



NATIONAL ENVIRONMENT SERVICE
TU'ANGA TAPOROPORO
COOK ISLANDS

Rat Eradication on the Island of Suvarrow



Elizabeth Munro
Biodiversity Officer
National Environment Service

By



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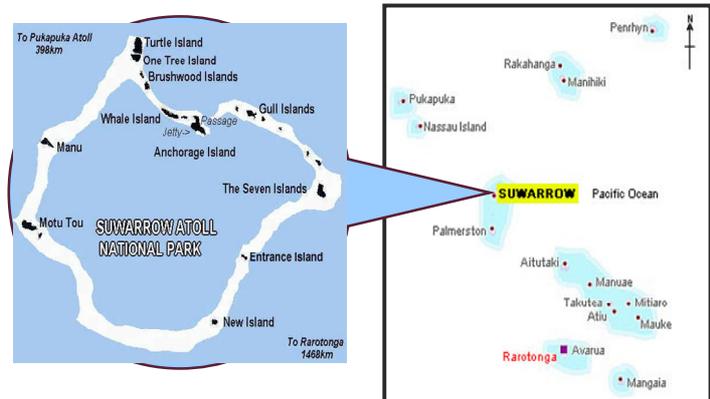
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LIST OF ABBREVIATIONS

NES	National Environment Service
TIS	Te Ipukarea Society
IAS	Invasive Alien Species

INTRODUCTION

The Island of Suvarrow and its surrounding waters was declared a National Park in 1978 under the Conservation Act 1975. The legal opinion sought in 2001 clarifies that Suvarrow is Crown Land. Today, Suvarrow is under the jurisdiction of the National Environment Service (NES) since 2003, for the primary purpose of conserving, preserving, protecting and managing the natural resources of Suvarrow.



The island lies roughly 800km northwest of Rarotonga and as such falls at the center of the 15 islands that make up the Cook Islands. The island is made up of 30 motu fringed around a lagoon of about 10km to 19km and a land mass of about 1.68sq km.

To ensure Suvarrow is maintained and people cause least amount of disruption to the environment, Suvarrow Rangers are placed on the island. The Rangers primary role is to ensuring the protection of the lagoon and the island environment of Suvarrow and monitor visiting yachts.

Suvarrow National Park is internationally known for its globally significant populations of seabirds and one of increasingly few sites in the world where seabirds occur largely undisturbed. Suvarrow is known for having approximately 9% of the world's population of Lesser Frigatebird, 3% of the world's Red-Tailed Tropicbird and over a hundred thousand Sooty Terns, a reputation that could be threatened if there is no control over rats and other introduced mammals.

The threat to Suvarrow seabirds was discovered when a rat infestation was documented on Motu Tou during a seabird survey in 2008. If left unchecked the risk of these rats invading the other islets remains as such the potential for severely degrading the Suvarrow National Park.



This report highlights the major elements of controlling rats on the island of Suvarrow, using cereal bait pellets containing brodifacoum that provide the most probable eradication success. The control program was carried out by the National Environment Service, Te Ipukarea Society and BirdLife International. The operation took place between the 22nd of April and 29th of May 2013. After the operation monitoring and management of the site became the responsibility of the National Environment Service - Suvarrow Park Ranger.

PROJECT GOAL

Pacific rat (*Rattus exulans*) was confirmed on 4 of the 30 motu. The objective of this project is to protect and restore Suvarrow wildlife and terrestrial environment for the enjoyment of current and future generations through the eradication of rats from these motu.



PROJECT OBJECTIVES

The objectives of this project are:

1. All rodents are eradicated from Suvarrow Atoll
2. Capacity built within TIS and NES to undertake invasive alien species eradication work
3. Project activities outputs and lessons learnt communicated to an international audience
4. Biological and social benefits of removing IAS assessed and project outcomes sustained.

