MINISTRY OF AGRICULTURE
COOK ISLANDS

NATIONAL ENVIRONMENT SERVICE
TU'ANGA TAPOROPORO
COOK ISLANDS

Biosecurity Plan for Palmerston, Manihiki and Penrhyn Islands of the Cook Islands

June 2023

Prepared for the Cook Island Ministry of Agriculture by:
Peter Corson, Quality Conservation.

Department of Conservation
Te Papa Atawhai

NEW ZEALAND
FOREIGN AFFAIRS & TRADE
Manatū Aorere

SPREP
Secretariat of the Pacific Regional Environment Programme

PRISMSS

Biosecurity Plan:

The development of this Biosecurity plan was made possible by the New Zealand Ministry of Foreign Affairs and Trade (MFAT) under the Managing Invasive Species for Climate Change adaptation in the Pacific (MISCCAP). MISCCAP has enabled the New Zealand Department of Conservation (NZDOC), the Secretariat of the Pacific Regional Environment Programme (SPREP) and Manaaki Whenua to partner and support Pacific Island Countries and Territories to take stronger action against invasive species, and thereby build resilience to climate change. The NZDOC support to the Cook Islands Ministry of Agriculture is delivered through the Pacific Regional Invasive Species Management Support Service (PRISMSS).

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Disclaimer:

Agreement of Partnership

This plan is an understanding for partnership and collaboration between people and agencies to protect Palmerston Island, Manihiki Island, Penrhyn Island and Suwarrow Island, from the invasion or re-invasion of invasive species.

Ministry of Agriculture

Mrs Temarama Anguna-Kamana	Temarama Anguna-Kamana
Secretary, Ministry of Agriculture	14 July 2023

National Environmental Service

Mr Halatoa Fua	
Director, National Environment Services	14th July 2023

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2 Introduction

Islands are a part of Cook Island's culture, identity and society. Unless stopped, invasive species will affect the Cook Islands way of life. Small efforts by many will help protect who we are and what we love.

Planning for the eradication of rats from Palmerston Island is underway with an intended operation in 2023. The project is a partnership between the Cook Islands' Ministry of Agriculture (MoA), National Environment Service (NES), Palmerston Island administration and community, Te Ipukarea Society (TIS) and New Zealand's Department of Conservation (NZDOC). The project is intended to improve the sustainability, health and welfare of the island communities by improving food production and reducing the impacts of rats on health, infrastructure and ecosystems. It is critical to ensure that rats can't get back to islands. Biosecurity actions are now needed to stop rats re-invading. This has led to also consider a broad range of pests across the Northern Group islands as well as Palmerston.

MoA is mandated via the Biosecurity Act 2008 to prevent the spread of pests into or within the Cook Islands. MoA will therefore be the Biosecurity lead for Palmerston and the Northern Group islands working in collaboration with warranted Biosecurity officers on each island.

The islands are home to people and the plan reflects that people are both a blessing and a curse by potentially moving invasive species, but also being passionate protectors of the islands.

The intention of this plan is to support people involved in biosecurity by describing what actions are required, by whom, to reduce the chance of accidentally or naively moving invasive species. Actions are shown for each group or agency, in each section and amalgamated in an associated spreadsheet. To support the biosecurity staff on Rarotonga and on the islands, an explanation is given in the text and detailed information is also provided, particularly in the appendices.

Basic island biosecurity principles apply. A precautionary approach is needed as there are many things that we don't know. Good biosecurity also protects the islands from threats that we don't know about yet. Stopping invasive species before they get on island is easier than getting them off islands. Working with people is essential. Staff and leaders need to be seen doing the right things. Surveillance needs to be regular and prompt enough to enable management of any invasive species before a population establishes. Any incursion response must be swift and decisive. Lastly, and importantly, to ensure the staff and residents know that they are not alone. Biosecurity can often feel thankless. The work is important and many people across the globe are willing to help.

A biosecurity plan for Suwarrow already exists (Boudjelas et al 2014). The actions in this plan should strengthen and support the actions noted in the Suwarrow National Park Biosecurity Action Plan (Boudjelas et al, 2014). A Cook Islands invasive species strategy also exists (Annon 2019). Both the Suwarrow Plan and the Invasive Species Strategy have well set out rationale and proposed actions. This plan looks to build on those actions and enhance them where needed.

Rarotonga is the key hub servicing Palmerston and the Northern Group islands, with shipping and aircraft. Within the Northern Group islands, only Pukapuka, Manihiki and Penrhyn have airfields.

Rarotonga has far more species than on Palmerston or the Northern Group islands. Flora and fauna on the Pa Enua is more simplistic. There are invasive species but far less than Rarotonga. However, every island has invasive species that are not wanted on the other islands. For example, the coconut termite exists on Pukapuka, Nassau and Suwarrow but not elsewhere. Much of the information is based on the Cook Islands Biodiversity database. This database is recognised as imperfect and needs other agencies to support this work to better inform the protection of islands.

Invasive species can have serious detrimental impacts on domestic life, human health, agriculture and ecosystems. Some Cook Islands native species may prove to be invasive and problematic on other Pa Enua. Ideally, no new species should be introduced to any of the islands. Invasive species lists are shown in Appendix 1.

There are many agencies, groups, companies and individuals with an interest and desire to protect the islands. The motivations differ. Most realise a benefit in protecting the islands from invasive species. Harnessing the interest and desire will help support MoA and NES protect the islands.

Consistent simple messaging is needed for biosecurity. Many groups will be involved including agencies but also suppliers and transport operators.

Stopping pests getting to islands is the most efficient use of biosecurity effort and funding. In time this should become normal behaviour. It is mission critical to work collaboratively, as partners, with the Avatiu Ports Authority, Cook Islands General Transport (CIGT), Taio Shipping, and others situated at or near the Ports, including the airlines flying to the Northern Group islands.

A key focus will be on the highest risk pathways and goods. CIGT and Taio shipping, as the vessel/barge operators are the key risk pathway. Items that have a high risk of transporting invasive species to the islands, risk-goods, include plants, fruit, vegetables, live animals, animal feed, unprocessed coconut material, soil, potting mix, mulch, building supplies, landscaping supplies and heavy machinery. There are already controls for plants, fruit and vegetables, and animals. These should be adequate and adhered to. Further controls should be considered for other risk-goods. Wherever possible the movement of risk-goods should be avoided. The movement of live animals could have serious consequences including for human health, entire herds, productivity and environmental issues such as weeds.

Consideration is given to possibly declaring Palmerston Island, Suwarrow and the Avatiu Ports area as Biosecurity pest-free areas, using the 2008 Biosecurity Act powers.

People are the most important surveillance tool. There are nearly 250 invasive species noted between Rarotonga, Palmerston and the Northern Group islands. No device can detect so many invasive species as people.

Surveillance for rats, mice and ants is needed for Palmerston Island. A simple network should be set up on the island relying on chew cards as well as observation initially. Like many newly established biosecurity networks, people will learn as things are tried, with non-target species and conditions peculiar to each island. Changes may be needed as more is learnt. The frequency of checks should be linked to the visitation of boats with cargo. Ant and weed surveillance is also suggested for Palmerston. This monitoring could be duplicated on the Northern Pa Enua.

Preparation is needed to make sure supplies are on the island when they are needed in case of an incursion. The people likely to be involved also need to understand what will happen, and with clarity about roles and decision making.

Biosecurity actions for inhabited islands are not fixed through time. Threats change, people change, and behaviours change with time. This plan should be reviewed regularly, in two years initially, and potentially on a two-year cycle.

Biosecurity for international travellers and freight arriving in Rarotonga is outside the scope of this plan.

3 Glossary

Advocacy and education:

The actions that lead to improve people's understanding and behaviours about biosecurity. This can be for the wider public but can also target agency staff or key partners.

Biosecurity:

Biosecurity is defined in the Cook Islands Biosecurity Act 2008 as the control by legal and administrative means of pests and diseases affecting animals, plants and their products, to avoid adverse effects from such pests and diseases on the economy and health of the Cook Islands.

Biosecurity controlled area:

A biosecurity controlled area, defined in the Cook Islands Biosecurity Act 2008, means an infested biosecurity controlled area declared under section 62 or a pest-free biosecurity controlled area declared under section 64.

Incursion response:

The term incursion response refers to the actions required, to prepare for, and then to respond to, a suspected or actual invasive species arrival on an island, to stop it from establishing a population.

Intercept/interception:

An intercept or interception is detection and management of an invasive species during the pest prevention phase and transport, that prevents an invasive species from arriving and or establishing a population on an island.

Invasive species:

An introduced species that become destructive to the environment or human interests. This can also include some native species that proliferate and become destructive following environmental changes caused by human activities. This can include species that are native to the Cook Islands, that are not native on a different island.

Invasion:

An invasion is when an invasive species escapes into the wild on an island.

Island/s:

In this document island or islands generally refer to the island atoll with many motu but may also refer to a smaller motu within the atoll.

Pathway:

Pathways are ways invaders can move between places. A pathway can refer to broad or fine-scale pathways, such as soil on plants, shipping routes, or vessels. All routes and ways that an invasive species can get between islands are pathways.

Pest/s:

Means any species, strain or biotype of a plant, animal, microbe or pathogenic agent, or any organism, which -

(a) causes disease; or
(b) is detrimental to or capable of harming or adversely affecting animals or animal products, plants or plant products, human beings or the environment.

Pest-free biosecurity controlled area:

An area where a specified pest or disease does not occur, so far as is known, and where incursions of that pest or disease should be prevented.

Prevention:

Prevention is a term to cover all the actions intended to stop invasive species getting to or establishing a population on an island. These actions are mainly focused prior to departure of vessels or planes, during transit, or at the point of arrival on an island.

Plant pest/s:

Also referred to as weeds or invasive plants these are any plant that is unwanted at a site and can negatively affect values.

Risk-goods:

Risk-goods are any substance or thing that has a higher chance of containing or harbouring an invasive species or unwanted organism that may cause harm. Some risk-goods may be declared but lists of risk-goods do not exclude other things from being considered as a risk-goods.

Risk pathway:

A risk pathway is a pathway where an invasive species (pest) is likely to move between two places. Risk pathways are normally considered as having a higher risk of transporting invasive species. Cargo vessels are an example of a risk pathway.

Sealed container:

Any container, appliance or package that excludes invasive species from entering and accessing, or stowing away in, the contents or packaging material of goods being transported.

Surveillance:

Surveillance is defined as monitoring to detect the arrival of new incursions of invasive species.

Weed/s:

See the definition for plant pests.

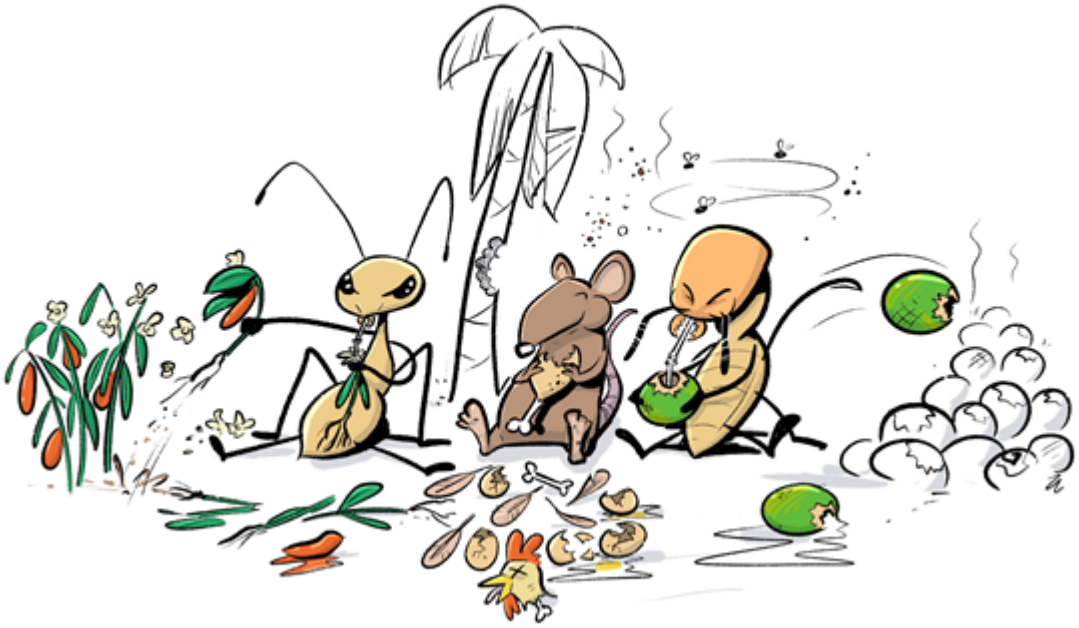
PART I - CONTEXT

4 Goals, objectives and outcomes

4.1 Biosecurity goals, objectives and outcomes

The goals and outcomes are presented as a current view of MoA. The objectives stated are broad as they cover many islands and over a long timeframe. Other groups and agencies may have different or additional goals and objectives.

Invasive species can have significant harmful effects. The key objective for this plan is that Island communities are protected from the harmful effects of new invasive species.



Goal: Protecting and Enhancing community and ecosystem resilience to climate change by managing invasive species.			
Objectives:	**Outcomes:**		
1. Improved health and welfare for island communities.	1.1 Island productivity is secure and increases.	1.2 Island communities are healthy.	1.3 Island infrastructure is protected.
2. Island communities are protected from the harmful effects of new invasive species.	2.1 Invasive species are stopped from being transported to Palmerston, Manihiki, Penrhyn or Suwarrow.	2.2 No new invasive pest establishes on Palmerston, Manihiki, Penrhyn or Suwarrow.	2.3 The island economies are protected.
3. Native biodiversity is protected and enhanced.	3.1 Native species can persist.	3.2 Bird and crab numbers increase.	3.3 Native species can return to Motu.
4. Palmerston community is protected from the impacts of rats.	4.1 Ship rats and pacific rats are eradicated from Palmerston Island.	4.2 Rats are prevented from returning to Palmerston Island.	4.3 Surveillance to detect rats and a response plan is in place for Palmerston.
5. Relationships enhance community protection and resilience.	5.1 Palmerston is a catalyst for improved protection for all Northern Group islands.	5.2 Agencies, individuals and companies work collaboratively to eradicate rats from Palmerston.	5.3 Agencies, individuals and companies work collaboratively to protect all Northern Group islands from invasive pests.

Table 1: Goals, Objectives and Outcomes

5 Biosecurity principles

Use a precautionary approach.	A precautionary approach emphasises caution. Agencies have a social and environmental responsibility to protect places and communities from harm. This is done by making sure items or species introduced to an island don't have irreversible future consequences.
Protection from threats we don't know about yet.	Good biosecurity practice protects the islands from threats we don't know about yet. Some threats haven't been identified yet. Others haven't yet become invasive. By managing the risk pathways, and stopping new species arriving, we are providing protection from future threats.
Manage the greatest risks first.	Minimise the greatest risks first. It is nearly impossible to eliminate all risks. Especially with inhabited islands. Resources, both human and monetary will always be limited. It is more effective that the focus is on actions that reduce the greatest amount of risk.

Work with people	Staff, people from other agencies and the public need to be informed and engaged for biosecurity to be effective. Once biosecurity becomes an attitude and natural behaviour, stopping invasive species is easier. People need to know what to do, when to do it, are supportive and know why they are doing the actions.
Stopping invasive species is easier than getting rid of them.	The most effective strategy is to stop invasive species travelling to the islands. Responding to invasive species once they have arrived, or have established, will be more expensive and is less likely to successfully remove them.
Be seen doing the right thing.	Agency staff, and island leaders need to be seen setting the standard for biosecurity. Others such as residents, transport operators or suppliers are unlikely to do more than what they see as the standard.
Biosecurity must be acceptable to all involved	As with eradication principles, the techniques for biosecurity must be acceptable to all involved. We can't use tools or rules that will affect health and welfare or are perceived to. The project aims to improve the lives for island residents. Biosecurity can't be so restrictive that it reduces or negates these improvements.
Surveillance needs to be sensitive and timely.	Surveillance needs to be sensitive, and timely, to detect pests before a population establishes. One pregnant rat or mouse can lead to a population, so we must be able to detect it through surveillance. This includes allowing enough time to mobilise an incursion response in a timeframe that has a reasonable chance of eliminating the pest.
Incursion response must be swift and decisive	To have a reasonable chance of success people on the islands must be equipped, know what to do in advance, then execute this promptly during an incursion response. It is easier to reduce the effort once a response it is fully established than to realise it is too late for any extra effort to be effective.
You are not alone	It is easy on an island to think you are alone and isolated. Many people across the globe know the value of islands and are willing to help. Ask for help and use experts! They are only a message away.

