Ulva Island Rat Eradication 2023 Monitoring Plan

Figure 1 Ulva Island in the forground with The Neck in the background. (Photo: Finlay Cox)

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Introduction

Norway rats (R*attus norvegicus*) re-established on Ulva Island (266ha), in Paterson Inlet, Rakiura/Stewart Island following reinvasion in 2021 with the incursion response abandoned in May 2022. Rats were first eradicated from Ulva Island in 1996 by use of bait stations and again in 2011 by aerial baiting (Murray, Ware, Horn, & McRitchie, 2022).

Norway rats are opportunistic omnivores with studies identifying seeds and fruits, invertebrates, eggs, and birds as being part of their diet in New Zealand. Invertebrates on Ulva Island thrived in the absence of rats, which had flow on benefits to the rest of the ecosystem. As Norway rats are predominantly ground dwelling animals, they pose the greatest risk to native species that inhabit this space (Russel & Innes, 2021). On Ulva Island this includes South Island Saddleback/Tīeke (*Philesturnus carunculatus*) and Red-crowned Kākāriki (*Cyanoramphus novaezelandiae)* both of which are threatened species (Peter & Cowley, 2006).

Other rare species that inhabit Ulva Island are Mohua/Yellowhead (*Mohua ochrocephala*), Stewart Island robin (*Petroica australis rakiura*), and Stewart Island weka (*Gallirallus australis scotti*). This biodiversity is represented at an accessible location to showcase local conservation values. The site is significant for the local economy as a key visitor site for tourists. There are also several threatened species that, if management of Ulva Island was reliable, could be translocated to the island for species security (Murray et al., 2022).

Purpose

The purpose of this plan is to identify and prioritise key result and outcome questions for the Ulva Island Norway rat eradication, describe how those questions will be answered, by who and within what timeframes. The target audiences are the Operations Manager Rakiura, Senior Ranger Biodiversity Rakiura, Te Whaka ā Te Wera Paterson Inlet Mātāitai Committee, Kaitiaki Roopu, Ulva Island Trust, and DOC staff and contractors who oversee and will carry out the work.

Scope

In scope

Included in the scope of this plan is monitoring of rats to confirm eradication success; measuring the short-term adverse effects on native terrestrial bird species; monitoring for brodifacoum residue in the marine environment; measuring the medium-term change in abundance on native bird species; and understanding how Ulva Islands pest-free status impacts the visitor experience.

Standard monthly biosecurity surveillance and reporting beyond the result monitoring period, is outside of scope of this plan and remains the responsibility of the Rakiura district.

Out of scope

The plan excludes effects on introduced species; input hours such as money spent, or number of hours worked; operational monitoring including bait spread and bait take; and outcomes not related to the eradication project.

Objectives and outcomes

Table 1

Area	Objective	Output	Outcome
Biodiversity	1. Norway rats are eradicated from Ulva Island	Successful completion of baiting operation to eradicate rats from Ulva Island. Native wildlife is released from predator pressure	1.1 Ulva Island's pest free status is restored providing continued protection for its native species, habitats, and ecosystems. 1.2 Operational impacts are broadly understood. 1.3. Vulnerable wildlife recovers. 1.4 Visitors enjoy an example of a healthy functioning lowland forest.
Biosecurity	2. Ulva Island remains free of pests	Updated biosecurity plan, improved surveillance, and response capability	2.1 Reinvasions are managed more efficiently and prevent pest populations establishing, negating the need for any further eradications. 2.2 Threatened species are managed for long-term persistence; social and economic benefits are sustained.
Iwi	3. Treaty of Waitangi obligations are met, and positive relationships are built.	Iwi report on positive engagement	3.1 Whanau, hapu and iwi are engaged and can carry out their responsibilities as kaitiaki of natural and cultural resources
Community	4. Community is informed; supports eradication and ongoing biosecurity	Community response is reported	4.1 DOC and community cooperate to sustain the outcomes.
Knowledge	5. Lessons are learnt for management of future island eradications	Project is documented	5.1 Capacity and knowledge are increased and shared.

Table 2

Outcome monitoring question	Indicator	Method	Timeframe
1.1 Have Norway rats been eradicated from Ulva Island?	Absence of rats from intensive searching within 4 months after eradication.	Sign searching with rodent detection dogs. Surveillance using 301 traps and 56 trail cameras.	2 days searching in November and 6 days in December 2023. Monthly surveillance checks after baiting (August to December 2023)
1.2 Did the eradication have short term adverse effects on native bird populations?	Vulnerable native bird species – weka and robins.	Distance sampling along 12.5km of transects plus evening call counts for weka to compare population indices before and after eradication as a function of time.	Immediately prior to the eradication and repeated 6 weeks after baiting; building on baseline date from 2017 – 2020 and 2022; quarterly for 2 years.
1.2 How does brodifacoum persist in the marine environment post-eradication?	Commonly harvested marine species (blue cod, mussels, limpets, trumpeter, pāua, kina).	Sample marine species adjacent to the coast of Ulva and near Crayfish and Groper Islands and assay for brodifacoum.	Sampling at 10 days, 6 weeks, 21 weeks and 8 months after second bait operation.
1.3 Have vulnerable native species benefited from the eradication of Norway rats?	Change in abundance of tīeke, robin and kākāriki over time.	Distance sampling along 12.5km of transects to compare population indices before and after eradication as a function of time.	Annual sampling between years 3 and 5 post-baiting adds to the dataset.
1.4 Do visitors value the pest-free island status?	Positive visitor response.	Visitor surveys	Survey visitors during the summer season Report annually in BPRS
2.1 Has Ulva Island remained rat free? 2.1 Has incursion management been more effective?	Rats have not re-established. Incursions events are restricted to individual animals.	Surveillance checks (traps, cameras, rodent detection dogs). Absence of large-scale responses due to rats breeding; auditing response efforts and compare to incursion database.	Monthly for devices year-round and monthly for dogs between November and April. Annual review.
2.2 Has improved biosecurity enabled more threatened species management on Ulva Island?	Number of threatened and locally important native species.	Report on relevant species population health through distance sampling indices; and any new translocations.	Report annually in BPRS.

2.3 Have economic and social benefits sustained?	Visitor numbers; revenue from concessions.	Collate concessions fees and visitor numbers and included in reporting.	
3.1 Do iwi representatives feel engaged?	Project involvement and knowledge – Te Whaka ā Te Wera Paterson Inlet Matāitai Committee; Kaitiaki Roopu; individuals.	Request feedback on involvement in the project and include in project report. Report on annual involvement ongoing	Post operational report. Report annually in BPRS.
4.1 Do community representatives and interested parties feel engaged?	Project involvement and knowledge – project stakeholder list.	Request feedback on involvement in the project and include in project report. Report on annual involvement ongoing.	Post operational report. Report annually in BPRS.
5.1 Were lessons captured and shared?	Project report; updated biosecurity plan.	Complete project debrief and share project report.	Post – operation by November 2023

Resourcing

Calendar of monitoring activities

Table 3 is an indication of the monitoring activities required in the first-year post eradication. Of note is the absence of trap and trail camera networks, and rodent detection dog checks post December 2023 as this is covered by the biosecurity plan (DOC-7306734) (Carter, 2023).

The responsibility for the activities in this monitoring plan will be handed over to the Rakiura Operations Team in June 2024.

Table 3

Year	Month	Task	Outcome	Who	Time Resource
2023	June	Pre-eradication bird monitoring	1.2 1.3	DOC Biodiversity Monitoring Team (bird ID skills)	6 person days
	August	Brodifacoum residue sample collection – Fishing and diving	1.2	DOC Rakiura Operations team (Diver required) Hananui	1 day x 5 people
		Trail camera checks	1.1	DOC Rakiura Operations team	3.5 person days
		Analysis of trail camera footage	1.1	DOC Rakiura Operations team with NET support	1 person day

2023		Coastal trap checks	1.1	DOC Rakiura Operations team (Skipper required)	10 person days
		Inland and perimeter trap checks	1.1	DOC Rakiura Operations team	4 person days
	September	Brodifacoum residue sample collection – Fishing and diving	1.2	DOC Rakiura Operations team (Diver required) Hananui	1 day x 5 people
		Bird monitoring	1.2 1.3	Ulva Island Trust	N/A
		Trail camera checks	1.1	DOC Rakiura Operations team	3.5 person days
		Analysis of trail camera footage	1.1	DOC Rakiura Operations team with NET support	1 person day
		Coastal trap checks	1.1	DOC Rakiura Operations team (skipper required)	10 person days
		Inland and perimeter trap checks	1.1	DOC Rakiura Operations team	4 person days
	October	Analysis of bird distance sampling data	1.2 1.3	9(2)(g)(ii) [redacted] (DOC Technical Advisor)	0.5 person days
		Trail camera checks	1.1	DOC Rakiura Operations team	3.5 person days
		Analysis of trail camera footage	1.1	DOC Rakiura Operations team with NET support	1 person day
		Coastal trap checks	1.1	DOC Rakiura Operations team (skipper required)	10 person days
		Inland and perimeter trap checks	1.1	DOC Rakiura Operations team	4 person days
	November	Rodent detection dog checks	1.1	Sandy King & dog Gadget	2 person days
		Trail camera checks	1.1	DOC Rakiura Operations team	3.5 person days
		Analysis of trail camera footage	1.1	DOC Rakiura Operations team with NET support	1 person day
		Coastal trap checks	1.1	DOC Rakiura Operations team (Skipper required)	10 person days
		Inland and perimeter trap checks	1.1	DOC Rakiura Operations team	4 person days
		Indicated start of the Visitor survey*	1.4	Senior Ranger, Heritage & Visitors, Rakiura Operations team Social Science and Monitoring Team	

2023	December	Brodifacoum residue sample collection – Fishing and diving	1.2	DOC Rakiura Operations team (Diver required) Hananui	1 day x 5 people
		Rodent detection dog checks	1.1	Rodent detection dog handler Skipper support	6 person days + skipper
		Bird monitoring	1.2 1.3	DOC Biodiversity Monitoring Team (bird ID skills)	6 person days
		Trail camera checks	1.1	DOC Rakiura Operations team	3.5 person days
		Analysis of trail camera footage	1.1	DOC Rakiura Operations team with NET support	1 person days
	December	Coastal trap checks	1.1	DOC Rakiura Operations team (Skipper required)	10 person days
		Inland and perimeter trap checks	1.1	DOC Rakiura Operations team	4 person days
2024	March	Brodifacoum residue sample collection – Fishing and diving	1.2	DOC Rakiura Operations team (Diver required) Hananui	1 day x 4 people
		Bird monitoring	1.2 1.3	DOC Biodiversity Monitoring Team (bird ID skills)	6 person days
	June	Bird monitoring	1.2 1.3	DOC Biodiversity Monitoring Team (bird ID skills)	6 person days
		Outcome monitoring report	1.1 1.2 1.3 1.4	DOC National Eradication Team and DOC Rakiura Operations Team	

*Time frames for the visitor survey to be determined by Rakiura team and Social Science and Monitoring Team

The timeframes to assess the outcomes are variable. Monitoring to assess the adverse effects on populations of weka and robin are relatively short-term (within a few months) but the benefits to saddleback being relatively long-term (several years). The persistence of brodifacoum in the marine environment is predicted to follow a similar pattern to the outcomes of monitoring undertaken in 2011 see (Masuda, Fisher, & Beaven, 2014).

Outcome Monitoring

1.1 Have Norway rats been eradicated from Ulva Island?

Rationale

It is important to ascertain whether the eradication was successful for future management of the site, to learn lessons for future eradications and to report to stakeholders.

Outcome target

Absence of Norway rats on Ulva Island by 4 months (December 2023) after the eradication

Experimental design

Question 1. Have Norway rats been eradicated from Ulva Island?

Best practice for rodent eradications is to wait at least two breeding seasons before undertaking extra monitoring effort to determine success. This is to allow for surviving rats to breed to detectable levels (Broome, Golding, Brown, Corson, Bell, 2017). Norway rats are prolific breeders with adult females, on average, producing five litters of 6-8 per year depending on environmental conditions. They can reach high densities in the absence of predators, which is often the case on offshore islands including Ulva Island (Russel & Innes, 2021). For this operation the success of the eradication will be determined in December 2023 – 4 months after the baiting. This could be considered relatively early post-eradication, however, because the risk of another incursion on Ulva Island is high, we want to be able to ascertain whether any Norway rats detected are a new incursion or survivors from the eradication.

To balance this, intensive effort will be undertaken during the four months post-operation (August to December). The biosecurity network on Ulva Island has been overhauled with 56 trail cameras installed around the coast and a network of 301 traps (DOC200 single and double sets) across the island as shown in figure 2 (Department of Conservation, 2023). Additionally, comprehensive searching by rodent detection dogs will be done in November and December 2023. If the trap checks, trail camera footage, and rodent detection dogs show no sign of rats on Ulva Island through to December 2023 then the eradication can be considered successful.

Post December 2023 monthly checks of the trail camera and trap networks will continue along with rodent detection dog checks November to April. However, they will be covered by the Ulva Island Biosecurity Plan (DOC-7306734) (Carter, 2023). A bait station network has also been installed to allow for a rapid response to future island incursions.