SPECIES CHARACTERISTICS

Pacific rat (*Rattus exulans*) has a slender body, pointed snout, large ears and relatively delicate feet. Its back is a ruddy-brown color, with a whitish belly. Mature Polynesian rats are 11.5 to 15.0 cm long from the tip of the nose to the base of the tail. Average weight is between 40 and 80 g. The tail has fine, prominent, scaly rings, and is about the same length as the head and body combined. Female *R. exulans* have eight nipples. The skull size has been shown to vary with latitude and with those from cooler climates being larger than those living in warmer climates. A useful feature to distinguish this rat from other species is a dark outer edge on the upper side of the hind foot near the ankle while the rest of the foot is pale. (Russell, 2002; Tobin, 1994)



Table 1 *Rattus exulans* biology and characteristic

Sci. name	<i>Rattus exulans</i>
Description	Very similar in appearance to the common black rat but slightly smaller. Generally 80-14mm long (plus 108-147mm tail). Weighs around 30-180g. Fur colour is brown to grey-brown with spiny black guard hairs.
Habitat	<i>Rattus exulans</i> can live in a variety of habitats including grassland, scrub and forests, provided that it has adequate food supplies and shelter. It is not a good swimmer, but is able to climb trees for food. Other habitats include those created by humans, such as houses and cultivated lands. These rats usually live, where there is good ground cover and well-drained soil. Possible food source for rats on Suvarrow are breadfruit, coconut and bird chicks and eggs
Distribution	Present on all islands in the Cook Islands except for the islands of Aitutaki, Atiu and Takutea
Life cycle	Breeding occurs throughout the year with a peak from October to June. 1-6 litters per year, commonly 3-4. Gestation is 21-24 days. Can live up to one year in the wild.
Impacts	Economic Damages a range of crops on islands across the Pacific. Environmental Impact significantly on ground nesting birds, insects and small lizards, particularly on islands. Overseas evidence suggests impacts to some tree species due to Pacific rats eating plant parts, seeds and seedlings. Social Have been reported to enter people’s homes, eating their food and even biting people in their sleep.
Control	Coordinated baiting and trapping programs are effective

SITE CHARACTERISTICS

Suvarrow consists of 30 islets and a coral reef circling a lagoon with a total area of 97km². The total landmass of the atoll is approximately 168 hectares. Anchorage Island is next to the reef passage and is approximately 600m long and 200m wide or about 12.8 hectares in total land area. The highest elevation on anchorage is 3 meters. All other islets in Suvarrow are with lower elevation. Islets are either coral rubble/sand cays that are wooded, with larger trees or smaller raised-reef islets with scrub vegetation and sometimes a few coconut trees. Suvarrow is now under the jurisdiction of the National Environment Service (NES) for the primary purpose of protecting the atolls wildlife.



Of the 30 motu, only 4 have confirmed rat presence. The motu targeted for rat eradication are:

Anchorage

Anchorage is the most vegetated islet on Suvarrow; it is where the Park rangers' base is and where they live. All visitors must report to the Suvarrow officers on Anchorage if they wish to land or stay on Suvarrow. Anchorage has a cyclone shelter with combined office and social area; the old coast-watchers house; a cooking shack; a shack to store petrol and a shack for the generator. There are two water storage tanks suitable for drinking, i.e. a plastic 5,000 liter tank and a concrete 1000 gal tank (4500 litres).

Vegetation cover is mainly coconut, ironwood, pandanus, cordia and some bread fruit.

Rats were formally surveyed in 2003 and confirmed as Pacific rat *Rattus exulans* (Ed Saul pers comm). A limited survey effort in 2012 was unable to trap rats, but they continue to be sighted in low numbers. A possible *Rattus rattus* sighting has been reported by a caretaker, but the presence of this species remains unconfirmed.