Section	ACTION	WHO	WHEN
5	Use a precautionary approach	Everyone	Always
5	Manage the greatest risk first	Everyone	Always
5	Work with people for island biosecurity	MoA, NES staff	Always
5	Stop invasive species before departure	Everyone	Always
5	Be seen doing the right things	MoA, NES staff	Always
5	Ensure biosecurity actions are acceptable to partners and the community	MoA, NES staff	Ongoing
5	Ensure surveillance is sensitive and timely	MoA, Biosecurity Officers	Always
5	Ensure incursion responses are swift and decisive	MoA, NES staff	Always
5	Ask for help and use experts	Everyone	Always

6 Risk pathways

Risk pathways and risk goods tables for Palmerston, Manihiki, Penrhyn and Suwarrow.

PATHWAY	FREQUENCY	POSSIBLE PESTS	RISK ϕ
Cargo vessels	4 times per year	Rats, mice	**High**
		Invertebrates	**Extreme**
		Myna	Low
		Plant pests	Moderate - High
Yachts	6-20 times per year	Rats, mice	Moderate
		Invertebrates	**High**
		Disease	Moderate
Vaka	Occasionally	Rats, mice	**High**
		Invertebrates	**High**
		Disease	Low
Cruise ships	Occasionally	Rats, mice	Low
		Invertebrates	**High**
		Disease	Moderate
Aircraft	Seldom on Penrhyn. Fortnightly on Manihiki.	Invertebrates	**High**
		Plant pests	**High**
		Rats, mice,	**Moderate**
		Pathogens	**High**
Police vessel (based on planned voyages)	Occasionally	Invertebrates	low
		Plant pests	low
		Rats, mice,	low
		Pathogens	low

Table 2: Risk pathways for Palmerston Island and Northern Group Islands

The highest risk pathways are the CIGT and Taio Shipping cargo vessels with a high to extreme risk. The Traditional Ocean Vaka also poses a high risk. Aircraft have a moderate to high risk of moving pests. Yachts and cruise ships have a moderate to high risk.

The key risk pathways to manage first are the cargo vessels and barges.

6.1 Risk-goods

The highest risk-goods for moving invasive species between islands are:

- plants,
- fruits and vegetables,
- soil, potting mix, mulch,
- building and landscaping supplies,
- animals,
- animal feed,
- heavy machinery and
- unprocessed coconut material.

These goods should be referred to as risk-goods. Wherever possible, avoid moving these goods! When they must be transported, they should be subject to controls. Cook Islands Biosecurity has biosecurity controls for plants, fruit and vegetables and animals intending to reduce the risk. More controls should be considered for soil, potting mix, mulch, building and landscaping supplies, animal feed, unprocessed coconut material and heavy machinery.

GOODS	FREQUENCY	POSSIBLE PESTS	RISK ϕ
Plants	Regularly	Invertebrates Plant pests Plant pathogens	**Extreme** **Extreme** **Extreme**
Soil (potting mix, soil, mulch etc)	Occasionally	Invertebrates Plant pests Plant and soil pathogens	**Extreme** **Extreme** **Extreme**
Coconut material (Unprocessed)	Occasionally. Regularly from Manihiki	Coconut termite, Coconut pests, Plant pests	**High** **High**
Fruits and vegetables	Regularly	Rats, mice, Invertebrates Pathogens	**High** **High** **High**
Animal feed	Occasionally	Rats, mice Plant pests	**Extreme** **High**
Animals	Occasionally	Human disease Heard disease Parasites Weeds	Moderate Low **High** **Extreme**
Heavy machinery	Occasionally	Rats, mice, weeds, invertebrates	**Extreme**
Building and landscaping supplies	With most barges	Rats, mice, reptiles Invertebrates Pathogens	**High** **Extreme** moderate
Personal effects/ luggage	Regularly	Invertebrates Plant pests Rats, mice, Pathogens	moderate moderate low low
Foodstuffs	Regularly	Invertebrates Plant pests Rats, mice, Pathogens	low low **High** low

Table 3: Risk goods for Palmerston and Northern Group Islands Group

ϕ the risk level spectrum is categorised as: no risk, low risk, moderate risk, high risk, or extreme risk.

Section	ACTION	WHO	WHEN
6	Focus on cargo vessels initially	MoA, CIGT, Taio Shipping, Te Anuanua	Immediately
6	Focus on risk-goods	MoA	Always
6	Develop and follow protocols for risk-goods	MoA, Pa Enua, CIGT, Taio Shipping, Te Anuanua	ASAP

PART II - ADVOCACY

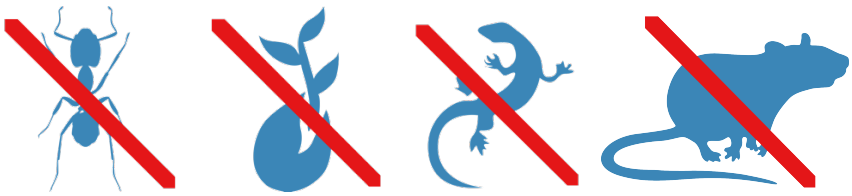
7 Information and education

7.1 Consistent key messages

Consistent, simple messaging should be used between agencies and audiences to inform people of what to do and why. Messages should be enhanced by simple, consistent graphics. These should be translated to Cook Islands Maori also.

Key messages that should be used are:

- Biosecurity is everyone's responsibility.
- Islands and their communities are special, vulnerable and must be protected.
- Pests will reduce the welfare, economy and values of the Pa Enua.
- Stop pests from getting to the Pa Enua.
- Weeds, insects and large pests can get to islands on boats or planes.
- Clean all goods going to the Pa Enua.
- Check goods before departure and keep them closed throughout the journey.
- Allow time for cleaning, checking and closing all goods.
- Avoid moving soil, plants, produce or animals to the Pa Enua as much as possible.
- Any movement of soil, plants, animals or produce requires inspections and approvals.



Examples of resources that can be adapted to suit Cook Islands' messaging requirements include The Hauraki Gulf Pest-Free information, the European and Mediterranean Plant Protection Organization's pest communication kits, Zev Landes creative communicator, US National Parks and the Nature Conservancy's Protect your Park video for the Channel Islands, the Orkney Native Wildlife Project resources, and the Pacific Invasives Initiative biosecurity poster.

Section	ACTION	WHO	WHEN
7.1	Use consistent, simple messaging with graphics	MoA, NES, TIS, Island Administration officers	Always

7.2 Audiences, means of communication and who leads the communication.

Messaging and education about biosecurity must target a variety of audiences. The table below lists many of the audiences, including internal agency staff which are often overlooked, and how the information will be provided.

Audience	Method of messaging	Who leads?
Island Communities	Word of mouth, Facebook, Messenger, posters, email	Island Administration Offices, MoA
MoA staff	Emails, meetings, plans, procedures	Biosecurity Director
NES Staff	Emails, meetings, plans, procedures	NES
Cargo vessel operators	Emails, regular contact with MoA	MoA
Cargo vessel clients	Emails, operator's website or Facebook	Vessel operator
Ports Authority	Emails, regular meetings and contact	MoA
Te Ipukarea Society	Emails, regular contact with MoA	MoA
Ministry of Health	Emails, regular contact with MoA	MoA
Supplier – CITC Building Centre	Initially meeting with MoA Educational info from NES	MoA/NES
Supplier – CITC Supermarket	Initially meeting with MoA Educational info from NES	MoA/NES
Companies managing freezers and goods for islands	Meeting – face to face, emails	MoA
Customs agents	Meeting – face to face, emails	MoA
Yacht and Launch skippers	Customs and MoA websites, Facebook	MoA (NES for Suwarrow)
Cook Islands Customs	Regular meetings	MoA
Cruise ship operators	Emails	MoA
Ministry of Finance and Economic Management	Meeting – face to face, email	MoA Secretary
Aircraft operators	Regular contact with MoA	MoA
Aircraft Passengers	Ticketing and information from airline	Aircraft operators
Police (Police vessel)	Regular meetings – face to face, email	MoA
General Public	Part of environmental campaign websites and Facebook	NES, TIS, transport operators
Rarotonga schools	Part of regular school programme	NES, MoA

Table 4: Audiences, means of messaging and who leads the communication

Section	ACTION	WHO	WHEN
7.2	Have regular meetings with primary partners	MoA	From 2023
7.2	Request partners distribute information	MoA, NES	At meetings

PART III –PREVENTION

8 Preventing invasive species getting to islands

Stopping invasive species getting to islands is the most efficient use of biosecurity effort and funding. Prevention is the combination of all actions to prevent invasive species being transported to an island. The checking of gear and vessels, and taking steps to stop invasive species being transported, should become normal behaviour.

It is important that people involved in biosecurity for Palmerston, Manihiki, Penrhyn and Suwarrow, particularly agency staff and island residents, are observed as setting that standard for prevention.

8.1 Pest surveillance at Avatiu Harbour and Port

Observational checks of the Port surroundings should be done every 3 months looking for invasive species threats within proximity of the port. This includes checking for weeds and looking for damaged plants, possibly from insects or fungi. People involved with the Cook Islands Natural Heritage Trust could potentially support this work. Assume that rats and some pest ants will be around the Port area without control and will continually re-invade. The bait station network (see 8.2, rats and mice) can also be used as check/observational sites for invasive ants round the Port area.

Ant surveillance should be carried out quarterly in the Port area. A walk-through survey should occur to detect species currently present and active. Yellow Crazy Ants (YCAs) are already known around the Port area. Note that YCAs are most active at dusk. Pottle monitoring should also occur every four months to check for new ant threats and show if control measures are effective. The table below shows the main foods and activity for high-risk ants. A combination of sugar (1:1 sugar water) and protein (peanut butter and sausage) should be used to maximise the ability to detect different species. Table 5 below shows some possible ant threats for Palmerston and the Northern Group islands. The standard MoA national invasive ant surveillance programme method should be used. There are more ants than these listed that threaten the islands, also refer to invasive species lists in Appendix 1 and the Cook Island Biodiversity database.

SPECIES	LOCATIONS[1]	DIET	PROBLEMS
Yellow crazy ant (YCA) *Anoplolepis gracilipes*	Rarotonga	Proteins and sugars (Scavenging predator) (nectar & honeydew)	Sprays formic acid. Harms crops, people, wildlife and infrastructure.
Tropical fire ant *Solenopsis geminata*	Rarotonga, French Polynesia, Samoa, Australia,	Sugars and proteins (seeds, honeydew, insects).	Painful bites and stings. Agricultural and environmental pest.
Carpenter ant *Camponotus chloroticus*	Rarotonga, Samoa, Tonga, Micronesia.	Wood	Hollows out wood. Damages buildings.
Pharoh ant *Monomorium pharaonis*	Rarotonga, Africa, Asia	Sugars and proteins.	Carries diseases.
Big headed ant *Pheidole megacephala*	Rarotonga, most of the Southern Group Tonga, Samoa, Hawaii.	Sugars and seeds.	Agricultural, domestic and environmental pest.
Not yet known to be in the Cook Islands			
Red imported fire ant *Solenopsis invicta*	USA, South America, Australia, Asia	Sugars and proteins (dead animals, insects and honeydew).	Painful sting. Stinging in swarms. Harms crops and wildlife.
Argentine ants *Linepithema humile*	New Zealand, every continent, Hawaii,	Sugars and proteins. Insects, honeydew, nectar, carrion,	Agricultural, domestic and environmental pest.
Little fire ant *Wasmannia auropunctata*	Tahiti, Hawaii, Australia, PNG, Solomon Islands	Sugars and proteins. Invertebrates and vertebrates, honeydew, nectar	Irritating sting. Agricultural, economic and environmental pest.

Table 5: A selection of invasive ants to detect and potentially control at Avatiu Port

Section	ACTION	WHO	WHEN
8.1	Undertake observational checks of the port and surroundings for invasive species.	MoA	Every 3 months
8.1	Assume rats will be present in and around the port and surrounding area.	MoA, NES	Always
8.1	Undertake surveillance for invasive ants at the port.	MoA	Every 3 months

[1] Based on information from the Cook Islands Biodiversity Database

8.2 Pest management at Avatiu Harbour and Port

8.2.1 Rats and mice

A permanent rat/mouse bait station line should be set up around the port, see the red line in Figure 1. These should extend from the port entrance area of the International Terminal to the breakwater on the Airport side of the Harbour. About twenty permanent sites, each with a plastic lockable bait station, will be needed, each spaced approximately 50m apart. Stations should be along an edge, such as a fence, building or rock wall or under a building (e.g., the Ministry of Transport or Ports Authority offices). Bait stations should hold rodent poison to target rats and mice, preferably Pestoff rodent blocks containing brodifacoum. All bait stations should be fixed in place. Baits should be replaced monthly. The Port Authority can change the baits once a month when undertaking their daily rubbish collection. Not all baits need to be changed at the same stage. A section of the port could be changed each week for example. The Ministry of Health may be able to supply baits. Disposable gloves should be worn when handling rodent poisons.

Figure 1: Aerial view of Avatiu Harbour and Port. Image supplied by Cook Islands Ports Authority

8.2.2 Ants and other insects

To stop insects, and in particular ants, from getting onto boats a combination of prevention and control should occur. A barrier insecticide (e.g., RipCord plus, Kiwicare No Bugs Super Protective Barrier spray or Termador) should be used to create a 2-3m barrier opposite, on the inland side of where ships tie-up. Do not spray immediately next to water. Check the proposed product/s are permitted in the Cook Islands. Extreme caution is needed with these products, likely to be Fipronil, a pyrethroid or permethrin, that they do not enter the water as they are highly ecotoxic to aquatic environments. Protective clothing must be worn. These sprays need to be applied in fine, dry weather and low wind, when they bind well to the ground. This product should also be applied around pallets of mooring ropes or other stevedoring equipment when stored.

Invasive species are more likely on the ground and near soil. Mooring ropes should be stored off the ground, without contacting the soil. Rubbish and refuse should be managed away from freight, mooring lines or any loading equipment. This control and prevention should extend to the yacht mooring area, as some vessels go to the Northern Group islands and or Palmerston.

People working in the Port area should also be made aware to look out for emerging queen ants prior to any sailings. This is high risk time as new colonies can easily establish.

8.2.3 Commercial operators

Commercial operators within the port areas, such as warehouses, surveying vessels or fishing vessels should also be encouraged to keep areas clean and to have traps and or bait stations in their sites or vessels. These operators may wish to become part of a Pest-free Warrant process on a voluntary basis (see section 9).

Rat, and separate mouse bait stations should be on CIGT and Taio Shipping vessels and checked regularly. Sticky boards should also be on the vessels and checked regularly for invertebrate pests such as cockroaches.

Commercial operators should manage insects in and around their worksites, including cargo storage areas. Where equipment and machinery is stored and operated, or where staff gear is stored and managed. Commercial operators should coordinate with MoA when surveys or control is being done. Any ants or insects that seem new or different, including new behaviours, should be reported promptly to MoA. Have several cans of general purpose insect spray on hand to respond to pest insects, for example an ant nest found on the fork hoist or in cargo. Keep warehouses clean and regularly swept to avoid any accumulation of seeds or soil debris.