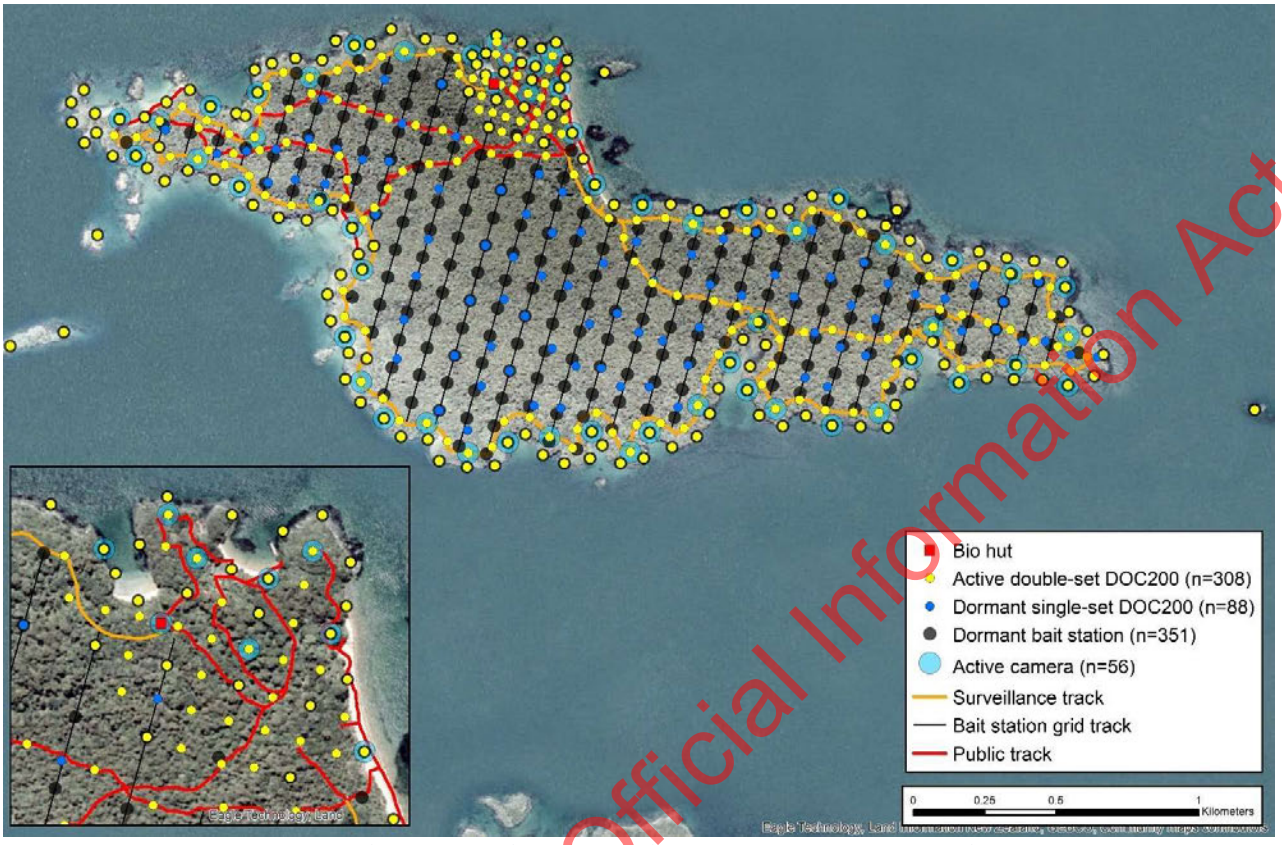

Figure 2: Planned biosecurity network for Ulva Island (Derpatment of Conservation, 2023; Carter. 2023)

Sampling regime

Intensive surveillance will be undertaken for the four months following the eradication to determine the success of the operation in December 2023. This will be done by rodent detection dog checks in November and December and trail camera and trap network checks monthly from August to December.

The trap network is split into three parts – coastal, perimeter and inland. The coastal tracks will take approximately 10 person days and require skipper support, the inland and perimeter tracks will take 4 person days combined.

The trail camera network will require fresh batteries and SD cards monthly which is predicted to take 3.5 person days. Additionally, the footage will need to be reviewed which could take up to 4.5 person days if done manually, however with the assistance of Megadetector removing empty images the time required will significantly reduce. The alternative is for the footage analysis to be outsourced to Evorta.

The rodent detection dog checks in November are for 2 person days and in December for 6 person days. A more intensive effort is planned for December to gain a greater level of assurance that we are detecting rats if they are present.

Who and when

The Rakiura DOC team will be responsible for the biosecurity network so will undertake the monthly trail camera and trap checks. The National Eradication Team can support the Rakiura DOC team in analysing the trail camera footage using the software Megadetector.

9(2)(g)(ii) with rodent detection dog Gadget will undertake the predator dog detection work in November with assistance from another detection dog and handler in December.

1.2 Did the eradication have short term adverse effects on native bird populations?

Rationale

It is important to quantify the extent of bait related non-target species mortality as much as possible to understand the impacts of this operation and increase understanding for future eradications. Ground feeding birds such as Stewart Island robins (*Petroica australis rakiura*) and Stewart Island weka (*Gallirallus australis scotti*) are most at risk (Masuda & Jamieson, 2013).

Results from the Ulva Island eradication in 2011 show the observation rate of weka declined 51% and the robin population reduced 31.5 % following the eradication (Masuda et al., 2013). The weka recovery group have advised that up to 90% of weka could be killed by this repeat eradication (Murray et al., 2022; Masuda et al., 2013). However, Stewart Island weka are well represented on other islands around Rakiura (Trewick, Pilkington, Shepherd, Gibb, & Morgan-Richards, 2017). A translocation of weka from Bench Island was done following the 2011 eradication, however the decision to do this was made in conjunction with the weka eradication of Bench (Beaven, 2012). The weka on Bench Island are genetically limited so it is not considered a good population source. Given that the haplotype of Stewart Island weka that is present on Ulva Island is found in weka populations on other nearby islands it is proposed that no pre-eradication mitigations are taken (Trewick et. al, 2017). This may be reassessed with further technical advice once we have the monitoring results, as a translocation could be undertaken.

Outcome target

Abundance of weka and robins compared immediately pre-eradication to those taken 6 weeks post eradication.

Experimental design

Question 1. *Were large population declines of weka detectable on Ulva Island which could be attributed to brodifacoum poisoning?*

Question 2. *Were large population declines of robins detectable on Ulva Island which could be attributed to brodifacoum poisoning?*

Question 3. *At what percentage of weka population decline do we need to introduce new genetics into the Ulva Island population?*

We expect the adverse impacts of the eradication on weka and robin populations to follow a similar trajectory as the 2011 Ulva eradication documented in Masuda (et al., 2013). The experimental design will again compare population indices for weka and robins on Ulva Island before and after the eradication as a function of time. Effects of the toxin are expected to be quickly apparent in a susceptible species. In the 2011 Ulva Island eradication the decline in weka and robin abundance was high, and we predict this will be the case from this eradication also.

The Ulva Island Trust contracted 9(2)(g)(ii) from 2017 to 2020 and 9(2)(g)(ii) for 2022 to conduct distance sampling to get density estimates for birds on Ulva Island, including weka and robins. The results for this are in figure 3 (9(2)(g)(ii), 2022; 9(2)(g)(ii), 2020). This methodology will be

replicated immediately prior to the eradication and then quarterly in September, December, March, and June for the following two years to understand any changes in the population densities.

However, for weka, distance sampling only detects non-territorial birds and so often excludes pairs. To gain a wider understanding of the changes in abundance of weka on Ulva Island, evening call counts will be conducted to monitor 'site-fixed' individuals. Any single call count can pick up between 35% and 95% of the weka that are within the calling range of that site (Beauchamp, 2017). It hasn't been used for Stewart Island Weka population monitoring before so it is unknown how good an indicator it will be, however it has been used for both North and South Island populations.

Answering question 3 is about determining a trigger point for future action. DOC's Weka Recovery Group has advised that up to 90% of weka could be killed by this repeat operation. Once we understand the weka population change from pre to post eradication further technical advice will be sought to determine whether a translocation should be undertaken to reduce the risk of a genetic bottleneck.

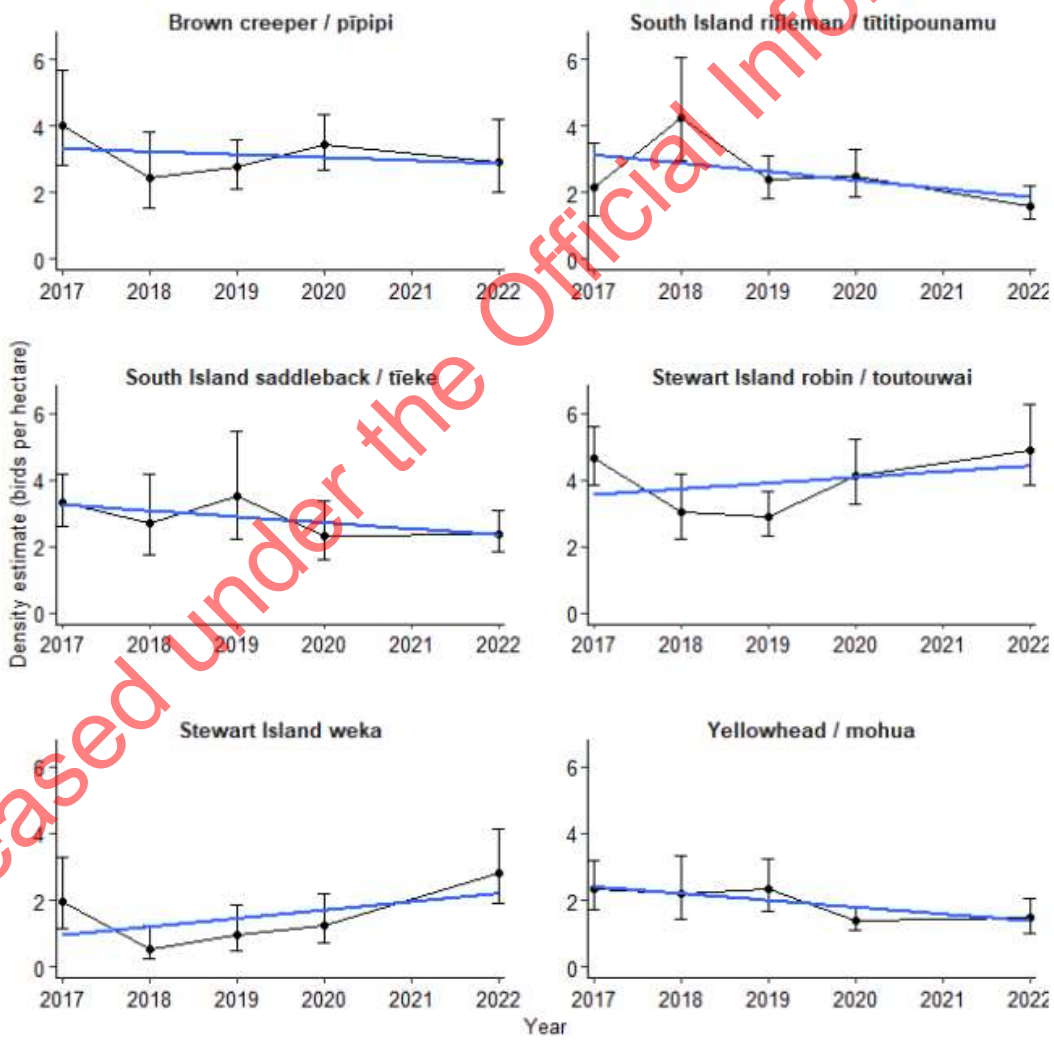

Figure 3 Trends in bird density per hectare 2017-2022. Blue line indicates trend derived from linear model (Urtica Ecology, 2022).

Monitoring techniques and analysis tools

Population indices for weka and robins are measured using distance sampling technique along fixed transect lines (Buckland, Anderson, Burnham, Laake, Borchers, & Thomas, 2004). Distance sampling is conducted by field staff traversing established transects on foot at about 1km/hr, guided by GPS. Each individual bird or group of birds (of the same species) seen are recorded in a data sheet along with their perpendicular distance from the nearest point on the transect line. The distance is measured using a laser range finder (to the nearest metre). The start and finish times are recorded for each transect along with other information including temperature, wind, precipitation and transect length (m). For Ulva Island, based on the previous monitoring work it is estimated to be between 3 to 6 people days to cover all transects on the island once.

The computer software 'Distance' (version 7.5) was used in 2022 to analyse the data and was done by 9(2)(g)(ii) (DOC Technical Advisor) on behalf of 9(2)(g)(ii). This was a similar methodology to what was done for the 2017-2020 monitoring and is described in (9(2)(g)(ii), 2020). The task specification can be found DOC-7387953.

Additionally, population indices for weka are measured using a call count methodology (Beauchamp, 2023). It provides data about the location of adult 'site-fixed' weka.

Sampling regime

Distance sampling is conducted along 18 parallel transects 200 metres apart that range from 105 metres to 1400 metres in length, with a total combined length of 12.5km (figure 1). These are the same transects used in the distance sampling done by 9(2)(g)(ii) and 9(2)(g)(ii) to allow for data comparison. The distance to an individual bird or group of birds (of the same species) is measured at 90° to the transect line. The number of individuals in the cluster is also to be recorded. Metadata is also recorded including weather variables and start and finish times. Refer to task specification (DOC-7387953) for further detail.

For the weka call counts field staff go to an assigned GPS location. Counts are for 1.5 hours, starting 30 minutes before sunset. Only those weka that can be accurately assigned a location are recorded.

Who and when

The pre-eradication monitoring will be done in June 2023 by a team of three from DOC's Biodiversity Monitoring Team who are qualified in bird identification. The monitoring will then be repeated quarterly post eradication in September, December, March, and June for 2 years following the eradication. Three of these measures (December, March, and June) will be done again by DOC's Biodiversity Monitoring Team with the September measure being contracted by Ulva Island Trust for continuation of their dataset.

The monitoring needs to be done in good weather with minimal wind.

9(2)(g)(ii) has offered to do the data analysis again.

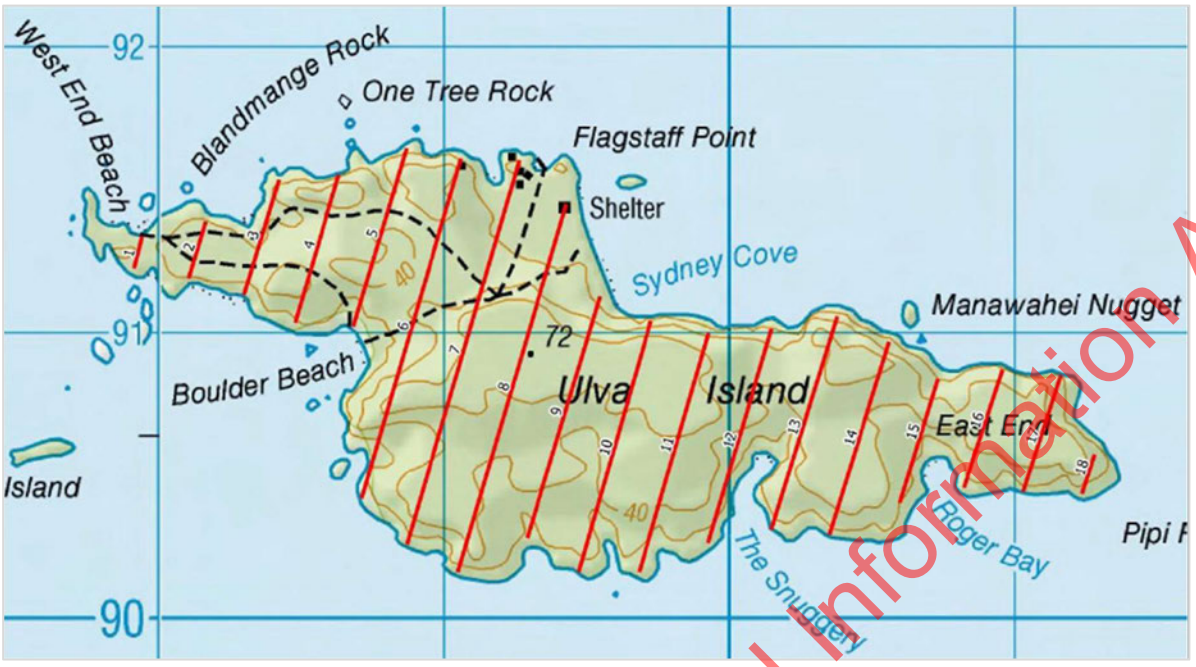

Figure 4: Approximate location of transect lines, Ulva Island (Broekema, 2020).

