rats should be controlled year-round. Control should be pulsed.

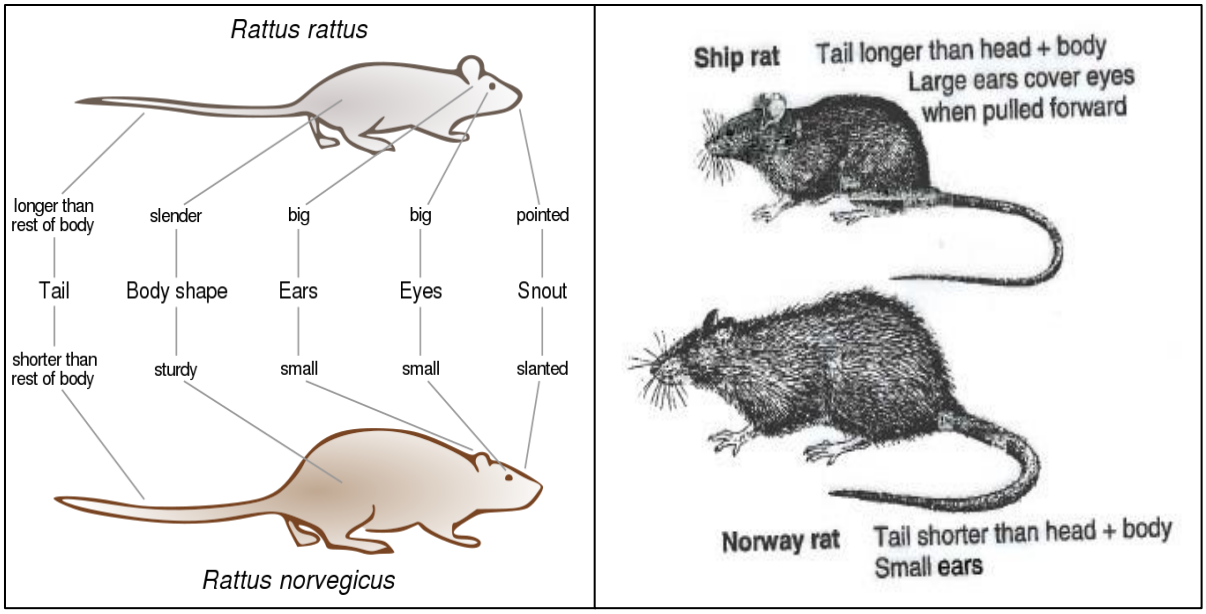
Monitoring

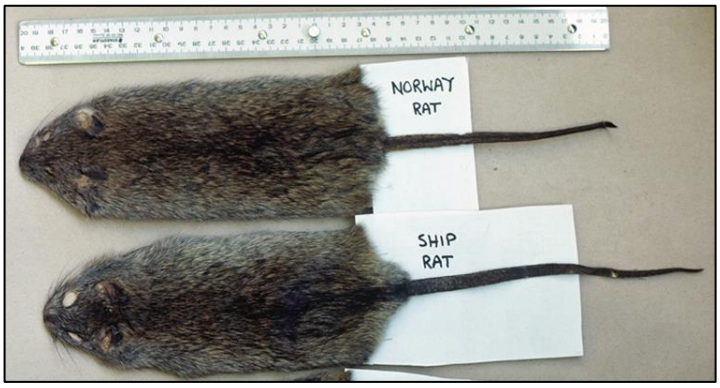
To gauge the success of your rat control, use 'tracking tunnels' before and after the control program.
Record the number trapped or the amount of bait taken.
Observations of rat browse on native fruits such as kohekohe, karaka, taraire and tawa will help to determine if your native forest is recovering.
Regular bird counts can help to monitor bird populations over time (See www.formak.co.nz for more information on monitoring methods).

Monitoring tools for target species

Rats:
Tracking tunnels with inked tracking cards placed in them, left out for one fine night. Each tracking tunnel line is 450m long, with 10 tunnels located every 50m along the line. Each line must be a minimum of 200m apart. Chew cards can also be used at the same spacings.

Monitoring the bait take and trap catches is also a great method to measure the effectiveness of your project. Doing so is less labour intensive because it is just recording what you are doing anyway. In doing so it shows the fluctuations in toxin use or trap catch so your how to plan for the next year.





Above and left: *the difference between ship and Norway rats in tail length and body size*

Bait take and trap catch recording templates

The below are some suggestions of the basic info you should record each time a trap and / or station is checked.

Bait Take Record					
Location					
Person					
Date			***Time***		
Bait name					
Safety issues identified					
		record bait in 1/4 blocks, eg 1 1/4, 1 1/2, etc			
Line #	**Station ID #**	**Estimate how much bait is still in station? (blocks)**	**How much bait did you remove? (blocks)**	**How much bait did you put in? (whole blocks)**	**Other comments eg. birds seen/heard, lizards seen, slug/snail damage, bait station condition**

Trap catch record					
Location					
Person					
Date			***Time***		
Safety issues identified					
Line #	**Trap ID #**	**Has the trap caught anything? (Y/N)**	**Species caught**	**How much bait did you put in? (whole blocks)**	**Other comments eg. Nothing caught but lure gone; notes of trap / station damage etc**

Mice

The impacts of mice on native plants and animals are not as well known, but are potentially serious on small invertebrates (e.g. weevils) and some lizards, and plant germination rates.

Where there is effective predator and rat control, one potential ripple effect is for mice to increase in numbers, so consideration of impacts, monitoring and management is needed.

Control methods for mice are however not perfected and any attempts to control mice should be carefully designed and monitored.

A typical house mouse

Potential control methods include:

- Anticoagulant poisoning, on grids of e.g. 25m x 25m,
- Trapping using covered mouse traps baited with something like peanut butter on grids of e.g. 25m x 25m. This may need to be supplemented with poisoning, e.g. when reinvading numbers build up in late summer-autumn.

Trapping can be used as a monitoring tool. If trapping is also the main control method an alternative trap line should be used to monitor mice.

Due to the increased labour required to control mice, you may consider increased control in particular parts of the project area instead of across the entire area.

The pest animals covered in the full guide are also available as individual chapters:

- **Possums**
- **Mustelids** **(stoats, weasels and ferrets)**
- **Feral cats**
- **Rabbits and hares**

Please contact us at biosecurity@aucklandcouncil.govt.nz for copies of any of the above.

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Find out more: **phone 09 301 0101**
or email **biosecurity@aucklandcouncil.govt.nz**

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