8.2.4 Regular management of coconut material

Coconut trees exist around the sides of the Port area. Coconut leaves, coconuts and dead coconut material should be removed regularly so that coconut pests, such as coconut termites or the coconut rhinoceros beetle, have less suitable habitat to establish or spread. Coconut debris should also be cleaned from the boat ramp and adjacent intertidal area. This will also reduce food and habitat for rats and insects.

8.2.5 Regular vegetation clearance

Vegetation along the seaward side of the Port, along the stream edge, and along the road edge over the rock retaining wall should be regularly trimmed and any debris removed. This should ensure there is a clear area between any vegetation and the Port boundary. Although not all of the vegetation species are known, or if they are native to Rarotonga or invasive, it should be assumed that some of the plants are not on Palmerston or on the Northern Group islands. Managing the vegetation also reduces the chance of insects or other invasive species getting into the Port area.

Section	ACTION	WHO	WHEN
8.2	Establish a permanent bait station network around Avatiu Port.	MoA, Ports Authority	2023
8.2	Maintain bait stations and replace rodent bait.	Ports Authority	Monthly
8.2	Use an insect barrier spray near bollards and where ships tie up.	Ports Authority	Every 3 months
8.2	Use insect barrier spray around pallets of mooring ropes and stevedoring equipment.	Shipping company	Ongoing
8.2	Control insects in and around commercial worksites.	Commercial operator	Ongoing
8.2	Be on the lookout for queen ant hatches at the Port	MoA, Ports Authority	Ongoing
8.2	Encourage commercial operators in the Ports are to have traps and or bait stations	MoA, Ports Authority	Ongoing
8.2	Keep warehouses regularly swept and clean.	Commercial operator	Ongoing

8.2	Have bait stations and sticky boards on CIGT and Taio Shipping vessels and check regularly	CIGT, Taio	Monthly
8.2	Remove rubbish and keep away from cargo, stevedoring equipment or crew gear.	Ports Authority & Commercial operator	Daily
8.2	Remove coconut material around the Ports and surrounding areas.	Ports Authority, and Punanga Nui Market staff	Regularly
8.2	Manage vegetation along the edges of the Ports Area.	Port Authority	Every 3 months

8.3 Controls for moving plants, fruits and vegetables.

Plants, fruits and vegetables are a high risk of enabling the transport of insects, bugs, snails, fungi and weeds. This extends to any soil that may be on or around and plant material. **Avoid the movement of plants as much as possible**. The Ministry of Agriculture has existing controls for the movement of plants and plant propagating materials. **An internal Clearance Certificate from MoA is required** before moving plants between islands.

If plants must be moved, people should check with MoA first before deciding how and when to move the plants, and work with MoA to decide on the safest way. Source the plants from the MoA nursery. Seeds are a safer option, and again source these from MoA. **All soil must be removed from plants and many plants must be defoliated**. Ideally, MoA should be provided with a minimum of one week's prior notice.

All fruit and vegetables destined for any Pa Enua must be inspected by Biosecurity Services staff on Rarotonga prior to shipment. Inspections should also occur for any fruit or vegetation being moved between islands. Coordinate any movement of plants with the MoA representative on the Pa Enua and MoA Rarotonga.

Vessels moving Cargo to the Pa Enua will not load plants, fruits or vegetable without having an inspection and Clearance Certificate. These controls may also be stated in Biosecurity Pest-free declared area notices, see section 8.8, or in a Pest-Free Warrant notice, see section 9.

The process and Internal Certificates is described in the Manual of Biosecurity Procedures for the Cook Islands (MoA 2015).

Section	ACTION	WHO	WHEN
8.3	Avoid the movement of plants as much as possible.	Everyone	Always
8.3	Check with MoA before deciding on moving plants to other islands.	Pa Enua, NES and individuals	Always
8.3	Move seeds in preference to entire plants and source from MoA.	Pa Enua, NES and individuals	Always
8.3	Remove all soil and defoliate plants before moving.	Pa Enua, NES and individuals	Always
8.3	Inform MoA an approval to move plants is required.	Pa Enua, NES and individuals	One week before movement

8.3	All fruit and vegetables must be inspected and obtain an internal certificate to move by MoA.	Pa Enua, NES and individuals	Before movement
8.3	Companies and crew will only load plants, fruit or vegetables onto vessels with an internal certificate.	Shipping company	Before loading.

8.4 Controls for moving live animals.

Moving live animals could have very serious consequences. These include moving:

- Diseases or parasites that can affect human health (e.g., Brucellosis or bird flu).
- Diseases that can affect entire herds and/or multiple species (e.g., African swine fever, or swine influenza).
- Diseases or parasites that affect the health and productivity of animals, such as fowl pox, ticks, lice or worms.
- Weeds, either as seeds on the skin/fur, or from passing out weed matter they have eaten.

Testing for multiple diseases in Rarotonga, or on the Pa Enua, will be difficult with limited experts and facilities available. The best thing to do in most cases is to use a precautionary approach. Whenever possible, avoid moving animals to or between islands. If animals must be moved, follow a clear process. There are current controls for the movement of animals and livestock.

Any live animals to be moved to the Pa Enua must inspected by the Advisory service of MoA prior to transport. Any movement of animals between the Pa Enua, or from Pa Enua to Rarotonga must be inspected by islands Agriculture staff prior to transport.

Only animals already present on the island, and allowed by the Pa Enua, will be allowed to be transported. **Shipping companies will not load or transport animals without an inspection by and an Internal Clearance Certificate from MoA**.

If animals must be moved, check with MoA staff first before deciding how and when to move them, and work with MoA to decide on the safest way. A vet may be involved at the discretion of MoA. Each situation will be different. Following the suggested controls process, shown in Appendix 3, will help to minimise risks.

REF	ACTION	WHO	WHEN
8.4	Use a precautionary approach to the movement of live animals.	MoA	Always
8.4	Avoid moving live animals if possible.	MoA & Pa Enua	Always
8.4	Only animals that are already present on the island, allowed by the Pa Enua and cleared by MoA, will be allowed.	MoA	Always
8.4	Any live animal being moved to the Pa Enua must be inspected.	MoA	Always
8.4	Follow the suggested controls prior to departure and once on the island.	MoA	Always

8.5 Controls for risk goods

8.5.1 Items that should be considered as risk goods

Some of the highest risk-goods for transporting pests are soil, potting mix, mulch, unprocessed coconut wood or fibre, landscape and building supplies and heavy machinery. These are highly likely to have insects, spiders, bugs, weeds, fungi or other invasive species. These goods also have a higher risk of

transporting rats and mice. The movement of these items should become controlled, similar to the movement of animals or plants, vegetables and fruit. Note that processed products, such as rito, are a much lower risk than the raw fibre or wood.

For soil or potting mix, if it must be taken to the island, it is safest to use the Yates Black Magic mix which comes in sealed bags and has been found to have the least weed issues in the MoA Nursery. Ideally buy the soil/potting mix through MoA or through CITC if it becomes a Pest-Free Warranted business. Do not take bags that are split or damaged or are dirty with contaminated soil from other open bags. Any potting mix or soil taken to the island should only be used in designated areas to restrict any weed issues and simplify surveillance.

In the case of coconut wood or fibre there is a chance of transporting pests such as coconut termites or the coconut rhinoceros beetle. The termite is present on Suwarrow, Pukapuka and Nassau. Avoid taking any coconut material to Palmerston, between any of the Northern Group islands or back to Rarotonga. Links for factsheets on the coconut termite and coconut rhinoceros beetle are given in Appendix 2.

Building and landscaping supplies have a high-risk profile because of the association with bare soil and disturbance, the large volume and inability to package them well, and with all of the places that are suitable for invasive species.

These include pellets (e.g., pig pellets) and hay or straw. These are desirable for mice and rats and can also harbour many weed seeds or insects. Taking products that are fully sealed reduces the risk. Hay and or straw will remain a high risk especially for weeds and insects and should be avoided if possible.

Heavy machinery, such as tractors, diggers, loaders, cranes, dump trucks etc., is a risk because of the large size, association with disturbed soils, difficulty to clean and the places invasive species could hide.

8.5.2 Suggested controls for risk goods

The table below indicates the goods discussed in 8.5.1 and suggests possible controls. These would be in addition to the existing controls for plants, fruit and vegetables, and live animals. This is intended to start a discussion, rather than set rules.

Risk good	Potential controls
Compost, potting mix, or soil	Transport only in commercially sealed bags, that are completely sealed (i.e., no cut, rip or tear), and from a list of suitable products available form MoA.
Coconut material	Do not transport unprocessed coconut material, nuts or leaves, without an Internal Clearance Certificate from MoA.
Animal feed	Transport only in bags, that are completely sealed (i.e., no cut, rip or tear), and from a list of suitable products available from MoA.
Hay or straw	Only transport with an Internal Clearance Certificate from MoA.
Heavy machinery (tractors, diggers, loaders, cranes etc.)	Must be water-blasted and made free of all soil, plant material and seeds.
Building and landscape supplies (including tools)	Clean and check thoroughly. Bang and shake to check for stowaways. Keep sealed if possible. MoA may require an Internal Clearance Certificate.

Table 6: Risk goods and possible controls to discuss.

REF	ACTION	WHO	WHEN
8.5	The transport of soil, potting mix, mulch and unprocessed coconut should become controlled	MoA	As soon as possible
8.5	Use Yates – Black Magic potting mix in sealed containers if possible	MoA, Pa Enua	Always
8.5	Only take goods in sealed bags or containers	MoA, Pa Enua	Always
8.5	Only use imported soil or potting mix in designated areas on the islands.	Pa Enua	Always
8.5	Consider formal controls for risk goods	MoA	From 2023

8.6 Collaboration with shipping companies

Shipping companies are an essential partner in keeping islands pest-free. See section 9 about the Pest-Free Warrant.

8.7 Collaboration with suppliers

Suppliers in Rarotonga, such as the CITC supermarket or building centre businesses, should be encouraged to ensure goods going to Palmerston, or any of the Northern Group islands, don't have invasive species. This includes informing suppliers what the required controls are, and finding out from the suppliers how they can help. It is important to build partnerships for the protection of the islands.

Try and find out if there is an area where goods destined for the islands, can be stored and better managed to protect the goods from pests. This may involve a secure area or an area that receives regular pest control and is free of possible pest contamination.

Suppliers should be encouraged to join the Pest-Free Warrant system (see section 9), or a similar system, if possible.

Suppliers should receive information, for example posters or web-based graphics, both to educate the staff, and to pass on to clients about keeping the islands free of invasive species.

In return, the suppliers making the effort to help protect the islands, should be used as preferred suppliers by the residents of Palmerston, and potentially the Northern Group islands. Posters or stickers, and some kind of online icon or logo, should be displayed by the supplier to show clients they are a collaborating supplier. Information about partnered supplies should also be displayed via Facebook and on websites.

Section	ACTION	WHO	WHEN
8.7	Collaborate with suppliers.	MoA	Ongoing
8.7	Consider storage sites for island supplies that are secure from pests.	MoA, Suppliers	From 2023
8.7	Provide suppliers with information to pass onto their staff and customers.	NES, MoA	Ongoing
8.7	Use collaborating suppliers as preferred suppliers.	Everyone	Always
8.7	Display information to show the business is a pest-free partner.	MoA, Suppliers	Once registered

8.8 Possible declaration of Pest-free biosecurity-controlled areas

Within the Biosecurity Act 2008 there is a possibility to declare pest-free biosecurity areas under Section 64 of the Act. If this is considered possible, both Palmerston and Suwarrow should be declared as pest-free, assuming the Palmerston eradication will be successful. In addition to declaring the areas as free of rats they could also be declared for a variety of pests such as mice, yellow crazy ants, carpenter ants, big headed ants or lantana. Coconut termites could be declared for Palmerston, but they are present on Suwarrow. Such a declaration would require the support from NES, regarding Suwarrow, or any Pa Enua for any other island declaration.

Consideration should also be given to declaring Avatiu Ports as a biosecurity pest-free area for the purpose of protecting Palmerston Island, Suwarrow Island and other islands.

If the Islands are declared pest free for the listed pests, controls could be stated for the required management. For example, vessels or craft must be maintained free of the declared pests. Although the actions would protect the islands from the stated pests it is also likely to offer protection from a large suite of pests.

To help with considering declaring a pest-free biosecurity controlled area and assist with discussions, a hypothetical draft is shown in Appendix 4.

It is the Secretary of the Ministry of Agriculture who would declare a pest-free biosecurity, and notify the public, once satisfied that the requirements within the Act have been met.

Section	ACTION	WHO	WHEN
8.8	Consider declaring biosecurity pest-free areas for Palmerston, Suwarrow and Avatiu Ports.	MoA Secretary	2024

9 Pest-Free Warrant

The Pest-Free Warrant system has originated in the Auckland Hauraki Gulf area and has been running for around 13 years. The system is managed between Auckland Council and NZDOC. The Warrant system is a process of certifying businesses that transport people or goods to islands, work on the islands, or provide supplies to the islands. It would be possible to use this system within the Cook Islands. Either by using the concept, see the image to the right as a mock example, or by picking up the Hauraki Gulf's system entirely.

Figure 2: Pest-free Warrant logo from Auckland of a Cook Islands alternative.

Pest-free Warranted operators are treated as partners in protecting places, not as subordinates.

The key focus should be on operators or suppliers who go to, or supply goods to, Palmerston Island or the Northern Group. The highest priority being CIGT and Taio Shipping and aircraft companies servicing Manihiki and Penrhyn. Voyaging vaka could also become certified.

There are four key components to the Pest-Free Warrant system:

1. The operator/supplier must supply relevant biosecurity information to clients. With the initial information normally supplied by the lead agency to the operator or supplier.
2. The operator/supplier must control pests on the vessel/s and at operational sites including storage areas.
3. The operator must not transport risk-goods or declared goods without the goods having an inspection and authorisation.
4. The operator or supplier must report pests that have been intercepted.

Businesses are assessed annually to ensure ongoing familiarity and compliance with the system. There is no charge for the Pest-Free Warrant system. It is in MoA's and the Islands' interests that the operators feel they are a partner protecting the islands.

If or when such a system is adopted, it is important for the residents or providers of/for the islands to use the certified operators as preferred suppliers.

MoA staff could be trained in the Pest-Free Warrant system in Auckland by NZDOC or Auckland Council staff when training occurs with NZ Ministry of Primary Industries. This would need to be through a formal request to NZDOC and/or Auckland Council's Pathways team.

Section	ACTION	WHO	WHEN
9	Consider implementing a Pest-Free Warrant system in the Cook Islands.	MoA	2023-2024
9	Liaise with NZDOC and NZ Auckland Council regarding the Pest-Free Warrant processes and material.	MoA	From 2023

10 Prevention on islands

10.1 Biosecurity controls on Palmerston Island

The Palmerston Biosecurity Officer must be familiar with this section (10) of the Plan and discuss with the residents of Palmerston of what is needed from them.

With no wharf at Palmerston Island, all unloading goes through a similar process regardless of the vessel arriving at Palmerston. Goods are loaded into small open Palmerston based vessels, which take the goods through the reef and to the landing site on Home Island. No unloading occurs without the approval of the resident MoA Biosecurity official.

It is important that the Biosecurity Officer pre-prepares the landing site with response equipment, goes to the vessel to authorise the unloading, and then returns to the landing site to give clearance of goods after inspection.

All tenders should be checked for pests before loading begins, after each load and when finished. Any goods going back to the main vessel, to go elsewhere, should also be carefully checked for pests and sealed.

The vessel and goods, particularly any risk-goods, should be visually inspected prior to loading the Palmerston tenders. If any goods have any evidence of pests, they must be rejected and not transported to the island. Only after a thorough inspection to ensure no pest is amongst the suspect goods can it be repackaged and transported to the island. If there is no secure space to do this on the boat, the suspect goods cannot go onto Palmerston Island.