Translocation requirements

The translocation process is outlined on https://www.doc.govt.nz/translocation-forms. It is a two-step process that takes approximately 2 months for permission to be granted.

1.2 How does brodifacoum persist in the marine environment post-eradication?

Rationale

It is important to understand the persistence of brodifacoum in the marine environment to inform the rāhui which is to be put in place to mitigate the risk of brodifacoum to human health and to create a wider understanding of the hydrodynamics of bait once they enter the water column.

Outcome target

The absence of brodifacoum in marine samples collected 8 months after the second bait operation.

Experimental design

Question 1. *For how long does brodifacoum persist in the marine environment after eradication?*

Question 2. *Which species should we sample to understand the persistence of brodifacoum in the marine environment?*

Question 3. *How do the bait particles behave once they enter the water column?*

Experimental design is based on similar work done for the 2011 eradication (Masuda et al., 2015). Monitoring of the marine environment in 2011 detected residual concentrations of brodifacoum in blue cod (*Parapercis colias*), mussels (*Mytilus edulis*), and limpets (*Cellana ornate*). Blue cod livers were tested separately to the muscle tissue, with the livers testing positive for brodifacoum residual but not the muscle tissue. Sampling was undertaken 10, 44, 143, and 241 days following the second bait operation. However,

species were only sampled if they tested positive at the previous time point. The exception to this was for mussels which tested negative for brodifacoum residual at 44 days but then tested positive at 143 days. It is unclear as to why they were tested at 143 days when the samples were negative previously. All samples tested clear of brodifacoum residual at 241 days after the second bait operation. Samples were collected from three areas around Ulva Island shown in figure 4.

For this operation brodifacoum residual testing will be done for the three species that tested positive in 2011 and those species regularly consumed by humans in Paterson inlet (as agreed with Te Whaka ā Te Wera Paterson Inlet Matāitai Committee) – blue cod (*Parapercis colias*), mussels (*Mytilus edulis*), limpets (*Cellana ornate*), pāua (*Haliotis iris*), kina (*Evechinus chloroticus*), and trumpeter (*Latris lineata*). For blue cod the livers will again be tested separately to the flesh. To get consistency with the monitoring work undertaken in 2011 sampling will be undertaken at the same time points described from the date of the second bait operation – 10 days, 6 weeks, 21 weeks, and 8 months with additional sampling done until all species test negative. This time however, sampling will be done for all species at all time points to gain a better understanding of the persistence of brodifacoum in the marine environment. When the rahui is lifted there needs to be confidence that all species are clear of brodifacoum residual. Samples will be collected in the same three areas shown in figure 4 which go out to 100m from the coastline of Ulva. This is the area where there will be the greatest concentration of bait entering the water. No samples will be collected in the Ulva Island marine reserve at the request of the Te Whaka ā Te Wera Paterson Inlet Matāitai Committee.

The fish will be dissected with only the liver and subsamples of the muscle tissue (c. 10g) collected for testing. For shellfish the shell is to be removed with all the soft tissue remaining intact. Individuals of the same species and sampling date will be combined and homogenised to make a composite sample to prepare for analysis. This is to maximize the number of time points and species against the cost of analysis.

To answer question 3, additional samples will be taken on the North-Eastern coast of Crayfish and Groper Islands. This is to gain a better understanding of how bait particles behave once they enter the water column. Hydrodynamic modelling undertaken by ADS Environmental (2023) has indicated that Crayfish and Grouper Islands are locations that bait particles are likely to track towards when entering the water near Pipi Rocks (figure 5). Samples of blue cod and mussels will be collected out to 100m offshore from these islands at the 10 day and 6-week time points with additional sampling done if these have positive results for brodifacoum residue. Individuals of the same species caught on the same day will be homogenised to be made into one composite sample for brodifacoum residue testing.

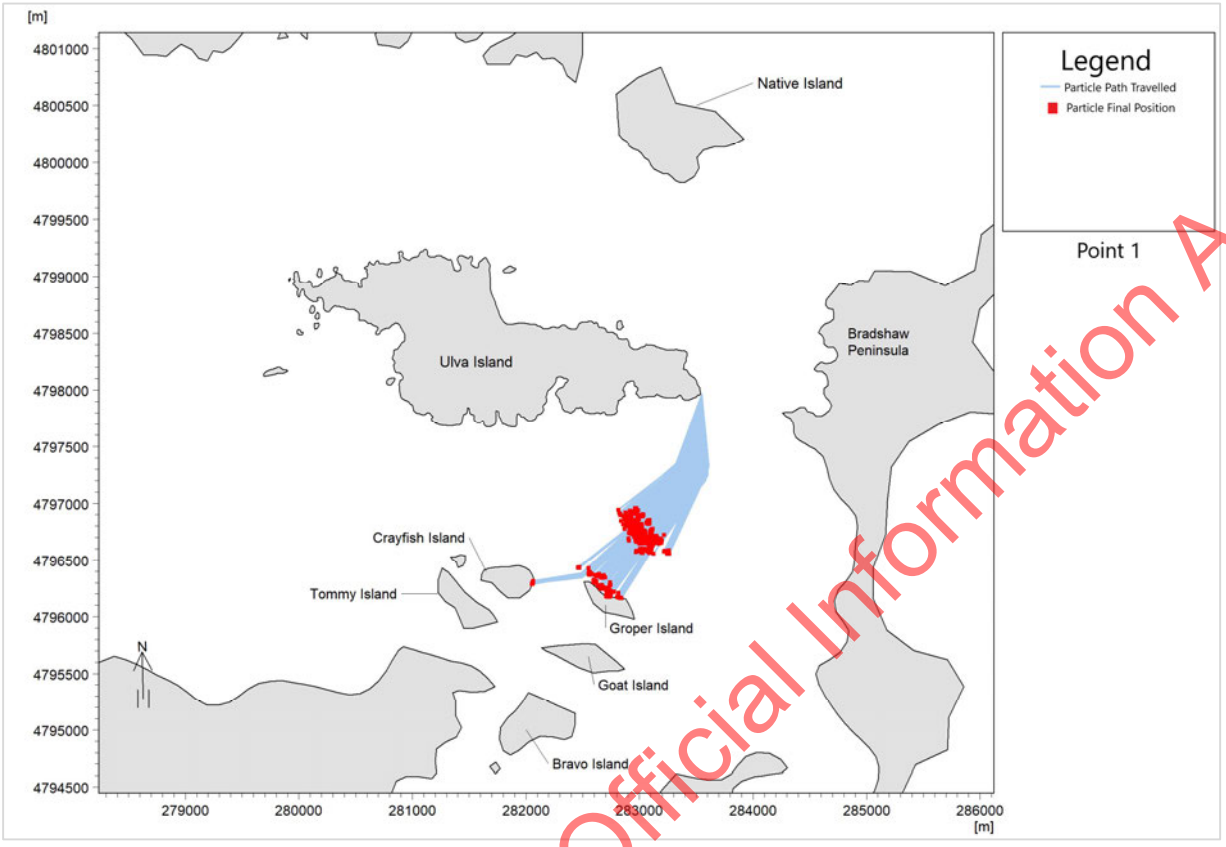

Figure 5 Hydrodynamic modelling of bait particles when entering the water near Pipi Rocks (ADS Environmental, 2023)

Monitoring techniques and analysis tools

Brodifacoum residual testing will be done by the Toxicology Laboratory at Landcare Research in Lincoln. Individuals of the same species caught on the same day will be homogenised to be made into one composite sample for each of the three islands - adjacent to Ulva Island, Groper Island, and Crayfish Island. All samples will then be tested using high performance liquid chromatography with fluorescence detection and a post-column pH switching technique as described by (Primus, Wright, & Fisher, 2005).

Samples will be retained in case further resolution (individual or site-based sample analysis) is required.

Sampling regime

Ulva Island sites

At each time point, samples will ideally be collected in equal proportions by species at the three collection areas around Ulva Island (figure 4). However, if the ideal amount cannot be collected at any of the three Ulva Island collection areas (e.g. 10 blue cod per area) then additional samples can be collected at the other two sites.

The ideal number of samples per species collected at each time point is in table 2 along with the method of collection. These are a target with the actual number and species determined by what can be collected on the day.

GIS tracks will be recorded of the vessel when lines are in the water.

Fish species will be collected by handline fishing and sedentary species will be collected by diving. At the request of the Te Whaka ā Te Wera Paterson Inlet Matāitai Committee fish samples will be collected irrespective of their size so that fish will not be caught and returned, this means fish under the legal-size limit will be caught. This requires a 'Fisheries Special Permit' from the Ministry of Primary Industries. Fish will be killed by cervical dislocation and shellfish by freezing. All samples will need to be frozen within 24 hours of collection and then sent to the Toxicology Laboratory at Landcare Research in Lincoln.

Table 4 Sample details for each time point

Species	Method of collection	Target no. samples for each site	Total target number sampled
Blue cod	Handline fishing	10	30
Trumpeter	Handline fishing	5	15
Pāua	Diving	5	15
Kina	Diving	5	15
Mussels	Diving	10	30
Limpets	Diving	10	30

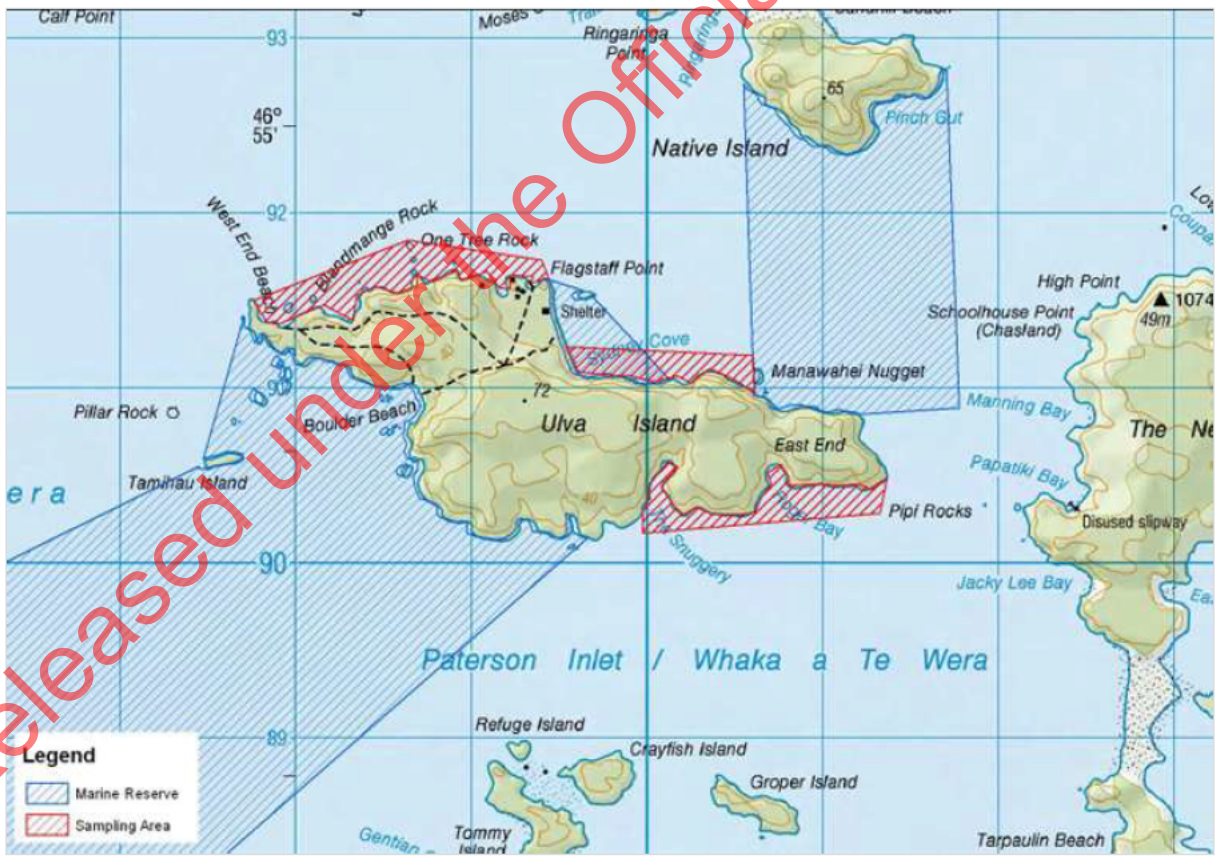

Figure 6: Sampling areas for marine monitoring Ulva Island (Roberts, 2011).

Groper and Crayfish Island sites

Samples of blue cod and mussels will be collected out to 100m offshore from these islands at the 10 day and 6 week time points with additional sampling done if these have positive results for brodifacoum residue.

GIS tracks will be recorded of the vessel when lines are in the water.

Blue cod will be collected by handline fishing and mussels will be collected by diving. For each species five individuals will be collected at each time point and location. Blue cod will be killed by cervical dislocation and mussels by freezing. All samples will need to be dissected, then frozen within 24 hours of collection and sent to the Toxicology Laboratory at Landcare Research in Lincoln.

Fisheries Special Permit

Ulva island sits within Paterson Inlet which is protected by the Te Whaka ā Te Wera Mātaitai Reserve. Additionally, on the North-wast and South-west of Ulva Island is the Ulva Island/Te Wharawhara Marine Reserve in which all fishing is totally prohibited. To be able to collect samples in these areas a 'Fisheries special permit' must be obtained from the Ministry of Primary Industries (MPI). This also allows for the collection of undersize fish and shellfish. DOC currently has a 'Fisheries special permit' (SP-731-2), an amendment needs to be obtained to include this monitoring work. As part of this, MPI require evidence of DOC communicating with the Te Whaka ā Te Wera Mātaitai Committee. Details for this process can be found https://www.mpi.govt.nz/fishing-aquaculture/fisheries-management/how-to-apply-fisheries-special-permit/

This will need to be carried on the vessel when undertaking the sampling work.