Motu Tou

Motu Tou (14.67ha) is the most western and lies approximately 18km WSW of Anchorage. It has fairly dense vegetation through the centre, predominantly coconut and pandanus (John Samuel). Rats recorded as present are *Rattus exulans*. (Rhys Jones: 2008, James Mataa 2011, John Samuel 2012,)

Motu Kena and Kena-iti

The two Motu Kena islets are part of the treatment area. Sizes 1.15 ha and 0.72 ha, the vegetation is the same as Motu Tou and both lie approximately 150 metres from Motu Tou. Pacific rat has been recorded for both motu.

Motu Oneone

Motu Oneone (10.7ha) lies 13km ESE of Anchorage. No definite rat presence has been noted here but has been included in planning due to an unconfirmed rat report in the relatively recent past.

Accessibility

Suvarrow Island can only be accessed by sea. All sailing vessels must report to the Suvarrow officers on Anchorage motu only between 1 June and 1 November annually (NES 2013).

Access to the motu can only be carried out by an outboard motor which can take about 45 minutes to travel to these motu. Permission is required from the Suvarrow Park Ranger to access any of the other motu.



Suvarrow lies within the trade wind zone of the South Pacific with south-easterly trade winds dominating from May to September. Air temperature is fairly uniform with a high year round at approximately 28°C. Typical South Pacific weather patterns exist for Suvarrow i.e. wet season from November to April and dry season May to October, July to August is a relatively dry period.

ENVIRONMENTAL EFFECT

The impact of brodifacoum entering wider terrestrial and marine food chains exist. The consumption of crabs by people presents a risk however this can be mitigated through circulation and advising visitors to the island of the rat operation and erecting warning signs on the island advising people not to collect and consume any source of food from these motu for a minimum of six months, from the date of operation.

Both hermit crabs and coconut crabs will eat the bait but will not be affected by it. According to toxicology analysis crabs are known to metabolize any brodifacoum residue within a one month period. Precautions will be made to ensure visitors do not consume coconut crabs from the islands.

The majority of birds on Suvarrow are sea birds that feed on marine fish. However, migratory birds namely the Bristle-thighed curlew, Wandering tattler and Lesser golden plover occasionally stop in Suvarrow during their migration. These migratory birds are known to stay on the coast of the motu and hardly venture on the inner of the motu. To minimize the impact of brodifacoum bait on these migratory species, baits will not be applied below the mean high water of each motu. Although there will be nesting birds around the motu this can't be entirely avoided because of baiting requirements, but efforts to minimize the impact on nesting birds will be lessened.

No bait will be applied directly to water and the only source is via crabs. In water brodifacoum has been shown to bind to substrates and is not transmitted through the food chain.

While there is perhaps the possibility for high mortality among other species within the Suvarrow ecosystem this is considered unlikely and in instances where this has happened (such as invertebrates) it can be reasonably expected that any impact is short lived and will not have a population level effect.

The effect of Brodifacoum on soil and plants is minimal. Brodifacoum is absorbed into the soil where it is then slowly degraded over weeks to months by soil bacteria. Soil type, temperature, and the presence of soil micro-organisms capable of degrading brodifacoum will all influence the degradation time. The low solubility of brodifacoum in water means that plant up take is unlikely.

The risks to human health are very low in a well-planned and controlled poison operation. Brodifacoum is a slight skin irritant and a mild eye irritant and it is classified as non-mutagenic and unlikely to be carcinogenic. However safety gloves is worn to minimize direct contact with Brodifacoum.

IMPLEMENTATION

Implementation of the project commenced with a meeting with key stakeholders on Rarotonga, TIS, NES and Birdlife International before the team departed for Suvarrow.



Upon the teams' arrival on Suvarrow they immediately commenced with preparing the tracks for the rat baiting. Tracks and baiting points were spaced every 20m, calculated to be the home range of every rat.

Timing of operation

Timing is crucial when carryout a rat eradication operation where dry weather is an ideal condition for applying cereal rat bait. It ensures the bait remains in good condition for as long as possible increasing likelihood of exposing all rodents to a lethal dose of the brodifacoum bait.