Once the tenders have transported goods to the loading site it is still important that every person is vigilant about pests, including any evidence of rats, mice, gecko, ants, fruit fly, beetles, other insects, bugs, snails, fungi, weeds, seeds or mould.

Dedicated biosecurity buckets should be at the landing site and have fly spray, bug bombs and polythene in case anything is detected. The polythene can be used to contain items with a suspected pest, e.g., beetle or gecko, to stop it from escaping. The buckets should be labelled “Biosecurity Response” and be clearly visible.

Items must be checked for pests before they leave the landing site. Avoid offloading at sunset if it means goods would need to be checked at night.

Sealed containers are the best way to pack and send goods. Sealed containers will generally not need to be opened at the landing site but a visual check of the outside of the container is required to check for any external pest that the container is no longer sealed or has been opened. All families/households should have a biosecurity container to seal items if anything suspicious is found when opening goods.

If something suspicious is detected, seal up the container or item. Write down or record (video or voice recording) what was seen. Do not open the item until the Biosecurity Officer has been informed and is present or authorises the container to be opened in a controlled manner.

Everyone on the island must be on the lookout for pests or unusual animals or plants when vessels are delivering goods to the island and for a period, 1-2 weeks, afterward. That includes looking for evidence of a wide range of pests, from rats to mosquitos.

Section	ACTION	WHO	WHEN
10.1	Discuss biosecurity awareness with the community	Biosecurity Officer	Ongoing
10.1	No unloading occurs without the approval of the resident Biosecurity Officer.	Biosecurity Officer	Always
10.1	Pre-prepare the landing site before offloading goods.	Biosecurity Officer	Always
10.1	Goods going off the island must also be checked and sealed	Biosecurity Officer	Always
10.1	Isolate and seal any suspicious items	Everyone	Always
10.1	Remain vigilant regarding pests	Everyone	1-2 weeks after ship arrives

10.2 Biosecurity controls for Suwarrow National Park

A biosecurity plan exists for the Island of Suwarrow, highlighting risk pathways by which pests could invade Suwarrow and tasks that are required to minimize the introduction of pests to the island.

Suwarrow is not an official port of entry to the Cook Islands. However, vessels have used Suwarrow as a port of first arrival and are therefore subject to border control requirements. All vessels travelling to outer islands, including Suwarrow, are subject to MoA internal controls. As Suwarrow is a National Park it is also subject to controls under the Conservation Act 1986/1987, managed by NES.

Known pests on Suwarrow, based on the Cook Islands Biodiversity Database, include coconut termites, yellow paper wasp, chaff-flower weed, hairy spurge, tree hibiscus, bitter Phyllanthus, wild cape gooseberry and weedy pigweed. Black scorpions are probably native to Suwarrow but are unwanted elsewhere. At the time of writing this plan the outcome of the last eradication attempt for Pacific rats in 2022, is still unknown. Yellow paper wasps are only found on Suwarrow, Palmerston and Rarotonga but not on any of the other Northern Group islands. Coconut termites are only found on Suwarrow, Nassau and Pukapuka.

The largest threat to Suwarrow is the movement of goods for the Ranger Station. Risk-goods such as building supplies should be cleaned and inspected before transit. Ideally no soil or plant material should be moved. If plant material or soil must be taken it must be subject to rigorous quarantine protocols. No live animals should be taken to Suwarrow.

The movement of items back to Rarotonga, or other islands from Suwarrow also has a risk of transporting invasive species such as coconut termites, wasps, weeds or black scorpion, which could become a threat to other island communities.

All vessels arriving at Suwarrow must be subject to a) completing arrival paperwork, and b) inspections before any person may be allowed on to Suwarrow. Visitors should be encouraged to arrive on the island with minimal gear, in closed bags, to reduce the threat of invasive pests arriving, or leaving the island.

Section	ACTION	WHO	WHEN
10.2	Follow Suwarrow biosecurity plan and internal controls for Suwarrow	NES, MoA	Always
10.2	Consider a Biosecurity Pest-free area declaration for Suwarrow.	MoA, NES	2023-2024
10.2	Avoid moving soil, plants, or unprocessed coconut materials to or from Suwarrow.	NES, NES Ranger	Always
10.2	Encourage visitors to have minimal gear and to transport gear in closed bags.	NES, NES Ranger	Always
10.2	All food and animal on deck be moved below deck prior to arrival to Suwarrow.	NES Ranger	Always

10.3 Biosecurity controls on Manihiki Island

10.3.1 Manihiki context

Manihiki has a population of 166. The CIGT cargo barge arrives every 2-3 months. Planes arrive approximately every two weeks. Currently fruit and vegetables come on every flight and barge, building supplies come on every barge. Animals arrive 1-2 times per year. Large machinery soil, potting mix or mulch also arrives 1-2 times per year. An upgrade of the Manihiki Airport is currently planned. Planes and the CIGT barge arrive at Tukao.

Goods being sent to Rarotonga or other islands include animals (6-7 times per year), plants, Uto (coconut embryo) on every barge, plants, large machinery, tamanu, logs and Rito.

Biosecurity staff on Manihiki indicate that the residents have a moderate understanding of MoA regulations for moving plants, animals, fruit and vegetables yet they have a good level of compliance with the regulations. Fruit-fly are a perceived threat for the residents.

The highest biosecurity risks are perceived to be via the cargo shipping between islands. Manihiki is currently serviced on the CIGT supply route that travels from Rarotonga to Manihiki, then onto Rakahanga then Penrhyn before returning to Rarotonga.

Invasive species on Manihiki are shown in Appendix 1, many of which do not occur on either Rakahanga or Penrhyn. These include the carpenter ant, Dengue mosquito, longhorned crazy ant, mice, grey sugarcane mealybug, and many weeds. Pacific rats are also present.

Pigs, chickens and cats are the domestic animals present on Manihiki. Hermit crabs and coconut crabs are also present. The domestic animals and crabs will affect invasive species surveillance on the island by interfering with baits, potentially being caught by traps, moving devices and potentially modifying pest behaviours.

10.3.2 Controls on Manihiki Island

The existing controls around the movement of plants, fruit and vegetables and live animals are useful and should be enforced. This also applies to goods leaving Manihiki going to other islands. Controls

around soil, mulch and potting mix should also be considered. These items, as well as building supplies, landscaping supplies and heavy machinery should be inspected.

Biosecurity controls should also be included in any infrastructure projects, including in contracts.

If possible, gear should be inspected, preferably on the vessel before coming ashore, or the next best, at a designated landing site at Manihiki. The landing site should be located away from dense vegetation and have a container to seal any contaminated or suspicious items.

The landing site should be checked for invasive ants and other species every 3 months and coincide with the barge schedule. MoA's surveillance protocol for ants, using pottles, should be used as well as visual searches.

Section	ACTION	WHO	WHEN
10.3	Discuss biosecurity awareness with the community	Biosecurity Officer	Ongoing
10.3	Use existing controls for plants, fruit and vegetables and live animals.	MoA, Biosecurity Officer	Always
10.3	Inspect risk goods prior to departure from Manihiki	MoA,	Always
10.3	Inspect goods on arrival on the vessel or at a designated landing site.	Biosecurity Officer	Always
10.3	Have a biosecurity response container where the biosecurity checks are occurring.	Biosecurity Officer	Always
10.3	Survey the landing site and surrounds for ants and other invasive species	Biosecurity Officer	Every 2-3 months

10.4 Biosecurity controls on Penrhyn/Tongareva Island

10.4.1 Penrhyn context

Penrhyn/Tongareva has a population of 226 (in 2016)[2]. The CIGT cargo barge arrives every 3 months and aircraft about every 2 months. Other vessels with goods or people arrive about twice a year. Fruit and vegetables and building supplies arrive with the cargo barge. The Tongoreva Airport and shipping arrivals are at Omoka.

Fish and plants are sent from Penrhyn to Rarotonga on the CIGT barge. Residents have a moderate level of knowledge about biosecurity control but a poor level of compliance with the regulations for moving animals, plants or fruit and vegetables.

The community is concerned about the possible arrival of the coconut rhinoceros beetle and believe it would most likely come from Rarotonga. Any invasive pests on coconut plants will affect rito and other coconut products.

Domestic animals present on Penrhyn include cats, chickens and pigs. Hermit crabs, coconut crabs, tupa (crab) and geckos exist on the island and would interfere with potential surveillance tools.

Penrhyn is serviced on the CIGT supply route that travels from Rarotonga to Manihiki, then onto Rakahanga, then Penrhyn before returning to Rarotonga. Any invasive species on Manihiki and Rakahanga Islands are potential threats to Penrhyn. The invasive species on Penrhyn are shown in Appendix 1. Benjamin fig, puncture weed, the Australian cockroach and giant clam shrimp only occurs

[2] Sourced from www.mfem.gov.ck on 15th May 2023

on Penrhyn and does not occur on Rarotonga, the other Northern Group islands or Palmerston. Therefore, the invasive species on Penrhyn are a threat for Rarotonga and thereafter all other islands.

10.4.2 Controls on Penrhyn/Tongareva Island

The controls for Penrhyn are the same for Manihiki.

The existing controls around the movement of plants, fruit and vegetables and live animals are useful and should be enforced. This also applies to goods leaving Penrhyn going to other islands. Controls around soil, mulch and potting mix should also be considered. These items, as well as building supplies, landscaping supplies and heavy machinery should be inspected.

Biosecurity controls should also be included in any infrastructure projects, including contracts.

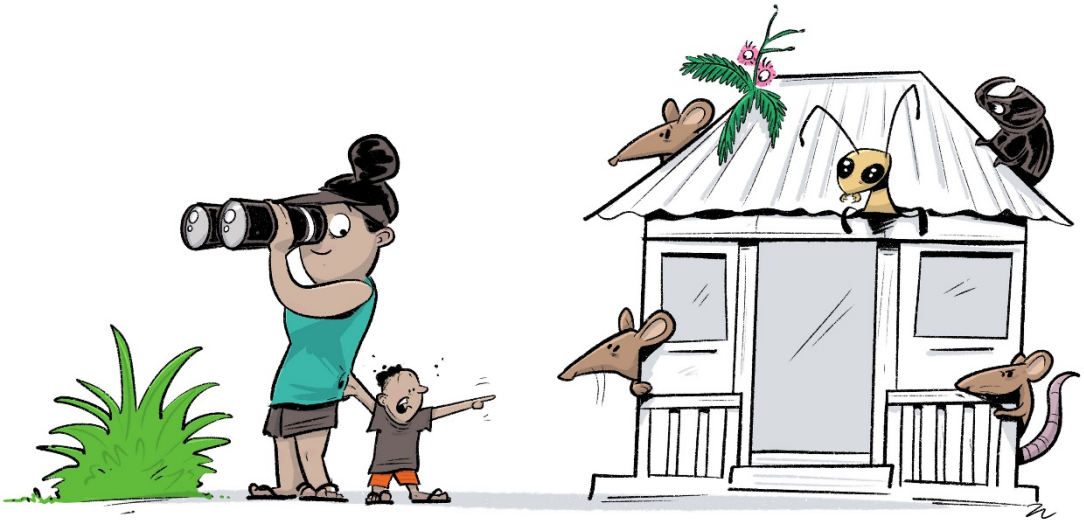
If possible, gear should be inspected, preferably on the vessel, or the next best, at a designated landing site at Penrhyn. The landing site should have a container to seal any contaminated or suspicious items.

The landing site should be away from any dense vegetation and checked for invasive ants and other species every 3 months and coincide with the barge schedule. MoA's pottle monitoring protocol for ants should be used as well as visual searches.

Section	ACTION	WHO	WHEN
10.4	Use existing controls for plants, fruit and vegetables and live animals.	MoA, Biosecurity Officer	Always
10.4	Inspect risk goods prior to departure from Penrhyn	MoA, biosecurity Officer	Always
10.4	Inspect goods on arrival on the vessel or at a designated landing site.	Biosecurity Officer	Always
10.4	Have a biosecurity response container where the biosecurity checks are occurring.	Biosecurity Officer	Always
10.4	Survey the landing site and surrounds for ants and other invasive species	Biosecurity Officer	Every 3 months

PART IV – SURVEILLANCE

Although pest prevention aims to minimise the risk of pests arriving it is still essential to detect pests if they arrive. This includes finding re-invading rats and invasive species that have never arrived before. This can be done using detection devices or via observations.



11 Observations

Observations are the most powerful and frequent surveillance tool to cover a range of invasive species on inhabited islands. There are nearly 250 invasive species noted between Rarotonga, Palmerston and the Northern Group islands. People are the most important surveillance tool. No device can detect so many pests. People need to make sure they are alert and looking in the right places.

Residents are likely to be the first people to see any sign of rodents or other invasive species if they arrive or establish. Pests are most likely to arrive with people and their goods, and initially be around the areas with people. Residents need to know what rodent sign looks like and which other invasive species to look out for. Training should be made available to key staff and residents so that they can recognise evidence of invasive species. This information should be passed on within the community. Evidence includes chewing on wires and food, droppings, any nest like material, birds being killed, or ants in places or with behaviours that haven't been noticed before.

Some resources regarding field the sign and identification of pests include the Pest Detective website for rats and mice, the Pacific Invasives Ant Toolkit and the Cook Islands Biodiversity Database. See Appendix 5 for further resources.

From other inhabited or frequently visited islands it has been shown that while observations are very useful, they are less accurate. Training of key people to detect invasive species, to communicate with others about pests, and to interview and verify people who have observed a suspected pest is necessary to prevent wasting time and resources responding to pests that may not be present.

The Biosecurity Officer should work with each family, individually or collectively, and the school, at least annually and preferably every six months to familiarise, or re-familiarise, all residents with possible signs of pests.

As important as identifying a possible new pest, is knowing what to do, and when, if a pest is detected or suspected. The Biosecurity Officer is the first point of contact on the island for any new or suspected pest, which should be reported immediately.

Section	ACTION	WHO	WHEN
11	Provide training for key staff and residents to recognise evidence of invasive species.	MoA, NES	Ongoing
11	Trained staff and residents should pass on information within the community to the school and families.	Biosecurity Officer, interested residents	Ongoing
11	Train key staff how to communicate and interview others to verify observations.	MoA	From 2023
11	Use the Biosecurity Officer on the island as the initial point of contact for reporting invasive species	Island residents	Ongoing

12 Surveillance on Palmerston Island

Surveillance on Palmerston Island should aim to detect:

- Rats
- Mice
- Invasive ants
- Thrips and shield bugs
- Coconut rhinoceros beetle
- Coconut termites
- Disease carrying mosquitos.
- Weeds
- Animal diseases

Non-target species that may interfere with, or be harmed by surveillance methods on Palmerston Island include children, pigs, chickens, crabs, ants and lizards.

12.1 Surveillance for rats and mice

The surveillance for rats and mice on Palmerston is influenced by the presence of hermit crabs, chickens, pigs, cats, ants and children. Better knowledge of the interaction between these non-target species and the various surveillance tools will help refine the surveillance regime over time. Options of tracking cards, traps, wax-tags, and cameras were considered and aren't deemed suitable for widespread, ongoing surveillance. Chew cards are considered viable, but this too may require refinement for the Palmerston situation.

Paying attention to detail is critical for all biosecurity components, including surveillance. An eradication mindset is needed – that each device has the highest chance of detecting the target pest. Every device or tool needs to be used and managed so that any pest present is detected.

12.1.1 Network

A network of permanent surveillance sites should be set up. This network can also be used during an incursion response. The network should include:

- Approximately 20-25 sites around the perimeter of the island, around 100m apart.
- A site at each house or communal building
- A site, or sites, at the nursery
- A site where pigs are often fed.
- A site, or sites, at other known food sources for rats, e.g., fruit trees, chicken roosts, or bird colonies.

In total there is likely to be 40-50 sites. Each site should be permanently marked and have a unique site number. Numbered cattle tags work well for this. Each site will have a wooden tracking tunnel. These won't be used for tracking during surveillance initially but need to be at the sites in case of an incursion (see section 14.3). Using permanent sites also allows general invasive species observations at each site.