Who and when

The collection of samples will be undertaken by the Local Rakiura DOC team and will start 10 days after the second baiting operation. The specific dates will be confirmed once the operation is completed in July/August 2023 but those in table 3 are an indication based on the second bait operation happening on the 26th of July (10 days after the first).

Table 5 sampling time points with approximate calendar dates

Sampling Time points (From second bait operation)	Approximate date for collection
10 days	5th August 2023
6 weeks	16th September 2023
21 weeks	30th December 2023
8 months	26th March 2024

1.3 Have vulnerable native species benefited from the eradication of Norway rats?

Rationale

South Island Saddleback/Tīeke (*Philesturnus carunculatus*) are prone to predation from introduced mammalian predators due to them nesting and foraging near the ground. Translocation of tīeke to Kapiti Island pūriro to the eradication of rats in 1998 often failed due to the presence of Norway rats for these reasons (Lovegrove, 1992). Their vulnerability to mammalian predators is also well documented by the

invasion of ship rats to Big South Cape in 1962 and the rapid decline in the South Island tīeke population down to 36 individuals. All remaining populations inhabit pest free Islands and sanctuaries. Nowdays one of the main threats to the South Island tīeke population is the reinvasion of introduced rodents and mustelids, including Norway rats, to the pest free places they inhabit like Ulva Island (Peter & Cowling, 2006).

Outcome target

An increase in the abundance of South Island tīeke from pre-operation to 5 years post eradication.

Experimental design

Question 1. Have Tieke increased in abundance on Ulva Island following the eradication of Norway rats?

Experimental design will compare abundance and density measurements taken pre-eradication to those taken 5 years after the operation to understand change over time. It will use the distance sampling methodology used to do annual monitoring on Ulva Island from 2017 to 2020 by 9(2)(g)(ii) and 2022 by 9(2)(g)(ii) on behalf of the 9(2)(g)(ii).

The sampling will be done in conjunction with that done for monitoring outcome 1.2 to answer the short term adverse effects on vulnerable native species.

Monitoring techniques and analysis tools

Population indices for saddleback are measured using distance sampling technique along fixed transect lines (Buckland et al. 2004). Distance sampling is conducted by field staff traversing established transects on foot at about 1km/hr, guided by GPS. Each individual bird or group of birds (of the same species) seen are recorded in a data sheet along with their perpendicular distance from the nearest point on the transect line. The distance is measured using a laser range finder (to the nearest metre). The start and finish times are recorded for each transect along with other information including temperature, wind, precipitation and transect length (m). For Ulva Island, based on the previous monitoring work it is estimated to be between 3 to 6 people days to cover all transects on the island once.

The computer software 'Distance' (version 7.5) was used in 2022 to analyse the data and was done by 9(2)(g)(ii) (DOC Technical Advisor) on behalf of 9(2)(g)(ii). This was a similar methodology to what was done for the 2017-2020 monitoring and is described in (9(2)(g)(ii), 2020).

Sampling regime

Distance sampling is conducted along 18 parallel transects 200 metres apart that range from 105 metres to 1400 metres in length, with a total combined length of 12.5km (figure 1). These are the same transects used in the distance sampling done by 9(2)(g)(ii) and 9(2)(g)(ii) to allow for data comparison. The distance to an individual bird or group of birds (of the same species) is measured at 90° to the transect line. The number of individuals in the cluster is also to be recorded. Metadata is also recorded including weather variables and start and finish times. Refer to task specification DOC-7387953.

Who and when

The pre-eradication monitoring will be done in June 2023 by a team of three from DOC's Biodiversity Monitoring Team who are qualified in bird identification. The monitoring will then be repeated quarterly post eradication in September, December, March, and June for 2 years and then annually for years 3 to 5

following the eradication. Three of these measures (December, March and June) will be done again by DOC's Biodiversity Monitoring Team with the September measure being contracted by Ulva Island Trust for continuation of their dataset.

The monitoring needs to be done in good weather with minimal wind.

9(2)(g)(ii) has offered to the data analysis again.

1.4 Do visitors value the pest-free island status?

Rationale

Ulva Island is an important island open sanctuary for the local Rakiura economy as a key site for tourism. It is an accessible location that showcases numerous threatened flora and fauna species. It is important that visitors value the pest-free environment of Ulva Island as they play a key role in Ulva Island biosecurity which is part of the island remaining free of invasive fauna and flora.

Outcome target

Visitors continue to value the pest-free experience with opportunities to encounter rare New Zealand fauna with 60% of survey respondents choosing it as one of the 5 main reasons they visited the island for the 2023/24 survey.

Experimental design

Question 1. *Do visitors value the pest-free island status?*

Question 2. *Did visitors have a positive experience on Ulva Island?*

A pilot study was conducted on Ulva Island from 1 March to 30 May 2022 to monitor visitor use and experience on the island. It was developed by the Department of Conservation's Social Research Team. There was the intention of repeating the survey annually over a full season, however this was put on hold due to the Norway rat incursion. In the survey question 12 asks what visitors' main reasons for visiting Ulva Island were. The two main reasons selected where 'to encounter rare New Zealand birds' (90.2% of respondents) and 'to experience a pest-free island sanctuary' (58.8% of respondents) as shown in figure 7 (DOC Social Research Team, 2022). These two answers relate directly to understanding the importance of the pest-free status and the benefits it provides to visitors' decisions for going to Ulva Island.

Continuing this survey for an entire summer season annually will create a greater understanding of the visitor experience regarding the importance of the pest-free status of Ulva Island. It will be of particular importance when it comes to future management actions.

Sampling regime

Respondents were recruited via a QR code displayed at the departure points on Ulva Island/Te Wharawhara and Stewart Island/Rakiura, and at the visitor centre in Halfmoon Bay, inviting visitors to complete the survey after their visit. The survey target population comprises all visitors to Ulva Island/Te Wharawhara. The sample frame is all visitors who encounter the QR code, and the final sample is self-selected. An incentive is provided for visitors to complete the survey. The results in this report have not been weighted to adjust for the non-random nature of the sample (DOC Social Research Team, 2022).

Who and when

Senior Ranger, Heritage and Visitors from the Rakiura Operations team with assistance from the Social Science and Monitoring Team in the Monitoring and Evaluation group. The Social Science and Monitoring Team undertake the data analysis.

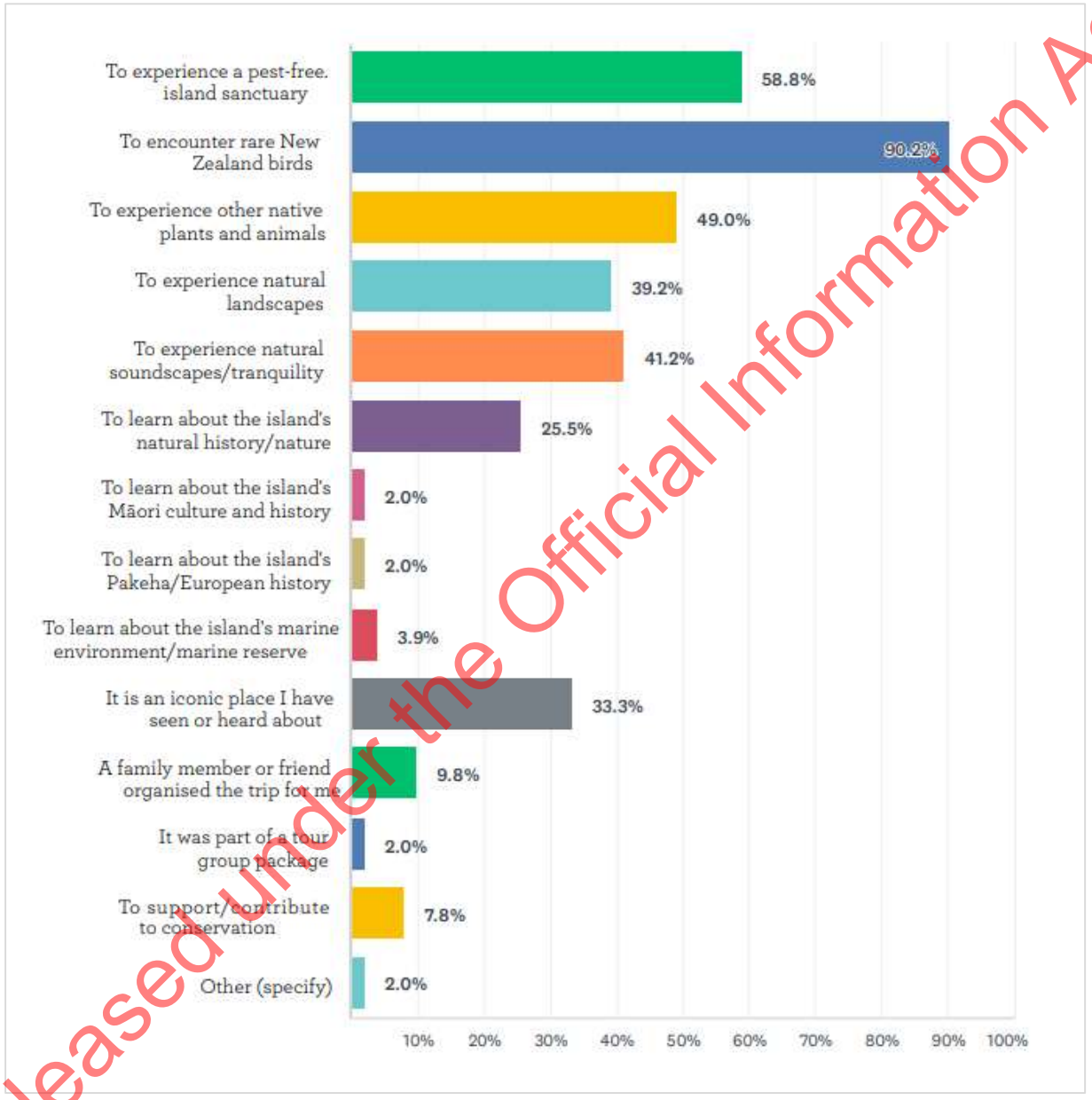

Figure 7 Results of Q12 "What were your main reasons for visiting Ulva Island?" (select the main five) from (DOC Social Research Team, 2022)

2.1 Has Ulva Island remained rat free and incursion management been more effective?

Rationale

Monthly biosecurity surveillance is important so that incursions are identified quickly. This will allow for responses to incursions to be rapid reducing the risk of populations establishing. This can make use of the island bait station network rather than larger scale eradications.

Outcome target

Future rodent incursions are identified and responded to quickly with no populations establishing.

Method

- Monthly surveillance checks of the biosecurity devices (traps and trail cameras) year-round.
- Monthly rodent detection dog checks from November to April.
- Annually auditing of response efforts and compare to the incursion database.
- Annually record results in BPRS.

Who and when

Senior Ranger, Biodiversity from the Rakiura Operations Team is responsible for the biosecurity plan ensuring that required actions are undertaken and for reporting in BPRS.

2.2 Has improved biosecurity enabled more threatened species management on Ulva Island?

Rationale

It is important to understand the effects on threatened and locally important species of the upgraded biosecurity plan and associated network.

Outcome target

The abundance of threatened species on Ulva Island increases following the implementation of the upgraded biosecurity network.

Method

- Report annually in BPRS on the health of threatened species populations. This will be provided through the distance sampling results (Outcomes 1.2 and 1.3).
- Report on any translocations to the island.

Who and when

- Senior Ranger, Biodiversity from the Rakiura Operations Team is responsible for BPRS reporting annually.
- The Biodiversity Monitoring Team and Ulva Island Trust will undertake the distance sampling.

2.3 Have economic and social benefits sustained?

Rationale

Given that the justification for the eradication was in part due to the importance of Ulva Island to the Rakiura economy it is important to quantify this.

Outcome target

Visitor numbers and revenue from concessions increased following the eradication comparing results from the financial year 22/23 and 23/24.

Method

- Report annually in BPRS on concession fees and visitor numbers.

Who and when

Senior Ranger, Heritage and Visitors from the Rakiura Operations Team.

3.1 Do iwi representatives feel engaged?

Rationale

It is important to have good engagement with local iwi representatives including Kaitiaki Roopu and Te Whaka ā Te Wera Mātaitai Committee.

Outcome target

Iwi representatives report on the level of engagement they have had in the Ulva Island eradication by November 2023.

Method

- Send quarterly updates about activities on the Island to iwi and community stakeholders, e.g., a newsletter or meeting.
- Feedback is requested from Kaitiaki Roopu and Te Whaka ā Te Wera Mātaitai Committee on their involvement in the eradication project and include results in the project report.
- Report annually on ongoing satisfaction of engagement and involvement in Ulva Island activities.

Who and when

Senior Ranger, Biodiversity from the Rakiura Operations Team to send out quarterly Ulva Island update and report on results annually in BPRS.

4.1 Do community representatives and interested parties feel engaged?

Rationale

It is important to have good engagement with community representatives and interested parties of Ulva Island.

Outcome target

Stakeholders report on the level of engagement they have had in the Ulva Island eradication by November 2023.

Method

- Send quarterly updates about activities on the Island to iwi and community stakeholders, e.g., a newsletter or meeting.
- Feedback is requested from concessionaires and community representatives on their involvement in the eradication project and include results in the project report.
- Report annually on ongoing satisfaction of engagement and involvement in Ulva Island activities.

Who and when

Senior Ranger, Biodiversity from the Rakiura Operations Team to send out quarterly Ulva Island update and report on results annually in BPRS.

5.1 Were lessons captured and shared?

Rationale

It is important to capture and report on any lessons learned from the project for future eradications. This includes operational, relationship management.

Outcome target

Complete a project debrief and report by November 2023.

Method

- Include feedback from iwi, stakeholders, DOC Rakiura Operations Manager, Te Whaka ā Te Wera Paterson Inlet Matāitai Committee, Kaitiaki Roopu, Ulva Island Trust, and DOC staff and contractors who carried out the work.
- Include operational improvements

Who and when

National Eradication Team by November 2023.