Brodifacoum cereal bait

The rodenticide PestOff 20R contains brodifacoum in a composite cereal, green dyed pellet. Brodifacoum the toxic agent in the cereal an anticoagulant toxicant, works by increasing (or decreasing) the clotting time of blood, leading to death from haemorrhaging. It is absorbed through the gastrointestinal tract and can also be absorbed through the skin.

Brodifacoum is perceived to lack insecticidal properties due to the different circulatory physiology of invertebrates.

Baiting Application



The most appropriate method of eradicating rats on the island of Suvarrow is by hand-broadcasting cereal rat bait containing brodifacoum. Baiters carried the baits in a 20-litre plastic bucket that holds about 15kg of bait. Plastic scoop that holds 125g of bait, were used to disperse the rat baits. The estimated total treatment area is less than 40 hectares.

Before any of the baits can be dispersed on the motu a track system was cut across the island at a space of 20 meters apart and marked at

25 meters interval along each track. Once completed baiters were able to move along each track to throw baits out at each baiting point. Rat baits were applied in two applications at seven to ten days apart, at a rate of 20kg/ha per application. The original application was 15kg/ha however, due to the high density of coconut crab on the motu the application rate was increased from 15kg/ha to 20kg/ha.

The total bait ordered was 1000kgs and based on a sowing rate of 20kg/ha for 5 motu totalling 40 hectares with a 20% contingency.

Table 2 Rat Bait Calculations for Suvarrow

Motu	Hectares	Bait @ 20kg/ha	Contingency 20%	Total Bait	Bait @ 25kg/ha
Anchorage	12.79	255.8	51.1	306.9	319.75
Motu Tou	14.67	293.4	58.6	352.0	366.75
Motu Kena #1	0.72	14.4	2.8	17.2	18.00
Motu Kena #2	1.15	23.0	4.6	27.6	28.75
Motu Oneone	10.70	214.0	42.8	256.8	267.50
TOTAL	40.03	800.6	159.9	960.5	1000.75

MONITORING AND EVALUATION

The success of the eradication will be determined by monitoring. If no rats are detected within two years of the operation another program will be organized to verify the atoll free of rats before it can be declared a rat free island. The impact of removing rats from the Atoll will be assessed by monitoring changes in seabird species and numbers. However, measures to ensure Suvarrow remains a rat free island needs to be put in place such as a Suvarrow Bio-security plan.

Monitoring by Suvarrow Officers

Upon the operation teams departure the Suvarrow officers were tasked with monitoring rats on Suvarrow. Four rat traps were laid around the Suvarrow officers compound. The traps were regularly checked and re-baited when required. The officers continue checking the traps for five months and still did not catch any rats in the traps.



In 2014, upon the Suwarrow officers return to the island, twelve rat traps were laid around the compound. None of the traps caught any rat. The setting and laying of traps was ceased due to too much interference by the coconut crabs. Motu Tou, Bird Island and Turtle Island were also monitored for presence of rats and no sightings of rats were detected.

CONCLUSION AND RECOMMENDATION

Presence of rats on Suwarrow has been recorded as zero for two years however a follow-up survey needs to be carried out to verify the results for there is still the risk of re-invasion especially when the Suwarrow officers are not on the island during the cyclone season (November – April) of each year.

The likely motu of re-invasion is Anchorage Island where all visiting yachts land. While the risks of re-invasion on the other motu are minimal, rats are known good swimmers and can swim from one motu to the other.

To ensure that Suwarrow remains rat free a Biosecurity protocol needs to be recognized and enforced for all visiting vessels to the island. A draft Biosecurity Plan has been developed by Te Ipukarea Society and Birdlife Pacific among key stakeholders in Rarotonga to develop the framework for a biosecurity plan. The plan highlights;

- risk pathways by which invasive alien species (IAS) could invade Suwarrow
- tasks required to minimize re-invasion
- surveillance measures required to enable early detection of incursion
- Responses to incursions.

These Biosecurity measure was trialed in 2014 when one of the local boats visited the island.



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