12.1.2 Chew cards

Chew cards are a piece of core-flute plastic with a lure pressed into the small internal sections of the core-flute. For rats and mice, the lure is usually peanut butter. To access the peanut butter rats and mice bite into the card, leaving evidence of either a rat or a mouse. A useful guide to the interpretation of bite marks, including rats and mice, has been prepared by Landcare Research in New Zealand and can be accessed online[3].

Figure 4: Chew card deployed on a tree.

On Palmerston the chew cards could be nailed up the trunk of a tree or onto a piece of wood to minimise interference by crabs, but still allow access for rats or mice.

Chew cards can either be bought from New Zealand pre-loaded with peanut butter[4] or can be made up on the island. There are instructions to make the cards[5] but they can also be made longer and thinner (see image above). Chew cards can be constructed from old signs, but it is essential to ensure pests aren't hiding in the small holes before being transported to Palmerston. Either the 90mm x 180mm size (see Predator Free NZ - How to make chew cards) or 80mm x 200mm size (image above) will suffice, with the latter allowing for 180 chew cards from one (1200 x 2400mm) sheet of core-flute. This means two sheets would be enough for the monitoring for a year. Pre-purchased cards would be best stored frozen to increase their shelf-life. If making up the cards on Palmerston, using a crunchy peanut butter can help to minimise the impacts of ants. Chew cards can also be an additional surveillance for some invasive ants.

For each surveillance event the chew cards should be placed out and left for one or two nights. This will be informed and refined in future by looking at the level of interference over two nights. Record the dates the cards were placed out and retrieved. When placing the chew cards each card should be labelled with the site number. After the 1-2 nights the cards should be collected. When collecting cards inspect each card for evidence of rats or mice. If there is any suspected rat or mice damage, photograph the card, including the site number, as a backup in case the card is lost or damaged. Also note and record the level of damage or interference from other animals. Keep the cards from any surveillance session as a set.

Cards should be rechecked back at a base once collected, ideally by a second person. The set of cards should be kept for 3 months as a reference, if needed, in case rat or mouse sign is later found.

12.1.3 Frequency

The frequency of surveillance on Home Island will depend on how often vessels come to Palmerston, primarily vessels with cargo for the island. Surveillance with chew cards should occur within 1-2 weeks of a vessel bringing goods or cargo to the island. This is likely to be 3-6 times per year. However, island residents, and especially the Biosecurity Officer, should be always alert for any evidence of rats or mice.

Surveillance on other islands or motu around the atoll should occur when groups go to those places. Chew cards can easily be placed out and checked within 1-200m of the key landing sites on each motu.

[3] https://www.landcareresearch.co.nz/discover-our-research/biodiversity-biosecurity/animal-pest-management/chewcards-for-detecting-animal-pests/
[4] https://www.connovation.co.nz/products/chew-cards
[5] https://predatorfreenz.org/wp-content/uploads/2021/09/How_to_make_chew_cards.pdf

Surveillance for rats and mice needs to be ready to begin on Home Island approximately two to three weeks after the rat eradication on Home Island has been completed.

Section	ACTION	WHO	WHEN
12.1	Pay attention to detail for surveillance	Palmerston Biosecurity Officer	Always
12.1	Establish a network of 40-50 permanent sites with a numbered marker.	Palmerston Biosecurity Officer	2 weeks after eradication
12.1	Place a wooden tracking tunnel at each site	Palmerston Biosecurity Officer	2 weeks after eradication
12.1	Use chew cards for surveillance monitoring, placing the out for 1-2 nights before retrieving	Palmerston Biosecurity Officer	1-2 weeks after each supply boat.
12.1	Check cards at the site and again back at a base	Palmerston Biosecurity Officer	When retrieving cards

12.2 Surveillance for other pests on Palmerston

Surveillance for horticultural pests, coconut rhinoceros beetle, coconut termites, weeds and animal diseases will be via observations from the Palmerston Biosecurity Officer and the community (see section 11). The island nursery will be a key surveillance site for horticultural pests. For animal diseases the most important period is when animals have recently arrived on the island, and this should be done with the animal's owner. For disease carrying mosquitos the Ministry of Health representative on Palmerston would take the lead for surveillance. Information on a selection of invasive species is available in Appendix 2. Ants will have structured monitoring due to the high risk, high impacts, and the difficulty to detect ants via observations alone.

12.2.1 Ant monitoring

According to the Cook Island Natural Heritage database, Palmerston Island already has seven species of invasive ants. Rarotonga has 24 species of invasive ants, including yellow crazy ants, longhorned crazy ants, robust crazy ants, big headed ants, Pharoah ants and instances of Tropical fire ants arriving. Pukapuka also has eight ant species not on Palmerston, including woolly ants that aren't on Rarotonga.

Pottle monitoring, using ~30ml pottles with a combination of a) 1:1 ration sugar water and a small amount of cotton wool, and b) a sausage meat paste, will be used. This method can detect most, but not all (e.g., Carpenter ants), invasive ants on Rarotonga or on other Pa Enua. MoA has a protocol for ant pottle monitoring which can be used. The chew cards to detect rats and mice may also detect some ant species.

Monitoring should occur within 1-3 days after goods have arrived. Pottles should be placed across the landing area at approximately 5m spacing. This should include a line of pottles going down the edge of the coastal vegetation edge and the access road heading to the village, each about 50m long.

Approximately 200 pottles should be on the island to enable pottle monitoring. About 80 pottles would be needed for the landing areas and lines of pottles. Do not use sunscreen or any other chemical lotions before handling pottles.

If any risk-goods have arrived, then the areas where these have been moved to should also be surveyed using the pottle monitoring method.

The Biosecurity Officer on Palmerston should become familiar with identifying key features and behaviours of invasive ant species. To aid identification, a high-quality clip-on macro lens for a smart phone camera is useful. So is a jeweller's loop. The Cook Islands Biodiversity database is a useful

resource. Ant monitoring guides have also been provided by Key Industries in New Zealand. The Pacific Invasives Ant Toolkit is a useful resource.

If any new invasive ant species are detected contact MoA in Rarotonga immediately. Take accurate photographs and records. See section 14 about responding to an incursion.

12.2.2 Active surveillance for weeds.

Active surveillance is well described by NZDOC in their Conservation Weed Management SOP (2008), DOCDM-231178. It is more efficient to treat weed species when they are found. Active surveillance is a planned activity that focuses on places of interest and species that haven't been found on the island previously. For Palmerston, Manihiki, Penrhyn or Suwarrow, even plants native to Rarotonga or other islands could become invasive.

As a summary island biosecurity active surveillance is:

- A planned activity, targeting specific sites on islands to detect **new incursions** of invasive plants.
- Carried out by people who are equipped to respond immediately.
- An attempt to eliminate the pest plants at the same time they are discovered on the island/s.
- Focused on vulnerable sites.

The focus areas include:

- Landing sites
- The first section of roads or tracks after the landing area
- Gardens, nurseries or horticultural sites
- Previously disturbed sites from building or infrastructure projects
- Sites where risk-goods have been moved to (e.g., where live animals have been released)
- Sites where goods arrive on the other motu.

The surveillance is done by visual searching. The intent is to treat any small-scale new weed infestations straight away. Treatment can be by hand pulling, herbicides, cutting or a combination. If large infestations are found this method becomes unsuitable. An active surveillance kit should be arranged for the island. This should include secateurs, loppers, a tarpaulin to cover plants, herbicide gel, herbicide spray, safety equipment and a list or booklet of weeds of concern. NES already has lists of environmental weeds which could be provided. Photographs should be taken of any suspected weeds on the islands. The photos should be of the plant and of the site. Photos of the plants should be sent to the Cook Island Natural Heritage Trust for formal identification and adding to the database. Because residents live and work in the same areas there is also a level of fortuitous or accidental weeds surveillance occurring.

Some of the more significant weeds to be aware of include the 36 species listed in Table 7 below. These are listed as the most serious invasives and occur on Rarotonga and no more than two of the other islands covered in this plan.

African Tulip-tree	Jambolan
Albizia	Lantana
Bay-rum tree	Leucaena
Bisset's Bamboo	Mile-a-minute Weed
Calopo	Night-blooming cestrum
Cecropia	Red passionfruit
Centro butterfly-pea	Red Strawberry-guava
Cockleburr	Red-bead tree
Comb Hyptis	Rose apple
Crassicarpa	Sensitive weed
Dodder	Spanish clover
False Elephant's foot	Sudan Grass
Giant Reed	Surinam Cherry
Grand balloon-vine	Tree marigold
Hard passionfruit	Triumfetta weed
Honolulu rose	Tropical Kudzu
Indigo	White ginger
Inkberry	Wild basil

Table 7: Highly invasive weeds to look out for

Surveillance for weeds should be reported on in the Biosecurity Officer's monthly reports to MoA.

Section	ACTION	WHO	WHEN
12.2	Surveillance of most invasive species and disease is via observations.	Palmerston Biosecurity Officer	Ongoing
12.2	MoH will take the lead on disease carrying mosquitos.	Palmerston Nurse	Ongoing
12.2	Undertake pottle monitoring for ants.	Palmerston Biosecurity Officer	When goods arrive.
12.2	Become familiar with identifying ants.	Palmerston Biosecurity Officer	Ongoing
12.2	Focus on key risk sites for weed surveillance.	Biosecurity officers	Ongoing
12.2	Arrange a kit for active weed surveillance for each island.	MoA, NES	2023-2024
12.2	Provide identification resources for invasive weeds	NES, MoA	2023-2024
12.2	Take photos of new weeds on islands and send to CI Natural Heritage Trust.	Biosecurity officers	ongoing
12.2	Become familiar with the key surveillance weeds.	Biosecurity Officer	Ongoing
12.2	Include weed surveillance in monthly reports.	Biosecurity Officer	Monthly

13 Surveillance on Manihiki, Penrhyn and Suwarrow

The surveillance on Manihiki and Penrhyn is a copy of the description and actions noted in section 12.2 Surveillance for other pests on Palmerston Island. However, there may also be surveillance at or near the airports and any large infrastructure projects.

For surveillance on Suwarrow, refer to the Suwarrow Biosecurity Action Plan (Boudjelas et al 2014). This would be managed by NES in consultation with MoA.

PART V – INCURSIONS

14 Incursion Response preparation

For each island there is a requirement to be able to respond to an invasive species incursion. On Palmerston or Suwarrow this will include rats and or mice. For all islands this includes agricultural or horticulture pests, animal disease, or invasive ants. The speed and intensity of the response should match the biology of the invasive species. Rats, mice and insects can breed quickly so responses must be fast. For some weeds the urgency may be lower. Each incursion will be unique and should be considered independently.

14.1 How will it be managed?

It is important to be swift and assertive for incursion management, making the incursion the top priority. Use as much resource as possible initially, then scale back later. This includes all MoA biosecurity staff on the island and as many other agency staff and residents as possible.

A clear management structure is essential so that everyone knows who's responsible and what their role is. On Palmerston, Mahihiki, Penrhyn or Suwarrow, it is the staff and residents on the island that will need to undertake the work. However, the overall response can be managed from Rarotonga. For biosecurity incursions this allows for better use of the Biosecurity Act to resource technical or logistical support. Either the Biosecurity Director, or a delegate who can focus on the incursion, should be in charge. Ideally this will be a person who knows the island. For Suwarrow, NES will be the managing agency. On the island, the Biosecurity Officer should be responsible for the operational response. Technical Advice should support the person in charge but can also support the Biosecurity Officer. Technical Advisors are not decision makers. The person in charge should also have regular liaison with the Mayor and or island Representative. The likely person in charge should be familiar with the surveillance and incursion response sections of this plan.

Section	ACTION	WHO	WHEN
14.1	Be assertive for incursion management	Everyone	Always
14.1	Ensure a clear management structure	MoA, Island Council	Always
14.1	Biosecurity Director or delegate to manage overall response, who can focus on the response	Biosecurity Director	
14.1	NES to Manage incursions on Suwarrow	NES	Always

14.1	Manage incursion operations on island	Biosecurity Officer	Always
14.1	Liaise with Mayor or island representative	Person in charge of incursion response	Always
14.1	Be familiar with the biosecurity Plan Surveillance and Incursion sections	Likely person in charge of incursion response	Always

14.2 Training

People involved should be trained in what will occur and how to use the tools for a response. For Palmerston this can be done as part of the rat eradication project. The Biosecurity Officer should also be considered as part of the wider MoA organisation and receive regular training on tools and practices. The Biosecurity Officer should ensure they are comfortable with using every device in the incursion response store. Where possible the Biosecurity Officer can take other people when carrying out surveillance so that others become familiar with the sites and devices. At least annually the Biosecurity Officer should also do a training at a community event to show residents traps, tracking tunnels, chew cards, bait stations, pottles and ant poison and how to use them. Once every 1-2 years a one-day incursion response exercise would be useful to re-familiarise staff and residents about the process and tools.

Devices are likely to be used in and around people's homes during an incursion response so the Biosecurity Officer should help residents plan where traps, tracking tunnels, bait stations or pottles would be best placed.

Section	ACTION	WHO	WHEN
14.2	Be comfortable with every incursion response device/tool.	Biosecurity Officer	Always
14.2	Train people likely to be involved with response tools.	MoA, NES, TIS, Biosecurity Officer	Ongoing
14.2	Take other people out when doing surveillance to familiarise others	MoA, NES, TIS, Biosecurity Officer	Once established
14.2	Run a one-day incursion response training	MoA, NES, Biosecurity Officer	Every 2 years
14.2	Help Residents plan where to put devices in or around their homes.	Biosecurity Officer	2023

14.3 Incursion Response equipment

It is the Biosecurity Officer's responsibility to maintain an incursion response kit. The items for the Palmerston kit are shown in Appendix 6. These items need to be available for an incursion and most need to be in a clean, dry area. Some items may need to be chilled, frozen or stored electronically. Because there would be a delay in getting items to the islands the incursion kits are relatively large. The kit should be inspected at least annually and reported on to MoA Biosecurity.

Wooden tracking tunnels will already be deployed at surveillance sites around Home Island on Palmerston, to weather the boxes, and to allow for their rapid use when an incursion occurs. These tunnels are 125mm high by 106mm wide to allow for multiple traps as well as tracking cards. A hole will be drilled horizontally through the tunnel to allow a wire and use the tunnel as a bait station for rodent poison.

Figure 5: Tracking tunnel box end and side profile.

The Biosecurity Officer will need to request replacement of perishable supplies (e.g., peanut butter and rodent bait) and other equipment or consumables with a limited life.

Section	ACTION	WHO	WHEN
14.3	Maintain the incursion response kit.	Biosecurity Officer	Ongoing
14.3	Inspect the incursion response kit.	Biosecurity Officer	Annually
14.3	Deploy wooden tracking tunnels at surveillance sites.	Palmerston Biosecurity Officer	2023
14.3	Ensure every wooden trap has a hole drilled to use as a rodent poison bait station	Palmerston Biosecurity Officer	2023

15 Responding to an incursion

It is possible that rats or mice could invade onto Palmerston or Suwarrow. Weeds, ants or other insect pests could invade onto any island.

This section gives an initial plan to rapidly respond to rat, mouse or ant incursions. For a rat or mouse incursion on Suwarrow refer to the Suwarrow Biosecurity Action Plan. For weeds and other animal pests there is usually time to decide the best actions to take, also noting that active surveillance for weeds is also an incursion response. For all incursions arrange for technical/specialist advice to support the response via MoA in Rarotonga.

MoA, along with NES, should keep a database of all incursions within the Cook Islands. All island incursions should be added to the database.

Section	ACTION	WHO	WHEN
15	Use this plan as an initial response plan for rats, mice and ants	MoA, Biosecurity Officer	Ongoing
15	Arrange technical specialists to support incursion responses	MoA,	Always
15	Keep a database of all incursions within the Cook Islands.	MoA, NES	Ongoing

15.1 Incursion response triggers

An incursion response can be triggered by the situations below:

1. **Detection**. A live pest found (i.e., seen, photographed, trapped or found).