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Appendix – Task resources

Task	Outcome	Type of document	Where to find
Distance sampling for birds	1.2 1.3	Task Specification	DOC-7387953
Weka call count survey	1.2	Task specification	DOC-
Weka Call Count Survey	1.2	Instructions	DOC-
Sample collection for marine brodifacoum residual testing	1.2	Task assignment	DOC-
Visitor Survey	1.4	Methodology	DOC-704677

Toxicology Laboratory Analysis Report

Manaaki Whenua
Landcare Research

54 Gerald Street
P.O.Box 69040
Lincoln, 7640
Ph: +64 3 321 9999
Fax: +64 3 321 9998

Report No: T8599

CLIENT: [redacted], Department of Conservation, PO Box 743, Invercargill 9840.
CLIENT REFERENCE No.: 4500055893 **Telephone No:** 0800 275 362
SAMPLES: Three marine samples
REQUIREMENT: Examine for brodifacoum
RECEIVED: 06 November 2024

Sample/s were received for analysis. The details were entered into the laboratory sample system and the sample/s given a reference number. The sample details and results are as follows:

No. samples: 3

LabNo.	Description	Brodifacoum, ng/g
28009	Muscle tissue, Ulva Island Cod	<MDL
28010	Liver tissue, Ulva Island Blue cod liver	3.03
28011	Shellfish, Ulva Island mussels	<MDL

The determination was carried out using TLM098, the determination of brodifacoum in animal tissue by LCMS. The method limit of detection is 1ng/g and the uncertainty (95% C.I.) is 15% for liver and 24% for muscle.

TESTED BY: [redacted] **WORKBOOK REF:** 36/13
TEST PERIOD: 14-18/11/24

AUTHORISED BY:

[redacted]

Date: 18/11/2024

Toxicology Laboratory Analysis Report

Manaaki Whenua
Landcare Research

54 Gerald Street
P.O.Box 69040
Lincoln, 7640
Ph: +64 3 321 9999
Fax: +64 3 321 9998

Report No: T8294

CLIENT: 9(2)(g)(ii) Department of Conservation, PO Box 743, Invercargill 9840

CLIENT REFERENCE No.: 4500028930 **Telephone No:** 9(2)(g)(ii)

SAMPLES: Eleven marine samples

REQUIREMENT: Examine for brodifacoum

RECEIVED: 05 October 2023

Sample/s were received for analysis. The details were entered into the laboratory sample system and the sample/s given a reference number. The sample details and results are as follows:

No. samples: 11

LabNo.	Description	Brodifacoum, ng/g
26394	Flesh sample, Crayfish Island Blue cod	<MDL
26395	Shellfish, Crayfish Island Mussels	<MDL
26396	Flesh sample, Groper Island Blue cod	<MDL
26397	Shellfish, Groper Island Mussels	<MDL
26398	Liver tissue, Ulva Island Blue cod liver	1.39
26399	Flesh sample, Ulva Island Blue cod	<MDL
26400	Shellfish, Ulva Island Kina	<MDL
26401	Shellfish, Ulva Island Limpets	<MDL
26402	Shellfish, Ulva Island Mussels	<MDL
26403	Foot tissue, Ulva Island Paua	<MDL
26404	Flesh sample, Ulva Island Trumpeter	<MDL

The determination was carried out using TLM098, the determination of brodifacoum in animal tissue by LCMS. The method limit of detection is 1ng/g and the uncertainty (95% C.I.) is 15% for liver and 24% for muscle.

TESTED BY: 9(2) **WORKBOOK REF:** 30/3

TEST PERIOD: 17-18/10/23

AUTHORISED BY:

9(2)(g)(ii)

Date: 25/10/2023

These results are confidential to the client and relate only to the samples as received and tested. This report may be reproduced in full only. The samples relating to this report will be disposed of after two months from the report date unless requested otherwise by the client. Where appropriate, the above results will be included in anonymised form in the National Vertebrate Pesticide Residue Database.

Toxicology Laboratory Analysis Report

Manaaki Whenua
Landcare Research

54 Gerald Street
P.O.Box 69040
Lincoln, 7640
Ph: +64 3 321 9999
Fax: +64 3 321 9998

Report No: T8351

CLIENT: 9(2)(g)(ii), Department of Conservation, PO Box 743, Invercargill 9840

CLIENT REFERENCE No.: 4500033069 **Telephone No:** 9(2)(g)(ii)

SAMPLES: Eleven marine samples

REQUIREMENT: Examine for brodifacoum

RECEIVED: 01 December 2023

Sample/s were received for analysis. The details were entered into the laboratory sample system and the sample/s given a reference number. The sample details and results are as follows:

No. samples: 11

LabNo.	Description	Brodifacoum, ng/g
26570	Flesh sample, Crayfish Island Blue Cod	<MDL
26571	Shellfish, Crayfish Island mussels	<MDL
26572	Flesh sample, Groper Island Blue Cod	<MDL
26573	Shellfish, Groper Island mussels	<MDL
26574	Liver tissue, Ulva Island Blue Cod	<MDL
26575	Flesh sample, Ulva Island Blue Cod	<MDL
26576	Shellfish, Ulva Island Kina	<MDL
26577	Shellfish, Ulva Island limpets	<MDL
26578	Shellfish, Ulva Island mussels	<MDL
26579	Foot tissue, Ulva Island Paua	<MDL
26580	Flesh sample, Ulva Island Trumpeter	<MDL

The determination was carried out using TLM098, the determination of brodifacoum in animal tissue by LCMS. The method limit of detection is 1ng/g and the uncertainty (95% C.I.) is 15% for liver and 24% for muscle.

TESTED BY: 9(2) **WORKBOOK REF:** 31/7

TEST PERIOD: 6-7/12/23

AUTHORISED BY:

9(2)(g)(ii)

Date: 8/12/2023

These results are confidential to the client and relate only to the samples as received and tested. This report may be reproduced in full only. The samples relating to this report will be disposed of after two months from the report date unless requested otherwise by the client. Where appropriate, the above results will be included in anonymised form in the National Vertebrate Pesticide Residue Database.

Toxicology Laboratory Analysis Report

Manaaki Whenua
Landcare Research

54 Gerald Street
P.O.Box 69040
Lincoln, 7640
Ph: +64 3 321 9999
Fax: +64 3 321 9998

Report No: T8375

CLIENT: 9(2)(g)(ii) Department of Conservation, PO Box 743, Invercargill 9840

CLIENT REFERENCE No.: 4500033069 **Telephone No:** 9(2)(g)(ii)

SAMPLES: Six marine samples

REQUIREMENT: Examine for brodifacoum

RECEIVED: 24 January 2024

Sample/s were received for analysis. The details were entered into the laboratory sample system and the sample/s given a reference number. The sample details and results are as follows:

No. samples: 6

LabNo.	Description	Brodifacoum, ng/g
26624	Liver tissue, Ulva Island Blue cod	4.32
26625	Flesh sample, Ulva Island Blue cod	<MDL
26626	Shellfish, Ulva Island Kina	<MDL
26627	Shellfish, Ulva Island Limpet	<MDL
26628	Shellfish, Ulva Island Mussel	<MDL
26629	Foot tissue, Ulva Island Paua	<MDL

The determination was carried out using TLM098, the determination of brodifacoum in animal tissue by LCMS. The method limit of detection is 1ng/g and the uncertainty (95% C.I.) is 15% for liver and 24% for muscle.

TESTED BY: 9(2) **WORKBOOK REF:** 31/14 and 31/16

TEST PERIOD: 26/1-7/2/24

AUTHORISED BY:

9(2)(g)(ii)

Date: 7/02/2024

These results are confidential to the client and relate only to the samples as received and tested. This report may be reproduced in full only. The samples relating to this report will be disposed of after two months from the report date unless requested otherwise by the client. Where appropriate, the above results will be included in anonymised form in the National Vertebrate Pesticide Residue Database.

Toxicology Laboratory Analysis Report

Manaaki Whenua
Landcare Research

54 Gerald Street
P.O.Box 69040
Lincoln, 7640
Ph: +64 3 321 9999
Fax: +64 3 321 9998

Report No: T8431

CLIENT: 9(2)(g)(ii) Department of Conservation, PO Box 743, Invercargill 9840

CLIENT REFERENCE No.: 4500044009 **Telephone No:** 9(2)(g)(ii)

SAMPLES: Three marine samples

REQUIREMENT: Examine for brodifacoum

RECEIVED: 10 May 2024

Sample/s were received for analysis. The details were entered into the laboratory sample system and the sample/s given a reference number. The sample details and results are as follows:

No. samples: 3

LabNo.	Description	Brodifacoum, ng/g
26816	Shellfish, Ulva Island Mussels	<MDL
26819	Flesh sample, Ulva Island Blue cod flesh	<MDL
26820	Liver tissue, Ulva Island Blue cod liver	6.48

The determination was carried out using TLM098, the determination of brodifacoum in animal tissue by LCMS. The method limit of detection is 1ng/g and the uncertainty (95% C.I.) is 15% for liver and 24% for muscle.

TESTED BY: 9(2) **WORKBOOK REF:** 32/17

TEST PERIOD: 14-15/5/24

AUTHORISED BY:

9(2)(g)(ii)

Date: 17/05/2024

These results are confidential to the client and relate only to the samples as received and tested. This report may be reproduced in full only. The samples relating to this report will be disposed of after two months from the report date unless requested otherwise by the client. Where appropriate, the above results will be included in anonymised form in the National Vertebrate Pesticide Residue Database.

Toxicology Laboratory Analysis Report

Manaaki Whenua
Landcare Research

54 Gerald Street
P.O.Box 69040
Lincoln, 7640
Ph: +64 3 321 9999
Fax: +64 3 321 9998

Report No: T8568

CLIENT: 9(2)(g)(ii) Department of Conservation, PO Box 743, Invercargill 9840

CLIENT REFERENCE No.: 4500055893 **Telephone No:** 9(2)(g)(ii)

SAMPLES: Three marine samples

REQUIREMENT: Examine for brodifacoum

RECEIVED: 20 September 2024

Sample/s were received for analysis. The details were entered into the laboratory sample system and the sample/s given a reference number. The sample details and results are as follows:

No. samples: 3

LabNo.	Description	Brodifacoum, ng/g
27867-	Flesh sample, Ulva Island Blue cod flesh	<MDL
27867-	Liver tissue, Ulva Island Blue cod liver	7.30
27982	Shellfish, Ulva Island mussels	<MDL

The determination was carried out using TLM098, the determination of brodifacoum in animal tissue by LCMS. The method limit of detection is 1ng/g and the uncertainty (95% C.I.) is 15% for liver and 24% for muscle.

TESTED BY: 9(2)

WORKBOOK REF: 35/16 and 35/19

TEST PERIOD: 3-17/10/24

AUTHORISED BY:

9(2)(g)(ii)

Date: 18/10/2024

These results are confidential to the client and relate only to the samples as received and tested. This report may be reproduced in full only. The samples relating to this report will be disposed of after two months from the report date unless requested otherwise by the client. Where appropriate, the above results will be included in anonymised form in the National Vertebrate Pesticide Residue Database.

Ulva Island Distance Sampling

Ulva Island 2023 Eradication

Six species of forest birds have been monitored annually in spring on Ulva Island since 2017 (except 2021) by the Ulva Island Trust. As this data already existed it was decided that the best way to understand the impact of the 2023 eradication on non-target bird species was by building on this existing data set.

Prior to the eradication distance sampling was undertaken in June 2023 to get a pre-eradication density measure of mohua, brown creeper, Stewart Island weka, Stewart Island robin, rifleman, and South Island saddleback. This methodology was again repeated in October 2023 to gain an understanding of how the eradication had impacted the same bird species. This will again be repeated quarterly through to June 2025.

The distance sampling is conducted along 18 parallel transects 200 metres apart that range from 105 metres to 1400 metres in length, with a total combined length of 12.5km (figure 1). These are the same transects used in the distance sampling done by 9(2)(g)(ii) and 9(2)(g)(ii) to allow for data comparison. The distance to an individual bird or group of birds (of the same species) is measured at 90° to the transect line. The number of individuals in the cluster is also to be recorded. Metadata is also recorded including weather variables and start and finish times.

The computer software Distance (version 7.3) is used to analyse the data.

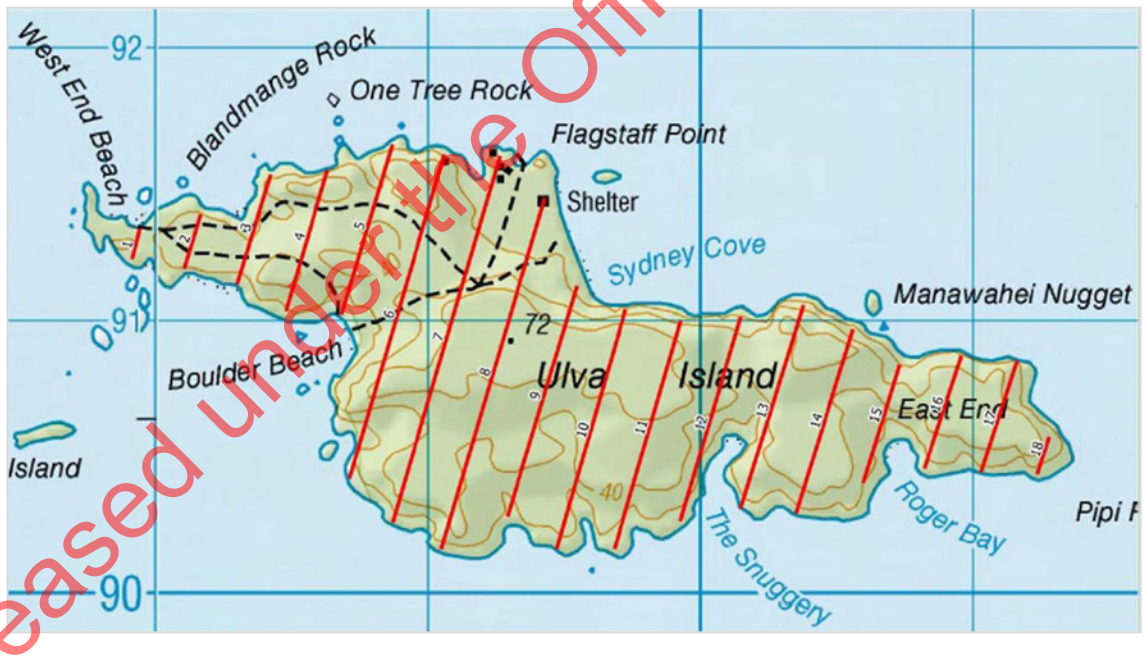
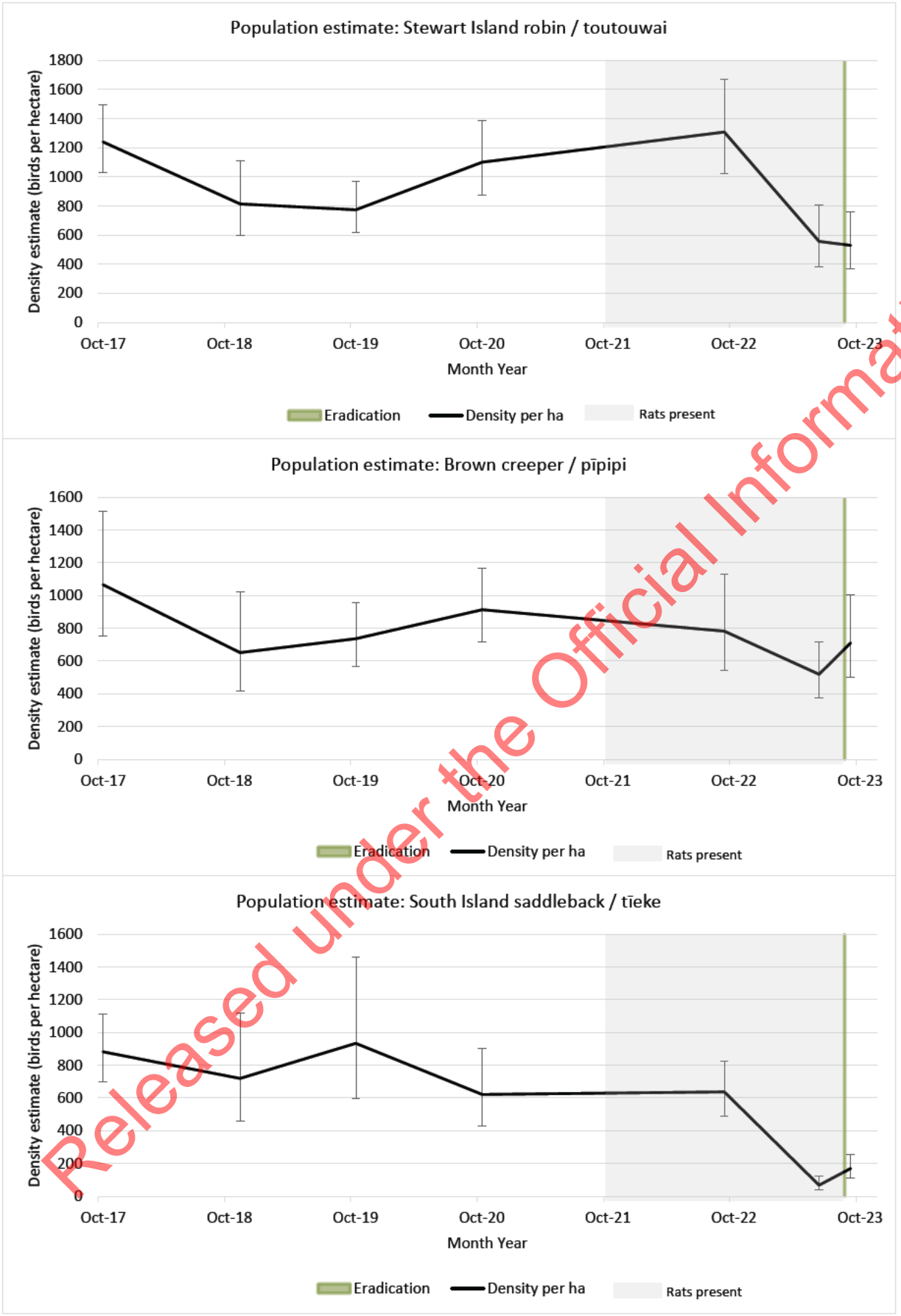
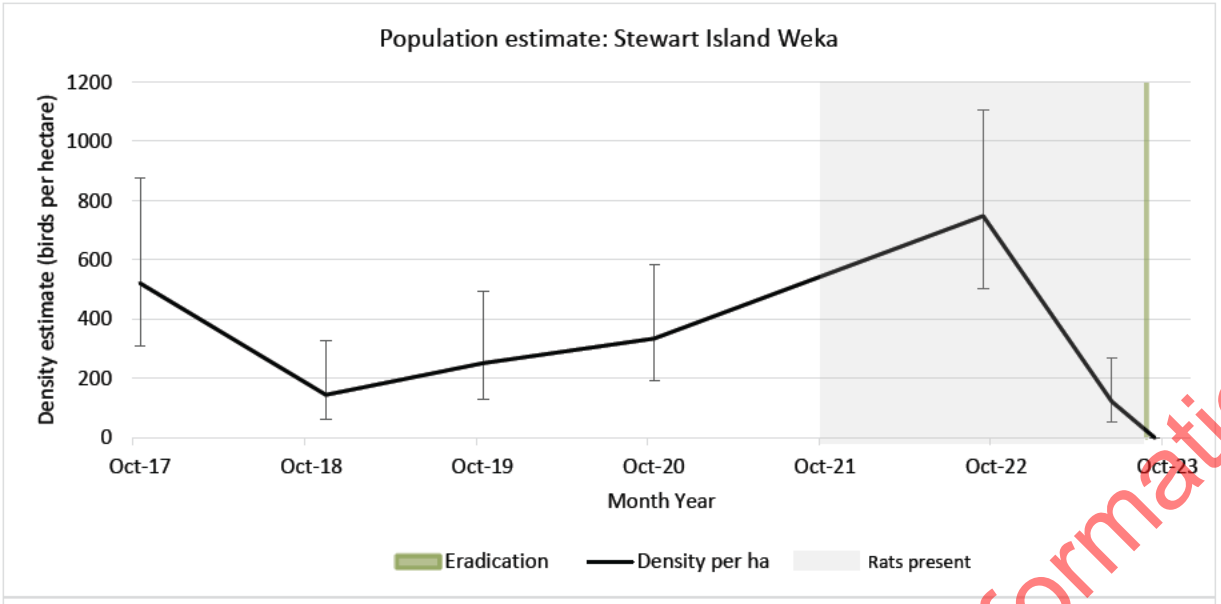


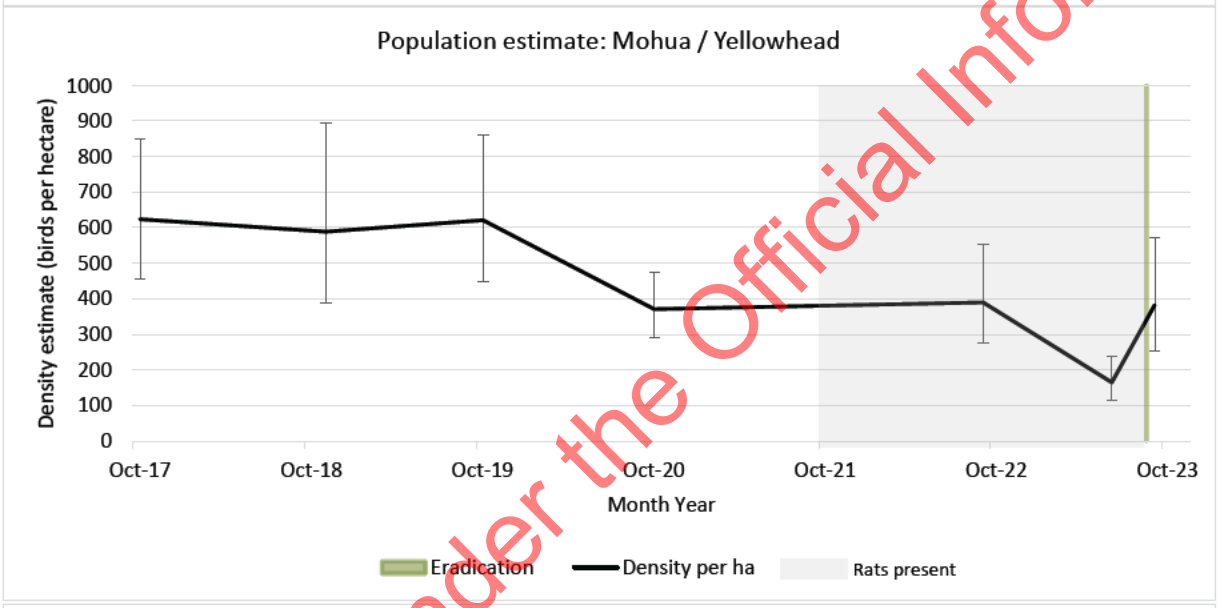
Figure 1. Approximate location of transect lines, Ulva Island (Broekema, 2020).

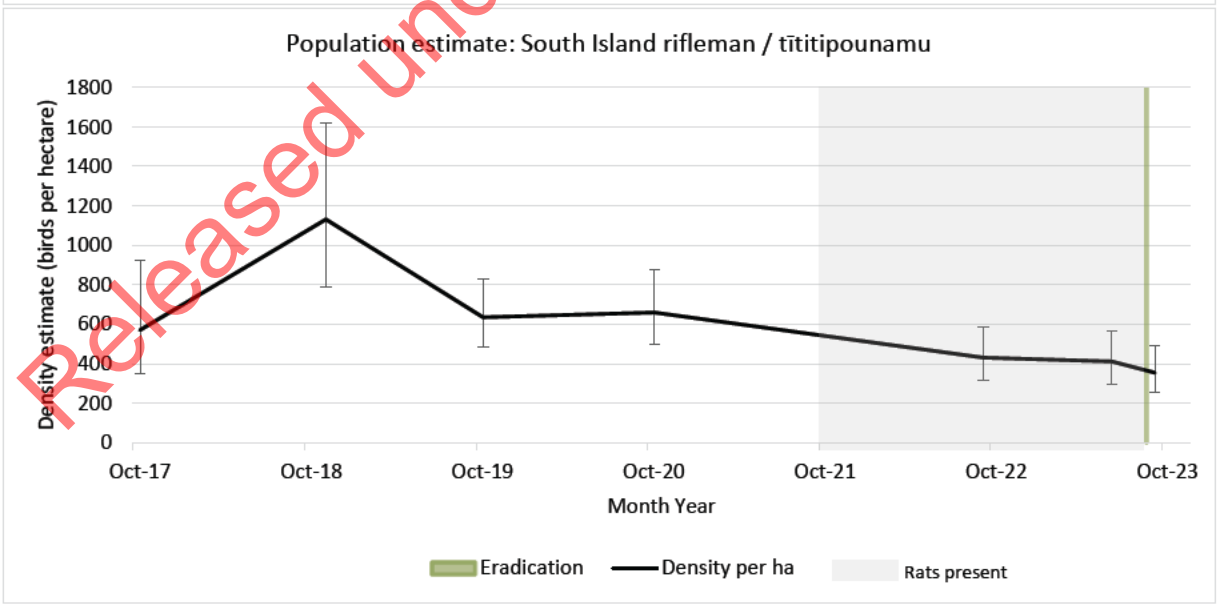
The results are attached. When comparing the results from different seasons it is important to also consider bird behaviour varies season to season and could impact detectability reducing or inflating the results. Also, some species had low numbers detected (<80 for a survey) therefore these results should be interpreted with caution, but will likely still give a trend rather than an accurate population estimate.

As you will see on the graphs, no weka were detected in the October 2023 survey. However, there were still weka present on the island but the methodology failed to detect any. This is always an issue with using distance sampling to survey weka therefore weka call counts were done additionally which estimate the reduction of weka numbers to be 68% ±2% from pre-eradication numbers.









Species	Model	GOF_p_value	MonthYear	Effort_km	Detections	CV	Density per ha	D_95_LCI	D_95_UCI	Population estimate	N_95_LCI	N_95_UCI
Brown creeper / pīpipi	HNorm + cos	0.3	Oct-17	24.2	145	17.36	3.99	2.81	5.68	1066	750	1516
Brown creeper / pīpipi	HNorm + cos	0.1	Nov-18	12.1	70	22.48	2.44	1.55	3.83	651	415	1022
Brown creeper / pīpipi	HNorm + cos	0.4	Oct-19	12.1	102	13.45	2.76	2.11	3.59	736	565	959
Brown creeper / pīpipi	Uni + cos	1	Oct-20	12.1	103	12.22	3.43	2.69	4.36	914	718	1165
Brown creeper / pīpipi	Uni + cos	0.35	Sep-22	12.4	47	18.29	2.93	2.03	4.22	783	543	1127
Brown creeper / pīpipi	Haz + cos	0.46	Jun-23	12.4	96	16.51	1.9445	1.40	2.69	519	375	719
Brown creeper / pīpipi	Haz + cos	NA	Sep-23	12.4	48	17.65	2.66	1.88	3.77	711	502	1007
South Island rifleman / tītitipounamu	Uni + cos	0.1	Oct-17	12.1	70	23.81	2.14	1.32	3.47	571	351	927
South Island rifleman / tītitipounamu	Uni + cos	0.2	Nov-18	12.1	106	17.58	4.23	2.96	6.06	1131	790	1618
South Island rifleman / tītitipounamu	Haz + cos	0.1	Oct-19	12.1	71	13.37	2.38	1.82	3.11	635	485	831
South Island rifleman / tītitipounamu	HNorm + cos	0.6	Oct-20	12.1	81	14.35	2.47	1.86	3.29	660	496	878
South Island rifleman / tītitipounamu	Uni + cos	NA	Sep-22	12.4	54	15.67	1.61	1.19	2.19	431	317	585
South Island rifleman / tītitipounamu	Haz + cos	0.14	Jun-23	12.4	55	16.12	1.54	1.12	2.13	412	299	568
South Island rifleman / tītitipounamu	Hnorm + cos	0.22	Sep-23	12.4	44	17.06	1.33	0.95	1.86	355	255	495
South Island saddleback / tīeke	Uni + cos	0.15	Oct-17	24.2	209	11.58	3.3	2.61	4.17	881	697	1114
South Island saddleback / tīeke	HNorm + cos	0.01	Nov-18	12.1	100	21.81	2.69	1.73	4.19	719	462	1117
South Island saddleback / tīeke	Haz + cos	0.7	Oct-19	12.1	102	22.85	3.5	2.23	5.47	934	597	1461
South Island saddleback / tīeke	Haz + cos	0.7	Oct-20	12.1	112	18.99	2.33	1.6	3.38	621	427	904
South Island saddleback / tīeke	Uni + cos	0.98	Sep-22	12.4	104	13.02	2.38	1.84	3.08	636	492	823
South Island saddleback / tīeke	Uni + cos	0.53	Jun-23	12.4	21	29.45	0.25	0.138	0.46	67	37	123
South Island saddleback / tīeke	Hnorm + cos	0.219	Sep-23	12.4	24	20.89	0.63	0.42	0.95	169	113	254
Stewart Island robin / toutouwai	HNorm + cos	NA	Oct-17	24.2	322	9.24	4.64	3.85	5.61	1240	1027	1497
Stewart Island robin / toutouwai	Uni + cos	NA	Nov-18	12.1	137	14.86	3.05	2.24	4.15	814	598	1109
Stewart Island robin / toutouwai	HNorm + cos	NA	Oct-19	12.1	127	11.41	2.89	2.3	3.64	773	615	971
Stewart Island robin / toutouwai	HNorm + cos	0.03	Oct-20	12.1	155	11.06	4.12	3.27	5.2	1101	873	1388
Stewart Island robin / toutouwai	HNorm + cos	NA	Sep-22	12.4	141	12.37	4.9	3.84	6.25	1307	1025	1668
Stewart Island robin / toutouwai	Haz +	0.66	Jun-23	12.4	102	18.9	2.0821	1.4357	3.0194	556	383	806
Stewart Island robin / toutouwai	Hnorm + cos	0.72	Sep-23	12.4	59	18.33	1.98	1.38	2.85	529	367	761
Stewart Island weka	Haz + cos	0.3	Oct-17	24.2	58	26.53	1.95	1.16	3.28	521	310	876
Stewart Island weka	Haz + cos	0.3	Nov-18	12.1	8	42.07	0.54	0.24	1.23	144	63	328
Stewart Island weka	Haz + cos	0.3	Oct-19	12.1	14	34.35	0.94	0.48	1.85	251	128	494
Stewart Island weka	Haz + cos	0.3	Oct-20	12.1	21	28.09	1.25	0.72	2.18	335	193	582
Stewart Island weka	Haz + cos	NA	Sep-22	12.4	53	20.04	2.8	1.89	4.15	748	505	1107
Stewart Island weka	Uni + cos	0.68	Jun-23	12.4	8	35.36	0.46	0.21	1	122	55	270
Stewart Island weka	NA	NA	Sep-23	12.4	0	NA	0	0	0	0	0	0
Yellowhead / mohua	HNorm + cos	0.7	Oct-17	24.2	124	15.5	2.33	1.71	3.18	623	456	850
Yellowhead / mohua	HNorm + cos	0.6	Nov-18	12.1	68	21.02	2.2	1.45	3.34	588	387	892
Yellowhead / mohua	HNorm + cos	0.6	Oct-19	12.1	78	16.35	2.33	1.68	3.22	621	449	859
Yellowhead / mohua	Uni + cos	0.8	Oct-20	12.1	94	12.16	1.39	1.09	1.78	371	290	476
Yellowhead / mohua	Uni + cos	0.78	Sep-22	12.4	39	17.6	1.46	1.02	2.07	389	274	554
Yellowhead / mohua	HNorm + cos	0.62	Jun-23	12.4	46	18.43	0.62	0.43	0.9	165	114	238
Yellowhead / mohua	Hnorm + herm	0.83	Sep-23	12.4	36	20.55	1.43	0.95	2.14	382	255	572