2. **Suspected**. For example, a dead animal is found, footprints or droppings are found, seeds are found, animals or plants are sick or dying, insect damage is seen.

3. **Highly likely.** For example, a report of a deliberate introduction, a shipwreck on the reef, or threats made to release pests.

4. **Interception.** A pest is detected on a boat or plane that has been to the island.

It is the Secretary of the Ministry of Agriculture's decision to respond to an incursion. The Secretary will delegate to the Director of Biosecurity to act on the Incursion.

15.2 For all incursions

For all incursions follow the procedure below.

1. If the incursion occurs during offloading a vessel, cease the offloading until the incursion situation is managed and/or contained.
2. Collect and secure all evidence and information.
    a. The site should be closed off, marked and examined.
    b. Take notes, recording all details (for example, bite marks in food on the bench and suspicious droppings found nearby).
    c. All evidence should be photographed and collected.
    d. Treat the area like a crime scene.
3. Immediately notify the following people about the incursion.
    e. The Biosecurity Officer on the Island (if someone other than the Biosecurity Officer has found the incursion)
    f. The Island Mayor (or NES for Suwarrow)
    g. The Director – Biosecurity in MoA in the first instance (or Deputy Director)
4. The Director – Biosecurity on providing advice to the MoA Secretary should immediately decide whether to respond to the incursion.
5. Inform island residents that an incursion response is happening.
6. Get expert advice.
    a. Use experts to confirm the likelihood and identity of a pest.
    b. Request that a Technical Advisory Group (TAG) is set up via MoA in Rarotonga.

15.3 Responding to a rat incursion

15.3.1 Initial response for rats

1. Check any existing chew cards or other devices that are still out as part of current surveillance. Ensure all details are recorded.

2. Re-check the set of chew cards from the last surveillance session.

3. Find out and record if there have been any vessel movements to the island or between the different motu within the last two weeks?

4. Exclude pigs and chickens from the area where the rat/s have been detected. If possible, pen the pigs and chickens.

5. Ensure residents seal food in rodent-proof containers where possible.

6. Record all actions taken as part of the response. Notebooks are provided as part of the response kit.

7. Use the surveillance sites as the initial response network.

    a. At every site set out fresh chew cards, baited with peanut butter. The cards can be fixed off the ground, part way up a tree or on a piece of wood, to minimise crab interference.

    b. At every odd numbered site (1, 3, 5, 7, ….), place out a tracking card in the wooden tunnel, fixing the card with a staple or map pin. Ensure each card is labelled with the date, site number and lure. Inside the tunnel place a poison rodent block on the horizontal wire. Also lure the top, inside of the tunnel with peanut butter. Use disposable gloves when handling poison.

c. At every even numbered site (2, 4, 6, 8, ….) install two victor rat traps, back-to-back within the wooden tunnel. This means the rat can approach from either direction. Lure the traps with a combination of peanut butter and lightly roasted coconut flesh. Victor traps should be finely set.

8. Near the detection site, set out the DOC200 traps at approximately 50m spacings. Bait the traps with peanut butter and lightly roasted coconut flesh. DOC200 traps should be calibrated to 75 grams. Ensure each trap has a unique identification number.

9. Install a lockable rat bait station with a poison rodent block in, or at, each house or communal building, cooking place, refuse site, the nursery and near (but outside) the pigpen. Use disposable gloves when handling poison rodent bait. Ensure each bait station has a unique identification number.

The response network is likely to take 2-3 people 2-3 days to establish. Establishing the full network will slow down on the second day when checking of the network is also needed.

15.3.2 Checking the response network.

1. Once the incursion network devices are in place, they should be checked daily for 7 days.

2. Each chew card, tracking card, poison rodent bait, trap and bait station should be checked daily.

3. Any evidence of rats should be recorded, and the evidence should be photographed and collected (e.g., a chew card, poison bait or tracking card).

4. If any rat is found in a trap, photograph it and then place it in a bag with a label, then in a second bag before freezing the rat. Before freezing, cut off an ear and store that as shown in the Ecogene DNA sampling protocols.

5. Chew cards that have been damaged, tracking cards tracked, or poison rodent bait eaten, should be replaced. Collect, keep and record anything replaced. Get a second person to double check any items collected to ensure there is no evidence of a rat.

6. Any peanut butter or coconut that has been eaten, or gone mouldy, should be replaced.

7. A daily record of the response activities must be kept and sent to MoA, to the mayor, and to the Technical Advisory Group if one has been established.

8. If no rat sign has been found for seven days, replace all baits and cards and reduce the checks to every three days.

9. If no rat sign has been found for three weeks, replace all baits and cards and then reduce the checks to once a week.

15.3.3 Checking other motu

1. Once the incursion network has been set up where the incursion, or suspicion of incursion is, and if there is no obvious link to a rat coming off a vessel or aircraft, adjacent motu could also be checked.

2. Other motu can be checked using chew cards, tracking tunnels and Victor rat traps.

3. Record and report on all checks undertaken on adjacent motu.

15.3.4 Wind up and finishing the rat response.

After six weeks of no evidence of any rat, and the response effort is considered adequate, the Secretary of Agriculture on advice from the Director of Biosecurity can close the response. The Director of Biosecurity should consult with the Technical Advisory Group about the amount of effort and the adequacy of the response.

The Biosecurity Officer must ensure that all gear used is cleaned and returned to the Incursion Response kit, and the incursion kit is either restocked with any perishable items that were used e.g., peanut butter, or these items are re-ordered via MoA in Rarotonga.

The Biosecurity Officer should record any lessons learned and make suggestions for improving future responses.

15.4 Responding to a mouse incursion

15.4.1 Initial response for mice

1. Follow steps 1-6 from the initial response for rats (15.3.1)

2. Use the surveillance sites as the initial response network.

    a. At every site set out fresh chew cards, baited with peanut butter.

    b. At every odd numbered site (1, 3, 5, 7, ….), place out a tracking card in the wooden tunnel, fixing the card with a staple or map pin. Ensure each card is labelled with the date, site number and lure. Inside the tunnel place a poison rodent block on the horizontal wire. Also lure the top, inside of the tunnel with peanut butter. Use disposable gloves when handling poison.

    c. At every even numbered site (2, 4, 6, 8, ….) install two victor mouse traps, back-to-back within the wooden tunnel. Place a stick on either side to direct the mouse to the plate of the trap. This means the mouse can approach from either direction. Lure the traps with a combination of peanut butter and coconut flesh. Victor traps should be finely set.

    d. At the site of the detection, and within a 200m radius of the mouse detection site, at each surveillance site, and halfway between each surveillance site, place and secure a mouse bait station. If possible, place 5 pellets of Pestoff 20R rodent bait in each mouse station. Otherwise place one Pestoff Rodent Block in each station.

3. In each house or building place a mouse trap where mice will have access, but children, chicken and pets cannot. Bait the mouse traps with peanut butter.

4. Install a lockable mouse bait stations with a poison rodent block in, or at, each house or communal building, cooking place, refuse site, the nursery and near (but outside) the pigpen. Use disposable gloves when handling poison rodent bait. Ensure each bait station has a unique identification number.

The response network is likely to take 2-3 people 2-3 days to establish. Establishing the full network will slow down on the second day when checking of the network is also needed.

15.4.2 Checking the response network.

1. Use the same checking regime as in the rat response network steps 1-4, and steps 8 and 9 (15.3.2).

2. If any mouse is found in a trap, photograph it and then place it in a bag with a label, then in a second bag before freezing the rat. Before freezing, cut off an ear and store it as shown in the Ecogene DNA sampling protocols.

3. Mouse evidence on chew cards can easily be overlooked. Look very closely for fine gnawing, normally on one surface. Also look for the peanut butter being licked into each section, from the bottom of the card. If in doubt, replace, collect and photograph the card and ask experts to confirm.

4. Any tracking cards tracked, or poison bait eaten, should be replaced. Collect, keep and record anything replaced. Get a second person to double check any items collected to ensure there is no evidence of a rat.

5. Any peanut butter or coconut that has been eaten, or gone mouldy, should be replaced.

6. A daily record of the response activities must be kept and sent to MoA, to the mayor, and to the Technical Advisory Group if one has been established.

15.4.3 Checking other motu

1. Mice are unlikely to swim between motu.

2. Once the incursion network has been set up where the incursion, or suspicion of incursion is, and if there is no obvious link to a mouse coming off a vessel or aircraft, adjacent motu could also be checked.

3. The motu can be checked using chew cards, tracking tunnels and Victor mouse traps.

4. Record and report on all checks undertaken on adjacent motu.

15.4.4 Wind up and finishing the mouse response.

As with the rat response, after six weeks of no evidence of any mouse, and the response effort is adequate, the Secretary of Agriculture on advice from the Director of Biosecurity can stop the response. The Director of Biosecurity should consult with the Technical Advisory Group about the amount of effort and the adequacy of the response.

Once the response is stopped the Biosecurity Officer must ensure that all gear used is cleaned and returned to the Incursion Response kit. All consumable items (e.g., tracking cards) must be re-ordered for the next cargo vessel delivery.

The Biosecurity Officer should record any lessons learned and make suggestions for improving future responses.

15.5 Responding to an ant incursion

Invasive ants could be detected anywhere on the island. They are most likely to be found near the landing site, in or near houses, buildings or infrastructure, at the nursery, where soil has been moved, and near food sources. The following response is considered adequate for many invasive species, but it won't be successful for all invasive ant species.

The sooner ants can be found, identified and controlled the more chance there is of stopping them from establishing on the island.

All information must be recorded.

15.5.1 Response for invasive ants

1. Cordon off the area and ensure no-one moves anything from within the area to any other location.

2. Exclude pigs and chickens from the area, if possible.

3. Take high resolution photographs of the suspected invasive ants with a macro lens.

4. Try and find worker ants that lead back to a nest. For many invasive ant species, workers will go to multiple nests.

5. If dealing with Tropical fire ants, ensure adequate clothing is worn to protect from the formic acid spray and stings.

6. If a single nest is found, treat it directly with an insecticide spray. Dig up the nest if necessary to ensure no workers or brood (eggs, larvae, pupae) escape or survive.

7. Contact an ant expert to confirm the invasive ant species ID. Request a Technical Advisory Group is set up to assist.

8. Inform the residents that invasive ants have been found.

9. Find out from residents what was moved to or from the area, and when?

10. Find out if the workers of the species consume sugars or proteins, or both. Use the Pacific Invasive Ant Toolkit, ant guides and Landcare Research/Biosecurity NZ factsheets.

11. place out pottles at 5m spacings around the area of the detection. Mark each pottle with a large bamboo skewer or something similar. For very small ants, such as the bi-coloured trailing ant, the spacing should be every 2m. For large, fast and active ants, such as yellow crazy ants the pottles can be spaced 10m apart. Use the pottle monitoring method for surveillance, in section 12.2.1. For ant species with workers who eat sugars use a sugar solution and cotton wool in the pottles. This is to help find the boundaries of the infestation. Do not use sunscreen or any other chemical lotions before handling pottles.

12. For ant species that feed exclusively on protein the same method can be used (as in 10), replacing the sugar solution for a blended sausage meat mix.

13. Leave the pottles out for 6-12 hours before collecting then mark the location of every pottle found with the invasive ants.

14. If a detection is found on the edge of the pottle grid, repeat the pottle monitoring to the edge of the grid.

15. If only a few pottles are found with the invasive ant, try and track the workers back to the nest/s and repeat step 5.

16. Once the extent of the infestation is known, treat the area with Vanquish Pro Ant bait in pottles (~2ml in each pottle) on a grid every 2m across the ground. Confirm with an expert that Vanquish is suitable. Leave the pottles out for 3-4 days. Ensure pottles do not enter the seawater. Wash out pottles well away from the sea or fresh water sources.

17. If Vanquish Pro Ant Bait is not available use a contact insecticide spray, making sure any spray does not come into contact with the water. Ensure the entire nest areas are dug up or accessed so that the spray can kill all queens, eggs and larvae.

18. Check all areas where items have been moved to and repeat steps 5-17.

19. Check the area again weekly, both visually and by bashing the ground with a stout stick to see if any ants erupt from the ground. If any other ants are detected repeat the process.

20. If multiple nests are found, at multiple sites, the Biosecurity Officer will require the support of other residents to support the ant response.

21. The response can be transferred into the ongoing surveillance programme after the invasive ants have not been detected for three months.

16 Biosecurity for Emergencies

Within the Cook Islands Emergency Management is a function of the Police (Police Act 2012). The Ministry of Health may also be involved. Biosecurity actions should not interfere with people and or agencies managing emergencies situations. These situations could include medical evacuations, disease, or disaster relief from cyclones to tsunami.

The best times to influence biosecurity in emergency situations is before and after the events. By having agencies that are conscious of invasive species, and have built in practices that minimise risk, such as regular inspections or on-board pest control on ships, the likelihood of moving pests during an emergency is reduced. Agencies such as the Police could be encouraged to obtain a Pest-Free Warrant for the Police vessel. International vessels with existing biosecurity certification should be used if possible for emergencies, if international help is required. Good relationships between agencies are essential.

An Animal Health Emergency Response Plan for the Cook Islands already exists. This is an emergency response plan as part of National Disaster Risk Management Arrangements. The plan is focused on animal health includes investigating the extent, quarantine, identify the source and assessing the ability to eradicate.

After an emergency event it will be important that Biosecurity staff on each island obtain clear details of what has occurred and what goods or machinery was moved between islands and to where on the various islands? From this information a decision can be made about the likelihood of invasive pests being moved, and if additional surveillance or potentially if an incursion response is required.

After the event the biosecurity actions that were needed should be debriefed with Police and other agencies involved.

Section	ACTION	WHO	WHEN
16	Develop good relationships with Police and Ministry of Health regarding emergencies.	Secretary of Agriculture, Director and staff of Biosecurity	2023/2024
16	Gather information about what has occurred during an emergency.	Biosecurity officers	When event occurs
16	Decide if further surveillance is required.	Director - Biosecurity	Within 7 days of emergency.
16	Debrief biosecurity requirements for emergencies with Police and agencies involved.	Secretary of Agriculture, Director - Biosecurity	After events occur

17 Bibliography

Annon. 2019. *Kaveinga Paruru a te kuki Airani no te au tu Katiri Kikino 2019 – 2025*. Cook Islands Invasive Species Strategy and Action Plan 2019 – 2025.

Auckland Council 2019. Auckland Regional Pest Management Plan 2019-2029.

Bassett I.E., Cook J., Buchanan F. & Russell J.C. 2016. Treasure Islands: Biosecurity in the Haruaki Gulf Marine Park. *New Zealand Journal of Ecology*, 40(2): 250-266.

Boudjelas S., Pierce R., Cranwell S. 2014. Biosecurity Action Plan for Suwarrow National Park, Cook Islands.

Clapperton B.K. 2006. A review of the current knowledge of rodent behaviour in relation to control devices. *Science for Conservation 263*. Department of Conservation. Wellington.

The Department of Conservation DOC 2023. Guidance on preventing the movement of invasive species between islands in Pacific countries and territories. Department of Conservation, Wellington, New Zealand. 68 p.

Department of Conservation 2008. Weed Surveillance SOP. DOCDM-231178. Department of Conservation internal plan. Wellington

Green C. 2012: Argentine ant detection – best practice. Department of Conservation. Unpublished. DOCDM-532450.

Harper G.A., Bunbury N. 2015. Invasive rats on tropical islands: Their population biology and impacts on native species. *Global Ecology and conservation* 3: 907-627.

Harper G.A., Pahor S., Birch D. 2020. The Lord Howe Island Rodent Eradication: Lessons Learnt from an Inhabited Island. University of California, Division of Agriculture and Natural Resources. Proceedings of the Vertebrate Pest Conference 29: 1-11.