Ulva Island Rat Eradication 2023 Monitoring Report

Figure 1: The team arriving on Ulva Island for the first aerial bait application. (Photo: 9(2)(g)(ii)

Version	Reason for change	Date	Author
1	Document set up	12th December 2023	9(2)(g)(ii)
2	Completed section 1.1 – Results Monitoring	31st January 2024	9(2)(g)(ii)

Contents

Introduction

Norway rats (*Rattus norvegicus*) re-established on Ulva Island (266ha), in Paterson Inlet, Rakiura/Stewart Island following reinvasion in 2021 with the incursion response abandoned in May 2022. Rats were first eradicated from Ulva Island in 1996 by use of bait stations and again in 2011 by aerial baiting (Murray, Ware, Horn, & McRitchie, 2022).

Norway rats are opportunistic omnivores with studies identifying seeds and fruits, invertebrates, eggs, and birds as being part of their diet in New Zealand. Invertebrates on Ulva Island thrived in the absence of rats, which had flow on benefits to the rest of the ecosystem. As Norway rats are predominantly ground dwelling animals, they pose the greatest risk to native species that inhabit this space (Russel & Innes, 2021). On Ulva Island this includes South Island Saddleback/Tīeke (*Philesturnus carunculatus*) and Red-crowned Kākāriki (*Cyanoramphus novaezelandiae)* both of which are threatened species (Peter & Cowley, 2006).

Other rare species that inhabit Ulva Island are Mohua/Yellowhead (*Mohua ochrocephala*), Stewart Island robin (*Petroica australis rakiura*), and Stewart Island weka (*Gallirallus australis scotti*). This biodiversity is represented at an accessible location to showcase local conservation values. The site is significant for the local economy as a key visitor site for tourists. There are also several threatened species that, if management of Ulva Island was reliable, could be translocated to the island for species security (Murray et al., 2022).

Two aerial baiting operations were undertaken on Ulva Island on the 5th and 16th of August 2023.

Objectives and outcomes

Table 1

Area	Objective	Output	Outcome
Biodiversity	1. Norway rats are eradicated from Ulva Island	Successful completion of baiting operation to eradicate rats from Ulva Island. Native wildlife is released from predator pressure	1.1 Ulva Island's pest free status is restored providing continued protection for its native species, habitats, and ecosystems. 1.2 Operational impacts are broadly understood. 1.3. Vulnerable wildlife recovers. 1.4 Visitors enjoy an example of a healthy functioning lowland forest.
Biosecurity	2. Ulva Island remains free of pests	Updated biosecurity plan, improved surveillance, and response capability	2.1 Reinvasions are managed more efficiently and prevent pest populations establishing,

			negating the need for any further eradications. 2.2 Threatened species are managed for long-term persistence; social and economic benefits are sustained.
Iwi	3. Treaty of Waitangi obligations are met, and positive relationships are built.	Iwi report on positive engagement	3.1 Whanau, hapu and iwi are engaged and can carry out their responsibilities as kaitiaki of natural and cultural resources
Community	4. Community is informed; supports eradication and ongoing biosecurity	Community response is reported	4.1 DOC and community cooperate to sustain the outcomes.
Knowledge	5. Lessons are learnt for management of future island eradications	Project is documented	5.1 Capacity and knowledge are increased and shared.

Table 2

Outcome monitoring question	Indicator	Method	Timeframe
1.1 Have Norway rats been eradicated from Ulva Island?	Absence of rats from intensive searching within 4 months after eradication.	Sign searching with rodent detection dogs. Surveillance using 301 traps and 56 trail cameras.	2 days searching in November and December, and 6 days in January 2024. Monthly surveillance checks after baiting (August to December 2023)
1.2 Did the eradication have short term adverse effects on native bird populations?	Vulnerable native bird species – weka and robins.	Distance sampling along 12.5km of transects plus evening call counts for weka to compare population indices before and after eradication as a function of time.	Immediately prior to the eradication and repeated 6 weeks after baiting; building on baseline date from 2017 – 2020 and 2022; quarterly for 2 years.
1.2 How does brodifacoum persist in the marine environment post-eradication?	Commonly harvested marine species (blue cod, mussels, limpets, trumpeter, pāua, kina).	Sample marine species adjacent to the coast of Ulva and near Crayfish and Groper Islands and assay for brodifacoum.	Sampling at 10 days, 6 weeks, 21 weeks, and 8 months after second bait operation.
1.3 Have vulnerable native species benefited from the eradication of Norway rats?	Change in abundance of tīeke, robin and kākāriki over time.	Distance sampling along 12.5km of transects to compare population indices before and after eradication as a function of time.	Annual sampling between years 3 and 5 post-baiting adds to the dataset.
1.4 Do visitors value the pest-free island status?	Positive visitor response.	Visitor surveys	Survey visitors during the summer season Report annually in BPRS
2.1 Has Ulva Island remained rat free? 2.1 Has incursion management been more effective?	Rats have not re-established. Incursions events are restricted to individual animals.	Surveillance checks (traps, cameras, rodent detection dogs). Absence of large-scale responses due to rats breeding; auditing response efforts and compare to incursion database.	Monthly for devices year-round and monthly for dogs between November and April. Annual review.

2.2 Has improved biosecurity enabled more threatened species management on Ulva Island? 2.3 Have economic and social benefits sustained?	Number of threatened and locally important native species. Visitor numbers; revenue from concessions.	Report on relevant species population health through distance sampling indices; and any new translocations. Collate concessions fees and visitor numbers and included in reporting.	Report annually in BPRS.
3.1 Do iwi representatives feel engaged?	Project involvement and knowledge – Te Whaka ā Te Wera Paterson Inlet Matāitai Committee; Kaitiaki Roopu; individuals.	Request feedback on involvement in the project and include in project report. Report on annual involvement ongoing	Post operational report. Report annually in BPRS.
4.1 Do community representatives and interested parties feel engaged?	Project involvement and knowledge – project stakeholder list.	Request feedback on involvement in the project and include in project report. Report on annual involvement ongoing.	Post operational report. Report annually in BPRS.
5.1 Were lessons captured and shared?	Project report; updated biosecurity plan.	Complete project debrief and share project report.	Post – operation by November 2023

Calendar of events

Table 3: Activities completed as part of the Ulva Island monitoring

Date	Task	Outcome	Who	Time Resource
5 August 2023	First aerial baiting application			
17 August 2023	Second aerial baiting application			
29-31 August 2023	First round of marine samples collected	1.2	National Eradication Team & DOC Rakiura Hananui / DOC Dingy	5ppl x 1 day 3ppl x .5 day 1ppl x .5 day
25-27 September 2023	Second round of marine samples collected – fish species	1.2	DOC Rakiura Hananui	
20 October 2023	Second round of marine samples collected – shellfish species	1.2	DOC Rakiura	
24 October 2023	Weka night-call counts	1.2	DOC Rakiura	3ppl x 1 night

Results Monitoring

1.1 Have Norway rats been eradicated from Ulva Island?

Based on the available information there is no reason to believe that Norway rats have survived the eradication operation or have re-invaded since. While it is theoretically impossible to prove absence, we can gain confidence of likely absence by increasing detection probability through intensive surveillance.

Four methods of surveillance are employed on Ulva Island including:

- DOC200 kill trapping on the coastal fringe
- Baited trail cameras on the coastal fringe
- Rodent detection dogs
- Ranger vigilance for any signs of an invader (scats, tracks, sightings etc).

These surveillance methods have been employed on set cycles following the August 2023 aerial applications of brodifacoum cereal pellets to eradicate Norway rats as per the draft Ulva Island Biosecurity Plan 2024 – 2029 (DOC-7306734).

Kill trap surveillance

There are 227 DOC 200 kill trap boxes arranged in a double cordon around the island's coastline, following current and retired walking tracks and on several nearby islets (see map below). These are rebaited and serviced on a monthly cycle with the target recheck interval between 20 and 30 days. Note that most of the traps are double-sets hence the greater number of "trap checks" than total trap boxes.

Month	Total trap checks	Rodents detected	Sprung trap – no catch	Comments
September 2023	36	0	4	
October 2023	396	0	29	
November 2023	397	0	3	
December 2023	524	0	4	Appears to be glitch on Trap NZ – double entries – true trap checks figure probably 262
January 2024	333	0		

Trap rechecks are planned on a cycle to ensure that intervals between checks are no less than 20 days and no more than 30 days. The September check was only partial because the trapping grid was still being installed and activated. Note the January 2024 check was later than planned because of the holiday period and the interval exceeded the maximum 30-day period. Traps are lured using non-toxic long-life strikers (peanut butter lure), eggs or ceramic pods soaked in peanut oil.

Ulva Island DOC 200 Trap Network
As at 26 January 2024

Baited trail-camera surveillance

There are 56 motion-activated trail cameras placed in a slightly zig-zagging cordon around the coastal perimeter of the island (see map below. These are focused on a ZIP motolure which dispenses a mayonnaise lure daily. These cameras run continuously and all footage has so far been manually reviewed with no rodent detections being made.

A total of 6877 camera day-nights (a full 24 hour period) have been run as follows:

Month	Images reviewed	Total camera day-nights	Rodents detected
September 2023	81,750	1074	0
October 2023	58,750	1705	0
November 2023	61,566	1650	0
December 2023	124,572	1668	0
January 2024	Ongoing at time of writing	780 (ongoing at time of writing)	

Note: approximately 125,000 images were generated between the December 2023 and January 2024 camera servicing round, and we are seeking assistance from Joris Tinnemans to use his machine learning model to automate the analysis of this data set. As such as don't have a result for rodent detections. No rodents have been detected on remaining footage from 31 August 2023 to 15 January 2024

Ulva Island Baited Trail Cameras
As at 26 January 2024

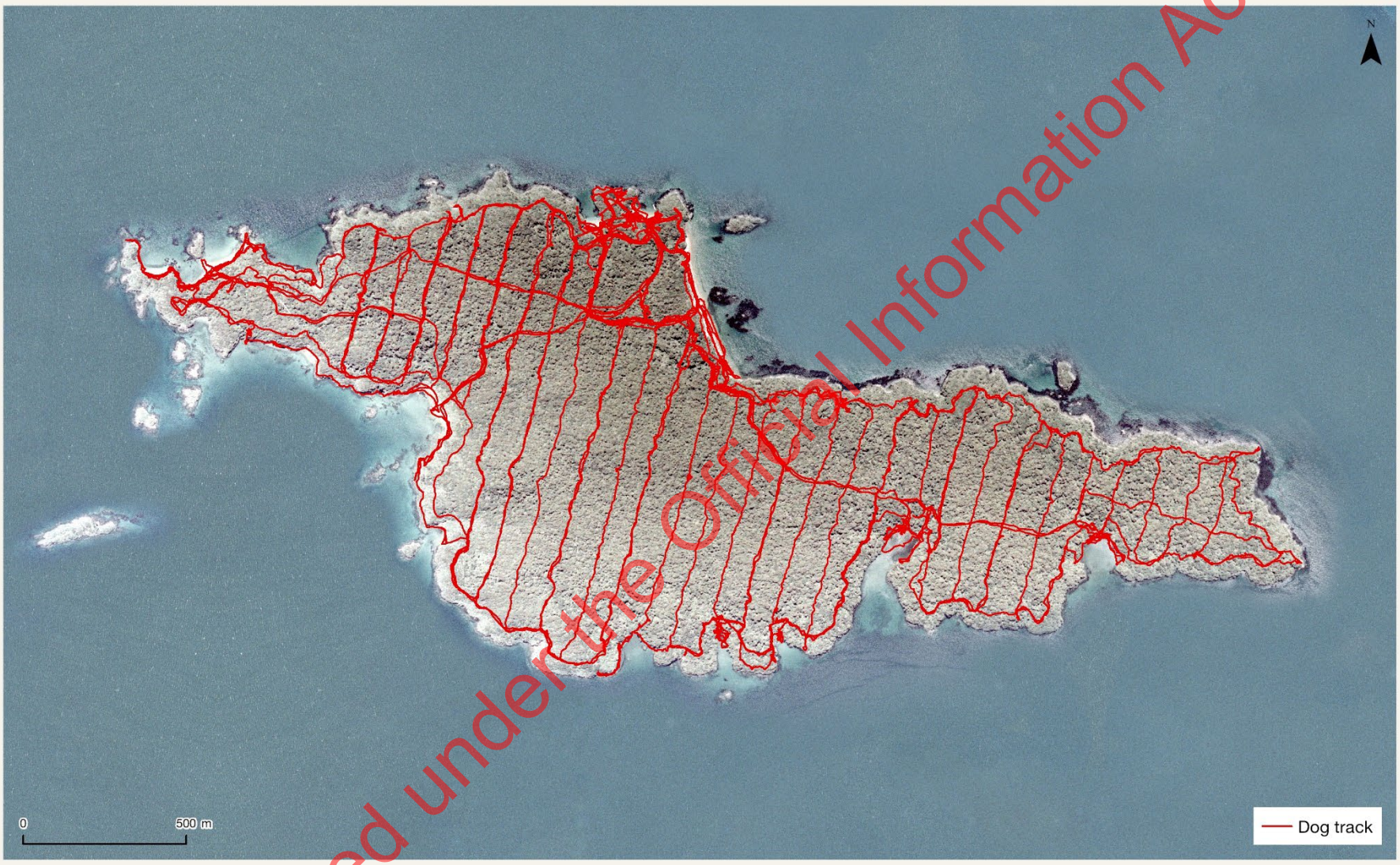
Rodent detection dog surveillance

No rodents have been detected during 13 dog-days of search effort with 2 days completed in November and December 2023 each and 9 in mid-January 2024.

The November and December dog work was the re-start of the scheduled rodent surveillance checks as per the biosecurity plan. These checks were done with one dog over 2 x two-day periods and covered a portion of the island including the highest priority search sites in Post Office Cove.

Map 1. Search tracks – 14th Nov = light blue line, 15th Nov = dark blue line.

The January rodent detection-dog work was completed by three handlers over three consecutive days, 15 to 17 January. This was designed to enable island-wide coverage within a three-day window and treated as a post-eradication validation check. Their combined search effort is shown on the map below.



Department of Conservation
Te Papa Atawhai

Rodent Dog Checks

15-17 January 2024

Ulva Island Eradication 2023

Te Kāwanatanga o Aotearoa
New Zealand Government

NZGD 2000 New Zealand Transverse Mercator | Not for publication nor navigation | 1:15,000 | Crown Copyright Reserved | Basemap from: | DOC, Geospatial Services | 23/01/2024

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1.2 Did the eradication have short term adverse effects on native bird populations?

Stewart Island Weka (*Gallirallus australis scotti*)

Introduction

Prior to the eradication of Norway Rats, it was understood that Stewart Island weka (*Gallirallus australis scotti*) were going to be significantly impacted. The Department of Conservation's Weka Recovery Group suggested a 90% reduction in weka numbers could be possible (DOC, per comms). This was informed by previous pest control operations that used the aerial application of brodifacoum cereal pellets and had significant reductions in weka numbers, including Nukuwaiata Island in 1993, Kapiti Island in 1996, and Ulva Island in 2011 (Beauchamp et al., 1999; Empson & Miskelly, 1999). This is due to the ground feeding and scavenging behaviour of weka making them susceptible to both primary and secondary poisoning (Beauchamp et al., 1999). Following the Ulva Island eradication in 2011 weka sighting reduced by 51% (Masuda et al., 2015).

For these reasons technical advice was sought as to whether intervention was required prior to the eradication to temporarily remove weka or whether planning needed to start for a translocation to occur after the eradication. At the time it was recommended that no immediate action be taken as the genetics of Ulva Island weka are well represented on nearby islands (Trewick et al., 2017).

Method

Distance sampling was undertaken prior to the aerial bait applications in June 2023 and then immediately following the

Results

The results of the distance sampling done post the eradication in September 2023 failed to detect any weka. A limitation of the method for weka is that it is more likely to detect transient individuals than site fixed ones (including pairs). This is why the weka call count method was also undertaken. The results of the weka call count surveys indicate that the weka population on Ulva Island has reduced by 68% ±2% from pre-eradication numbers. This, however, is based on a limited number of three sites being surveyed but still provides us with a good indication.

Discussion

Weka are naturally susceptible to large rapid population fluctuations based on environmental conditions and food availability, such as during droughts or floods. However, when conditions are favourable they can be very productive breeding year-round, with pairs producing up to 14 chicks in a year (Beauchamp et al., 1999). The best conditions for weka are moist islands with rich soil, like those on Ulva Island. For these reasons and given that Ulva Island has previously supported a high density of weka, it is believed that the population will likely recover to pre-eradication levels within 2 years (DOC, per comms). This will be monitored using the methods discussed previously with the distance sampling repeated quarterly and the weka call count surveys will be done annually both through to June 2025. These results will be reported as we have them.

Further actions

To gain a determination of the breeding health of the population, a sex ratio analysis could be undertaken. This will help us understand whether the population has been skewed by the eradication and how it is likely to rebound.

Stewart Island Robin (*Petroica australis rakiura*)

Introduction

Following the 2011 Ulva eradication robin (*Petroica australis rakiura*) numbers declined by 31.5%. It was predicted that robins would again be negatively impacted by the eradication in 2023.

It was predicted in 2011 that the population would rebound to 89% of pre eradication numbers within 2 years of the eradication, however monitoring stopped before this could be measured. Therefore, for the 2023 eradication we plan on undertaking monitoring for 2 years following the eradication.

Method

Distance sampling was undertaken pre and post the aerial bait applications. The before measure was done over 5 days in June 2023. The monitoring was done following the same methodology used by the Ulva Island Trust to do annual monitoring. This provided a long term comparable dataset.

Results

The data was analysed using distance software 7.2.

Discussion

Following

1.2 How does brodifacoum persist in the marine environment post-eradication?

Introduction

To understand how brodifacoum persists in the marine environment following the aerial application of brodifacoum bait samples were collected

Sample collection

Samples were to be ideally collected at the timepoints in table 4, however there were delays in the collection due to weather conditions and staff illness.

Table 4: Planned vs actual sample collection time points

Sampling Time points (Post second bait operation)	Target date	Locations to be sampled	Actual date	Actual sample time points (Post second bait operation)
10 days	26/08/2023	Ulva sites x 3, Groper and Crayfish Islands	29/08/2023 to 31/08/2023	12-14 days
6 weeks	27/09/2023	Ulva sites x 3, Groper and Crayfish Islands	25/09/2023 to 27/09/2023, 20/10/2023	39-64 days (5-9 weeks)
21 weeks	10/01/2024	Ulva Sites x 3	09/01/2024 to 15/01/2024	145-151 days (20-21 weeks)
8 months	16/04/2024	Ulva Sites x 3	Not yet sampled *	

INSERT MAP

The species and number of individuals were decided in agreement with the Te Whaka a Te Wera Mataitai Committee.

Trumpeter was harder to collect due to

Samples were collected at three sites around Ulva Island, and Groper and Crayfish Islands (figure 1).

Method

The samples were frozen and packed with ice in polystyrene bins and shipped to the Toxicology Laboratory at Landcare Research in Lincoln to be analysed for brodifacoum residue. The analytical chemistry technique was Liquid Chromatography Mass Spectrometry (LCMS).

All the samples from the same island and species were homogenized with a sample assayed.

Results

For both the first and second round

Of all the assayed done only Blue Cod (*Parapercis colias*) tested positive for brodifacoum residue (table 5).

Table 5 Samples collected 12-14 days post bait application 2

Assay #	Assay	Days post bait application 2	Total Individuals for Assay	Results (Brodifacoum, ng/g)
1	Crayfish Is. Blue Cod	12	10	<MDL
2	Crayfish Is. Mussels	14	10	<MDL
3	Groper Is. Blue Cod	12	10	<MDL
4	Groper Is. Mussels	14	10	<MDL
5	Ulva Blue cod liver	12	27	1.39
6	Ulva Blue cod	12	27	<MDL
7	Ulva Kina	13	10	<MDL
8	Ulva Limpets	13 & 14	30	<MDL
9	Ulva Mussels	13 & 14	30	<MDL
10	Ulva Pāua	13	15	<MDL
11	Ulva Trumpeter	12	2	<MDL

Table 6 Samples collected 39-64 days post bait application 2

Assay #	Assay	Days post bait application 2	Total Individuals for Assay	Results (Brodifacoum, ng/g)
1	Crayfish Is. Blue Cod	41	10	<MDL
2	Crayfish Is. Mussels	41	10	<MDL
3	Groper Is. Blue Cod	41	10	<MDL
4	Groper Is. Mussels	41	10	<MDL
5	Ulva Blue cod liver	39-40	25	<MDL

6	Ulva Blue cod	39-40	25	<MDL
7	Ulva Kina	64	16	<MDL
8	Ulva Limpets	64	29	<MDL
9	Ulva Mussels	64	30	<MDL
10	Ulva Pāua	64	15	<MDL
11	Ulva Trumpeter	39	2	<MDL

Table 7 Samples collected 145-151 days post bait application 2

Assay #	Assay	Days post bait application 2	Total Individuals for Assay	Results (Brodifacoum, ng/g)
1	Ulva Blue cod liver	145-147	30	4.32
2	Ulva Blue cod	145-147	30	<MDL
3	Ulva Kina	146 & 151	15	<MDL
4	Ulva Limpets	146 & 151	30	<MDL
5	Ulva Mussels	146 & 151	30	<MDL
6	Ulva Pāua	146 & 151	15	<MDL

Of all the species tested only the liver from Blue Cod (*Parapercis colias*) tested positive for brodifacoum residue.

Discussion

Fisheries Special Permit Reporting

As part of the Fisheries Special Permit activities undertaken under the permit need to be reported to MPI annually.

Relevant Documents

Document	DOCCM Link
Task assignment – Marine monitoring sample collection	DOC-7390114
Sample collection document	DOC-7436900
Toxicology lab report – 12 to 14 days post toxin	DOC-7552017
Toxicology lab report – 39 to 64 days post toxin	DOC-7552019
Toxicology lab report – 145 to 151 days post toxin	DOC-7561865

1.3 Have vulnerable native species benefited from the eradication of Norway rats?

1.4 Do visitors value the pest-free island status?

2.1 Has Ulva Island remained rat free and incursion management been more effective?

Rationale

Monthly biosecurity surveillance is important so that incursions are identified quickly. This will allow for responses to incursions to be rapid reducing the risk of populations establishing. This can make use of the island bait station network rather than larger scale eradications.

Outcome target

Future rodent incursions are identified and responded to quickly with no populations establishing.

Method

- Monthly surveillance checks of the biosecurity devices (traps and trail cameras) year-round.
- Monthly rodent detection dog checks from November to April.
- Annually auditing of response efforts and compare to the incursion database.
- Annually record results in BPRS.

Who and when

Senior Ranger, Biodiversity from the Rakiura Operations Team is responsible for the biosecurity plan ensuring that required actions are undertaken and for reporting in BPRS.

2.2 Has improved biosecurity enabled more threatened species management on Ulva Island?

Rationale

It is important to understand the effects on threatened and locally important species of the upgraded biosecurity plan and associated network.

Outcome target

The abundance of threatened species on Ulva Island increases following the implementation of the upgraded biosecurity network.

Method

- Report annually in BPRS on the health of threatened species populations. This will be provided through the distance sampling results (Outcomes 1.2 and 1.3).
- Report on any translocations to the island.

Who and when

- Senior Ranger, Biodiversity from the Rakiura Operations Team is responsible for BPRS reporting annually.
- The Biodiversity Monitoring Team and Ulva Island Trust will undertake the distance sampling.

2.3 Have economic and social benefits sustained?

Rationale

Given that the justification for the eradication was in part due to the importance of Ulva Island to the Rakiura economy it is important to quantify this.

Outcome target

Visitor numbers and revenue from concessions increased following the eradication comparing results from the financial year 22/23 and 23/24.

Method

- Report annually in BPRS on concession fees and visitor numbers.

Who and when

Senior Ranger, Heritage and Visitors from the Rakiura Operations Team.

3.1 Do iwi representatives feel engaged?

Rationale

It is important to have good engagement with local iwi representatives including Kaitiaki Roopu and Te Whaka ā Te Wera Mātaitai Committee.

Outcome target

Iwi representatives report on the level of engagement they have had in the Ulva Island eradication by November 2023.

Method

- Send quarterly updates about activities on the Island to iwi and community stakeholders, e.g., a newsletter or meeting.
- Feedback is requested from Kaitiaki Roopu and Te Whaka ā Te Wera Mātaitai Committee on their involvement in the eradication project and include results in the project report.
- Report annually on ongoing satisfaction of engagement and involvement in Ulva Island activities.

Who and when

Senior Ranger, Biodiversity from the Rakiura Operations Team to send out quarterly Ulva Island update and report on results annually in BPRS.

4.1 Do community representatives and interested parties feel engaged?

Rationale

It is important to have good engagement with community representatives and interested parties of Ulva Island.

Outcome target

Stakeholders report on the level of engagement they have had in the Ulva Island eradication by November 2023.

Method

- Send quarterly updates about activities on the Island to iwi and community stakeholders, e.g., a newsletter or meeting.
- Feedback is requested from concessionaires and community representatives on their involvement in the eradication project and include results in the project report.
- Report annually on ongoing satisfaction of engagement and involvement in Ulva Island activities.

Who and when

Senior Ranger, Biodiversity from the Rakiura Operations Team to send out quarterly Ulva Island update and report on results annually in BPRS.

5.1 Were lessons captured and shared?

Debriefs were undertaken after each bait application and at the end of the project.

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Appendix 1 – Task resources

Task	Outcome	Type of document	Where to find
Distance sampling for birds	1.2 1.3	Task Specification	DOC-7387953
Weka call count survey	1.2	Task specification	DOC-
Weka Call Count Survey	1.2	Instructions	DOC-
Sample collection for marine brodifacoum residual testing	1.2	Task assignment	DOC-
Visitor Survey	1.4	Methodology	DOC-704677