Harris S., Timmins S.M. 2009. Estimating the benefit of early control of all newly naturalised plants. *Science for Conservation* 292. Department of Conservation Wellington.

Holloran P. 2006. Measuring performance of invasive eradication efforts in New Zealand. *New Zealand Plant Protection* 59:1-7.

Howald G., Donlan C.J., Galván J.P., Russell J.C., Parkes J., Samaniego A., Wang Y., Veitch D., Genovesi P., Pascal M., Saunders A., Tershy B. 2007. Invasive rodent eradication on islands. *Conservation Biology* 21: 1258−1268.

Johnson J. 2016. Proceedings of the 9th Australasian Soilborne Diseases Symposium. Editor, RE Falloon. ISBN 978-0-473-37524-9

Keitt B., Campbell K., Saunders A., Clout M., Wang Y.W., Tershy B. 2011. The global islands invasive vertebrate eradication database: a tool to improve and facilitate restoration of island ecosystems. In: Veitch C.R., Clout M.N., Towns D.R. eds Island invasives: eradication and management. Gland, Switzerland and Auckland, New Zealand, IUCN. Pp. 74–77.

Key Industries. 2016. Ant ID Guide. 25p. Key Industries. Auckland

Kim J., Corson P., Mulgan N., Russell J. 2019: Rapid Eradication Assessment (REA): a tool for pest absence confirmation. *Wildlife Research*. CSIRO Publishing WR18154

King C.M., Forsyth D.M. 2021. *The handbook of New Zealand mammals, 3rd edition*. Otago University Press, Auckland. ISBN 978-1-98-859258-9.

Lee CC., Chiu MC., Shih CH. Yang CC.S., Liu H.C., Lin CC. 2021. The role of anthropogenic disturbance and invasion of yellow crazy ant in a recent decline of land crab population. Sci Rep 11, 12234.

McKenzie-Mohr D. 2000. Promoting sustainable behaviour: an introduction to community-based social marketing. *Journal of Social Issues* 56: 543–554.

Ministry of Agriculture. 2015. Manual of Biosecurity Procedures for the Cook Islands. MoA, Rarotonga.

Nathan H.W., Clout M.N., Murphy E.C., MacKay J.B. 2013. Strategies for detection of house mice on a recently invaded island. *New Zealand Journal of Ecology 37* (1): 26-32.

Passera L. 1993: Characteristics of tramp species. In: Williams D.F. ed. Exotic ants: Biology, impact, and control of introduced species. Boulder, CO, Westview Press. Pp. 23–43.

Russell J.C., Towns, D.R., Anderson S.H., Clout M.N. 2005: Intercepting the first rat ashore. *Nature* 437: 1107.

Russell J.C., Beaven B.M., MacKay J.W.B., Towns D.R., Clout M.N. 2008. Testing island biosecurity systems for invasive rats. *Wildlife Research* 35: 215–221.

Samaniego-Herrera A., Boudgelas S., Harper G.A., Russell J.C. 2017. Assessing the critical role that land crabs play in tropical island rodent eradications and ecological restoration. In Veitch C.R., Clout M.N., Martin A.R., Russell J.C., West C.J. eds. Island Invasives: Scaling up to meet the challenges. Proceedings of the international conference on island invasives 2017. Occasional Paper of the IUCN Species Survival Commission N 62. Pp209-222

Saunders A., Towns D., Broome., Horn S., Neureuter S., Conomos K., Corson P., Galbraith M., Gilbert J., Ogden J., Waterhouse K. 2021. Social dimensions in island restoration: some case studies from Aotearoa – New Zealand. *Pacific Conservation Biology*. Special Issue. CSIRO Publishing

Saunders J.T., Greer G., Bourdôt G., Saunders C., James T., Rolando C., Monge J., Watt M.S. 2017. The economic costs of weeds on productive land in New Zealand. *International Journal of Agricultural Sustainability*, 15:4, 380-392.

Sweetapple P., Nugent G. 2011. Chew-track-cards: a multiple-species small mammal detection device. *New Zealand Journal of Ecology* 35 No.2: 153-162.

Ujiyama S., Tsuji K. 2018. Controlling invasive ant species: a theoretical strategy for efficient monitoring in the early stage of invasion. *Sci Rep* 2018. 8: 8033.

Appendices

Appendix 1: Invasive species lists

Invasive terrestrial species listed as present from the Cook Islands Biodiversity Database. These records are recognised as being incomplete. Any records of species not in these lists should be sent to the Cook Islands Natural Heritage Trust , ideally with photographs. Species that only occur on a single island, either Palmerston or one of the Northern Group islands, are shown in bold text.

Note all the islands except Suwarrow have chickens, pigs and cats. These are considered as domestic animals and not listed as invasive species here.

Palmerston Island invasive species

Invasive species from Cook Islands Biodiversity Database.

Animals	**Ants**	**A crazy ant**	*Nylanderia vaga*
		Ant	*For Plagiolepsis alluaudi*
		Ant	***Cardiocondyla emeryi***
		Ant	**For *Plagiolepsis alluaudi***
		Honey ant	**Dol *Iridomyrmex anceps***
		Weaver ant	*Tetramorium bicarinatum*
		Harvester-ant	*Pheidole oceanica*
	Cockroach	American cockroach	*Periplaneta americana*
	mammal	Pacific rat[ξ]	*Rattus exulans*
		Ship rat[ξ]	*Rattus rattus*
	Mosquito	Polynesian mosquito	*Aedes polynesiensis*
	Moth	**Coconut flat moth**	***Agonoxena argaula***
Plants		Beggars tick	*Bidens pilosa*
		Billygoat weed	***Ageratum conyzoides***
		Blue Rat's-tail	*Stachytarpheta cayennensis*
		Broom weed	*Sida rhombifolia*
		Burr grass	*Cenchrus echinatus*
		Cassytha	*Cassytha filiformis*
		Common guava	*Psidium guajava*
		Hairy spurge	*Euphorbia hirta*
		Java sedge	*Cyperus javanicus*
		Mexican fire-plant	***Euphorbia cyathophora***
		Rubber tree	*Ficus elastica*
		Sensitive weed	*Mimosa pudica*
		Small-flower nightshade	*Solanum nodiflorum*
		Surinam Cherry	*Eugenia uniflora*
		T-grass	*Paspalum conjugatum*
		Tree hibiscus	*Hibiscus tiliaceus*
		Willow primrose	Ludwigia octovalvis
		Wire grass	Eleusine indica

Residents also say that Asian paper wasps are on the island. ξ = subject to an eradication attempt

Suwarrow invasive species

Invasive species from Cook Islands Biodiversity Database.

Animals	**Mammal**	**Pacific rat**	***Rattus exulans*[6]**
	Scorpion	Black scorpion	*Liocheles australasiae*
	Termite	Coconut termite	*Neotermes rainbowi*
	Wasp	**Yellow paper wasp**	***Polistes olivaceus***
Plants		Bitter phyllanthus	*Phyllanthus amarus*
		Chaff-flower Weed	***Achyranthes aspera***
		Hairy spurge	*Euphorbia hirta*
		Tree hibiscus	*Hibiscus tiliaceus*
		Purple-flower love-grass	*Eragrostis tenella*
		Weedy pigweed	*Portulaca oleracea*
		Wild Cape gooseberry	*Physalis angulata*

Nassau invasive species

Invasive species from Cook Islands Biodiversity Database.

Animal	**Mosquito**	**Polynesian mosquito**	***Aedes polynesiensis***
	Termite	Coconut termite	*Neotermes rainbowi*
Plant		Artillery plant	*Pilea microphylla*
		Bitter Phyllanthus	*Phyllanthus amarus*
		Burr grass	*Cenchrus echinatus*
		Cassytha	*Cassytha filiformis*
		Emilia	*Emilia sonchifolia*
		Java sedge	*Cyperus javanicus*
		Little ironweed	*Cyanthillium cinereum*
		Samoan sword fern	***Nephrolepis saligna***
		Tree hibiscus	*Hibiscus tiliaceus*
		Willow primrose	*Ludwigia octovalvis*
		Wire grass	*Eleusine indica*

[6] *Rattus exulans* may have been eradicated.

Pukapuka invasive species

Invasive species from Cook Islands Biodiversity Database

Animal	**Ant**	**A crazy ant**	***Nylanderia vaga***
		Ant	***Cardiocondyla nuda***
		Bicolored trailing ant	***Monomorium floricola***
		Big headed ant	*Pheidole megacephala*
		Carpenter ant	***Camponotus chloroticus***
		Longhorned crazy ant	*Paratrechina longicornis*
		Robust crazy ant	***Nylanderia bourbonica***
		Weaver ant	*Tetramorium bicarinatum*
		Woolly ant	***Tetramorium lanuginosum***
		Dark-head ghost-ant	***Dol Tapinoma melanocephalum***
		Harvester-ant	*Pheidole oceanica*
	Beetle	**Corn-sap Beetle**	***Carpophilus dimidiatus***
		Oedemerid Beetles	***Eobia bicolor***
			Sessinia livida
	Cockroach	American cockroach	*Periplaneta americana*
		Surinam Cockroach	***Pycnoscelus surinamensis***
	Fly	**Latrine blowfly**	***Chrysomya megacephala***
	Gecko	**Mournful Gecko**	***Lepidodactylus lugubris***
		Oceanic gecko	***Gehyra oceanica***
	Mammal	Pacific rat	*Rattus exulans*
	Mosquito	Polynesian mosquito	*Aedes polynesiensis*
	Moths	**Caster oil moth**	**an EREBIDAE *Achaea janata***
		Coconut spiked moth	***Tirathaba rufivena***
		Diamondback moth	***Plutella xylostella***
		Grass Armyworm	***Spodoptera mauritia***
		Potato moth	***Stoeberhinus testaceus***
		Tineid Moth	***Trachycentra* sp. PK32**
		Tropical armyworm	***Spodoptera litura***
		White-brow Hawkmoth	***Gnathothlibus erotus***
	Scorpion	Black scorpion[7]	*Liocheles australasiae*
	Termite	Coconut termite	*Neotermes rainbowi*
	Wasp	**A burrowing wasp**	***Pison* sp. MK1**
		Keyhole wasp	***Pachodynerus nasidens***
	Bug, thrip, aphid, scale.	**Grey Sugarcane Mealybug**	***Dysmicoccus boninsis***
		Nigra Scale	***Parasaissetia nigra***
		Silverleaf whitefly	***Bemisia argentifolii***
		Spiralling whitefly	***Aleurodicus dispersus***
		Taro Planthopper	***Tarophagus proserpina***
Fresh water	**Fish**	**Shortfin molly**	***Poecilia mexicana hybrids***
		Tilapia	*Oreochromis massambicus*
Marine	Starfish	Crown of thorns	*Acanthaster planci*

[7] Probably native but unwanted elsewhere

Plant	**Artillery plant**	***Pilea microphylla***
	Beach pea	*Vigna marina*
	Beggars tick	*Bidens pilosa*
	Bitter phllanthus	*Phyllanthus amarus*
	Blue Rat's-tail	*Stachytarpheta cayennensis*
	Burr grass	*Cenchrus echinatus*
	Cassytha	*Cassytha filiformis*
	Common guava	*Psidium guajava*
	Creeping spurge	*Euphorbia prostata*
	Hairy spurge	*Euphorbia hirta*
	Java sedge	*Cyperus javanicus*
	Little ironweed	*Cyanthillium cinereum*
	Sensitive weed	*Mimosa pudica*
	Sessile joyweed	***Alternanthera sessilis***
	Short-flower sida	***Sida acuta***
	Sporobolus Pyramidalis	*Sporobolus pyramidalis*
	Torulinium Sedge	***Torulinium odoratum***
	Tree hibiscus	*Hibiscus tiliaceus*
	Weedy pigweed	*Portulaca oleracea*
	Wild Cape gooseberry	*Physalis angulata*
	Willow primrose	*Ludwigia octovalvis*
	Wire grass	*Eleusine indica*

Manihiki invasive species

Invasive species from Cook Islands Biodiversity Database.

Animals	**Mosquitos**	**Dengue Mosquito**	***Aedes aegypti***
		Polynesian mosquito	*Aedes polynesiensis*
Marine	Starfish	Crown of thorns	*Acanthaster planci*
Plants		**African Tulip-tree**	***Spathodea campanulata***
		Artillary plant	*Pilea microphylla*
		Beach pea	*Vigna marina*
		Beggars tick	*Bidens pilosa*
		Bermuda Grass	*Cynodon dactylon*
		Bitter phyllanthus	*Phyllanthus amarus*
		Blue Rat's-tail	*Stachytarpheta cayennensis*
		Broom weed	*Sida rhombifolia*
		Burr grass	*Cenchrus echinatus*
		Cassytha	*Cassytha filiformis*
		Coffee senna	***Senna occidentalis***
		Commelina	***Commelina diffusa***
		Common guava	*Psidium guajava*
		Creeping spurge	*Euphorbia prostata*
		Hairy spurge	*Euphorbia hirta*
		Java sedge	*Cyperus javanicus*
		Little ironweed	*Cyanthillium cinereum*
		Oyster lily	*Tradescantia spathacea*
		Red Clerodendrum	***Clerodendrum speciosissimum***

Red Strawberry-guava	*Psidium cattleianum*
Rubber tree	*Ficus elastica*
Sporobolus Pyramidalis	*Sporobolus pyramidalis*
Surinam Cherry	*Eugenia uniflora*
Tree hibiscus	*Hibiscus tiliaceus*
Weedy pigweed	*Portulaca oleracea*
Willow primrose	*Ludwigia octovalvis*
Wire grass	*Eleusine indica*

In addition to the species noted in the database, Biosecurity staff on Manihiki have also stated that Pacific rats, mice, American cockroaches, carpenter ants, and grey sugarcane mealybug, are also present.

Rakahanga invasive species

Invasive species from Cook Islands Biodiversity Database.

Animals	mosquito	Polynesian mosquito	*Aedes polynesiensis*
Fresh water	fish	Tilapia	*Oreochromis massambicus*
Plants		Beach pea	*Vigna marina*
		Beggars tick	*Bidens pilosa*
		Bitter Phyllanthus	*Phyllanthus amarus*
		Broom weed	*Sida rhombifolia*
		Burr grass	*Cenchrus echinatus*
		Cassytha	*Cassytha filiformis*
		Common guava	*Psidium guajava*
		Creeping spurge	*Euphorbia prostata*
		Emilia	*Emilia sonchifolia*
		Hairy spurge	*Euphorbia hirta*
		Java sedge	*Cyperus javanicus*
		Little ironweed	*Cyanthillium cinereum*
		Nordeweed	***Synedrella nodiflora***
		Oyster lily	*Tradescantia spathacea*
		Small-flower nightshade	*Solanum nodiflorum*
		T-grass	*Paspalum conjugatum*
		Tree hibiscus	*Hibiscus tiliaceus*
		Weedy pigweed	*Portulaca oleracea*
		Willow primrose	*Ludwigia octovalvis*
		Wire grass	*Eleusine indica*

Penrhyn (Tongareva) invasive species

Invasive species from Cook Islands Biodiversity Database.

Animals	**mammal**	**House mouse**	***Mus musculus***
		Pacific rat	*Rattus exulans*
		Ship rat	*Rattus rattus*
	mosquito	Polynesian mosquito	*Aedes polynesiensis*
Marine	starfish	Crown of thorns	*Acanthaster planci*
Plants		**Benjamin fig**	***Ficus benjamina***
		Broom weed	*Sida rhombifolia*
		Burr grass	*Cenchrus echinatus*
		Common guava	*Psidium guajava*
		Puncture weed	***Tribulus cistoides***
		Spanish clover	***Desmodium incanum***

In addition to the species noted above from the database, Biosecurity staff on Penrhyn indicate that whitefly, latrine blowfly and sensitive weed are also present.

Appendix 2: Invasive species factsheet links

Yellow Crazy Ant factsheet

https://piat.org.nz/uploads/PIAT_content/pdfs/yellow-crazy-ant-risk-assessment.pdf

Tropical fire ant factsheet

https://piat.org.nz/index.php?page=tropical-fire-ant

Pharaoh ant factsheet

https://piat.org.nz/index.php?page=pharaoh-ant

Coconut termite factsheet

http://coconutpests.org/pests-and-diseases-of-coconut/coconut-termite

Coconut rhinoceros beetle

http://coconutpests.org//pests-and-diseases-of-coconut/coconut-rhinoceros-beetle-oryctes

Rat information

Ship rats https://www.pestdetective.org.nz/culprits/ship-rat/

Pacific rats https://www.pestdetective.org.nz/culprits/kiore/

Mouse information

https://www.pestdetective.org.nz/culprits/mouse/

Lantana factsheet

https://apps.lucidcentral.org/ppp_v9/text/web_full/entities/lantana_434.htm

Red passionfruit on Mauke report

https://library.sprep.org/sites/default/files/control-red-passion-fruit-mauke-island.pdf

Wedelia daisy factsheet

https://apps.lucidcentral.org/ppp_v9/text/web_full/entities/wedelia_447.htm

Appendix 3: Suggested protocol for moving live animals to Palmerston, Manihiki, Penrhyn and Suwarrow

PHASE	ACTION	TIMEFRAME
Planning/lead-in	Person hoping to move animal/s should supply MoA and shipping company notice of an intention to move animals.	Three weeks prior to movement
	MoA decides whether a vet needs to be involved.	When notified
	MoA decides on quarantine periods pre-departure and on arrival.	Within 7 days of notification.
	MoA, with the person moving animal/s, decides on a quarantine area on the destination island.	Within 7 days of notification.
	MoA decides if the movement will be allowed.	Within 7 days of notification.
	MoA and the owner identify a suitable quarantine area on the source property with no weeds. Make sure there can be no contact with other animals.	Within 7 days of notification.
	The owner/mover must manage weeds if deemed necessary by MoA.	1-2 weeks before Quarantine.
Pre-departure Quarantine	Select only healthy-looking animals to be moved	One week prior to moving.
	Quarantine the animals intended to be moved from other animals on the property, or adjacent properties, including wild animals.	One week prior to moving.
	Treat the animals for internal parasites.	2-3 days before movement.
	Treat the animals for external parasites such as lice or ticks	2-3 days before movement.
	Obtain an Internal Clearance Certificate from MoA.	Day before movement
	Owner/mover must clean the animals of dirt and seeds.	Day of movement
	MoA inspect the animals prior to transport and, if deemed necessary by MoA.	Day of movement
Loading	Provide the shipping company with a copy of the MoA Internal Clearance Certificate prior to loading	Day of movement
	Load animals, keeping separate from any other animals.	Day of movement
Unloading	Ensure the quarantine area on the destination island is secure.	Prior to arrival
	Unload animals directly to the quarantine area. Burn faecal matter and any bedding material used during the transport.	Immediately after unloading
Arrival quarantine	Keep animals in quarantine	For 10 days
	Regularly inspect animals for signs of pests or disease. Burn faecal matter and any bedding material used during quarantine.	Until the end of quarantine
	Continue to check the quarantine area for weeds.	For a minimum of 3 months

Appendix 4: Hypothetical Biosecurity Area Declaration

DRAFT HYPOTHETICAL BIOSECURITY AREA DECLARATION FOR PALMERSTON ISLAND, SUWARROW NATIONAL PARK AND AVARUA PORT

Palmerston Island and Suwarrow National Park are intended to be maintained with no rats or invasive ants and to avoid new pests or diseases arriving or establishing. Avarua is the primary port of departure for vessels going to Palmerston Island or Suwarrow National Park.

Under section 64 of the Biosecurity Act 2008 notice is hereby given by the Secretary, declaring Palmerston Island and Suwarrow National Park as Pest-free biosecurity controlled areas for the pests listed in schedule 1.

Also under section 64 of the Biosecurity Act the Secretary declares Avarua Port as a Pest-free biosecurity controlled area for the purpose of avoiding moving the pests listed in Schedule 1 out of Avarua Port and to either Palmerston Island or Suwarrow National Park.

Under sections 65 and 81 of the Biosecurity Act the Secretary hereby gives notice that vessels, and items listed in Schedule 2, are regulated for the purpose of avoiding moving the pests listed in Schedule 1 to either Palmerston Island or Suwarrow National Park.

Any person that contravenes this declaration may be subject to penalties as defined in Sections 94 the Biosecurity Act 2008:

For an individual, a fine up to $10,000.

For a body corporate, a fine up to $100,000.

SCHEDULE 1: DECLARED PESTS THAT ARE ABSENT FROM PALMERSTON AND SUWARROW

PALMERSTON ISLAND

Brown rats	*Rattus norwegicus*
Coconut termite	*Neotermes rainbowi*
House mouse	*Mus musculus*
Polynesian rat	*Rattus exulans*
Ship rat	*Rattus rattus*
Yellow crazy ant	*Anaplolepis gracilipes*

SUWARROW NATIONAL PARK

Brown rats	*Rattus norwegicus*
House mouse	*Mus musculus*
Polynesian rat	*Rattus exulans*
Ship rat	*Rattus rattus*
Yellow crazy ant	*Anaplolepis gracilipes*

SCHEDULE 2: REGULATED ITEMS

Vessels or Craft	Must be maintained free of the pests in Schedule 1, maintain pest control on the vessel and operational areas, and not carry any of the items below contrary to the controls stated.
Plants	Must be bare-rooted or in a bio-secure root medium and inspected by a Biosecurity Officer or delegate.
Soil, mulch or seedling mix	Only fully sealed bags of soil, mulch or seedling mix, approved by the Ministry of Agriculture, may be transported to Palmerston.
Vehicles and or trailers	must be made free of soil, washed, and be inspected by a Biosecurity Officer. A minimum of 72 hours must be given to the Ministry of Agriculture prior to loading.
Heavy machinery such as loaders, tractors, diggers	All machinery must be made free of soil, washed, and be inspected by a Biosecurity Officer. A minimum of 72 hours must be given to the Ministry of Agriculture prior to loading.
Building and landscaping supplies	Must be made free of soil, inspected for any pests, and where possible contained in a pest-proof container.
Coconut plants, wood or fibre	May not be moved to Palmerston Island.
General goods	Must be transported in a pest-proof containers.

Appendix 5: Biosecurity resources

Cook Islands Biodiversity database

http://cookislands.bishopmuseum.org/search.asp

Pacific Invasives Ant Toolkit

Website - https://piat.org.nz/

Case studies: https://piat.org.nz/index.php?page=management-case-studies

Training: https://piat.org.nz/index.php?page=biosecurity-training-for-quarantine-officers

Pacific Pests, Pathogens and Weeds

Website - https://apps.lucidcentral.org/pppw_v11/text/intro/index.html

Or as an App via Google Play or the Apple store

Pest Detective

https://www.pestdetective.org.nz/

Find A Pest

Website - https://www.findapest.nz/

Or as an App via Google Play or the Apple store

Global Invasives Species Database

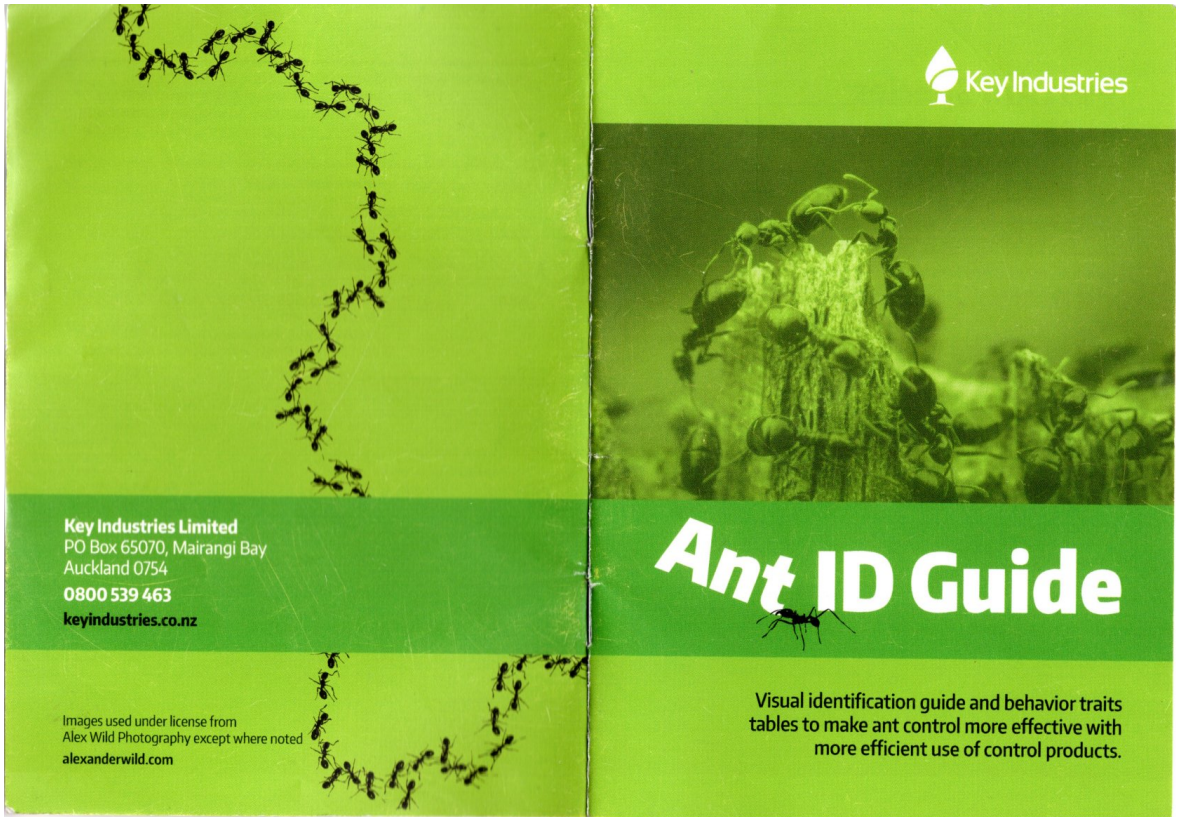
http://www.iucngisd.org/gisd/

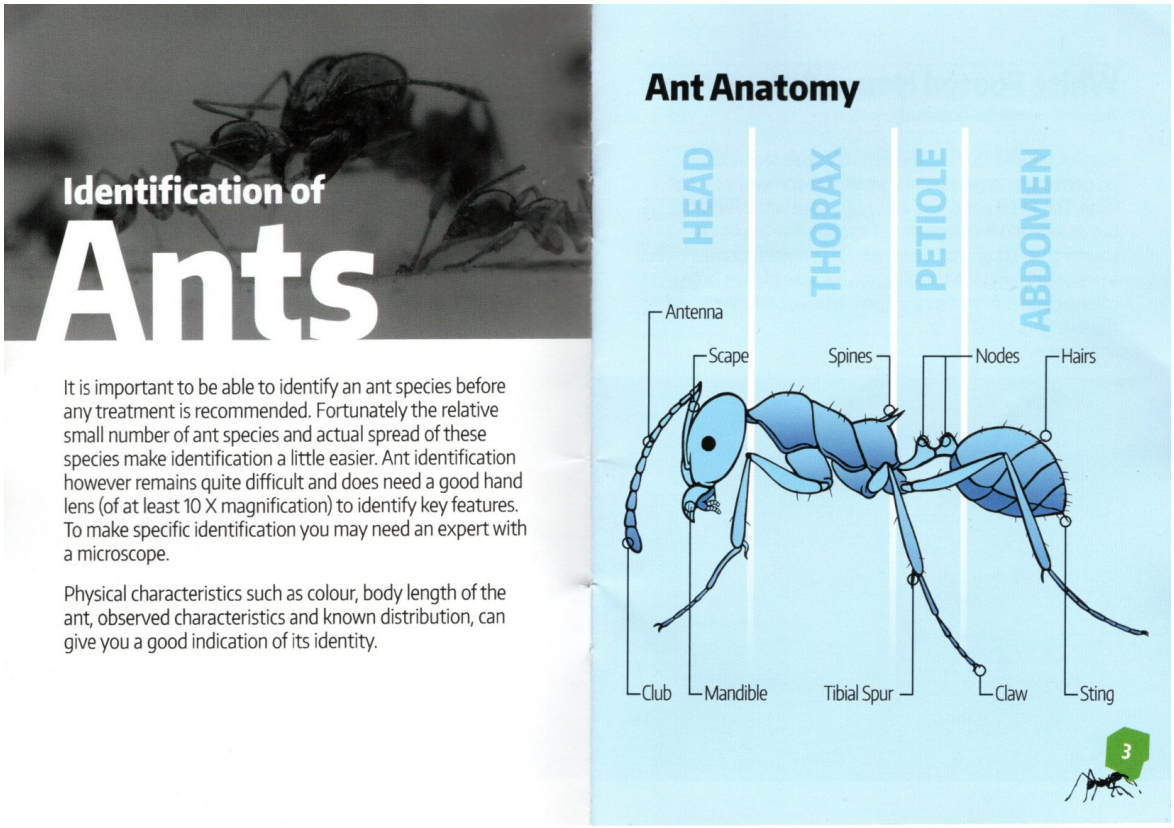
Secretariat of the Pacific Regional Environment Programme (SPREP)

https://www.sprep.org/resources

Ant identification

Ant identification booklet guides have been provided to MoA courtesy of Key industries in Auckland.





Appendix 6: Incursion Response kit

ITEM	DETAILS	QUANTITY
Biosecurity Plan	Hard copy or electronic	1
Victor Professional rat traps	Drill hole near corner for cord/cable.	50
Victor Professional mouse traps	Drill hole near corner for cord/cable.	100
Wooden tracking tunnel covers	for traps or tracking tunnels 600mm	40
Peanut butter	High grade peanut butter	2kg
Peanut oil	As an alternative lure.	2 ltr
Chew card – core flute	Cut core flute (100mm x 150mm)	200
Wax tags – Peanut butter lure	Keep chilled/cool	200
Black Trakka tracking cards	Keep chilled or cool.	200
Rat bait stations and keys	Lockable, able to be attached to a tree	45
Mouse bait stations and keys	E.g., Protecta RTU mouse bait station	50
Pestoff rodent blocks	Keep chilled or cool. 10kg buckets	2 buckets
Wire for tracking tunnels	To suspend Pestoff rodent blocks	60
DOC200 stainless traps	In standard boxes. Plus setting tool.	10
Spare mesh for DOC200 traps	Cut to outside dimensions (~250x250mm)	20
75 gram weights	For calibrating DOC 200 traps	2
Flagging tape	3 colours. At least 3 rolls of each colour	9 rolls
Pottles for ant monitoring	30ml with lids.	200
Cotton wool balls	Bags of 100-200	2 bags
Macro lens attachment	For photography.	2
Jeweller's loop	For identifying ants	2
Set of georeferenced maps of each island/motu	Hard copy or electronic.	1
Guide to the identification of rodents	Laminated copies plus electronic	4
Guide to the identification of ants	Laminated copies plus electronic	2
Snap-lock bags	Variety of sized for samples.	4 packets
DNA sampling kit	For collection and preservation of samples	1
Waterproof notebooks	A6 size	4
Marker pens	For writing on	4
Spare screws	Stainless. 10g 60mm, 8g 25mm, #2 square head. Tek (hex) screws 50mm	50 of each.
Screwdriver	#2 square head and fitting for Tek screws	2 of each
Nails	75mm galvanised	3 kg
Hammers	Claw hammers	3
Paint brushes	38mm and 50mm for cleaning traps	4
Insecticide sprays and paste	E.g., Kiwicare No Bugs indoor, No Bugs super bug bomb. Flyspray.	

Vanquish ant bait	Ant poison. 325ml tubes (keep frozen and separate from food) and a caulking gun.	3