



**COOK ISLANDS**

**INVASIVE SPECIES**

**EARLY DETECTION & RAPID RESPONSE PLAN**



**Feb 2018**



**NATIONAL ENVIRONMENT SERVICE**  
TU'ANGA TAPOROPORO  
COOK ISLANDS



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## Acknowledgements

*Akameitaki'anga i te katoatoa tei piri mai e tei oronga mai, i to ratou au manako no te tata'anga i teia parani. Teia parani, e au ravenga teia no te parūrū i te Kuki Airani mei tetai uatu tu katiri kikino te ka riro, ei tāmānāmanatā i to tatou Ao Ora Natura, ta tatou ravenga kimi moni e to tatou ora'anga tangata.*

This plan was developed by the National Environment Service (NES) in partnership with the Biosecurity Service and the Ministry of Agriculture, in liaison with the Ministry of Health – Community Health Services, Ministry of Marine Resources and Ports Authority. This work was compiled by international consultant Dr D.J. Butler, R&D Environmental Ltd, NZ.

The NES is grateful for the involvement of all those who have assisted with this plan with particular appreciation of the efforts of the Biosecurity team during the successful Incursion Response Simulation Exercise carried out as part of the project.

Funding was provided within the GEF-PAS project: “Prevention, control and management of invasive alien species in the Pacific Islands” delivered by National Environment Service coordinated by the Secretariat of the Regional Environment Programme (SPREP).

## List of Acronyms

**BIO** – Department of Biosecurity & Quarantine, MOA  
**DBS** – Director of Biosecurity  
**EMCI** – Emergency Management Cook Islands  
**EOC** – Emergency Operations Centre  
**ERMC** – Emergency Response Management Committee  
**GEF** – Global Environment Facility  
**GEF-PAS** - Global Environment Facility Pacific Alliance for Sustainability  
**MFEM** – Ministry of Finance and Economic Management  
**MMR** – Ministry of Marine Resources  
**MOA** – Ministry of Agriculture  
**MOE** – Ministry of Education  
**NES** – National Environment Service  
**NHT** - Cook Islands Natural Heritage Trust  
**OPSC** - Office of the Public Service Commissioner  
**OPM** – Office of the Prime Minister  
**SPC** – Secretariat for the Pacific Community  
**SPREP** - Secretariat for the Pacific Regional Environment Programme  
**USDA** – United States Department of Agriculture

# Managing Early Detection and Rapid Response

Ensuring the Cook Islands is well prepared to detect and respond rapidly to an invasive species emergency.

This Early Detection and Rapid Response Plan is a key document for managing the early detection and response to invasive species, but there are some actions beyond it that also need to happen. These are set out in this initial section.

Actions required:

**Action 1: Keep this plan under review and update key information as needed.**

Key information that will go out of date includes:

- Phone numbers for office and key staff for the public to report sightings to; addresses of offices (p. 43 Annex 3)
- Information sources, including people, for local identification (Annex 3)
- International contacts for pest and disease identification (Annex 4)
- Legislation and related arrangements (Table 1 p. 8)

Responsibility: MOA

**Action 2: Ensure updated plans are held in key offices.**

Up to date copies of this plan should be held by the following:

- Ministry of Agriculture
- National Environment Service
- Ministry of Health
- Ministry of Marine Resources
- Emergency Management Cook Islands

Responsibility: MOA

**Action 3: Carry out periodic simulation exercises approximately every three years to test the system.**

Running simulation exercises are very important to test the country's responsiveness and to review and refine procedures. Annex 7 summarises a successful exercise conducted in June 2016, based on members of the public reporting sightings of an unidentified snake in Avarua. This exercise was 'real' for many of those involved for more than two hours as they were not informed beforehand that an exercise was to take place. The fewer staff that know an exercise is to happen the better.

Such an exercise is a much more effective test than a desk-top one. However it must be debriefed thoroughly and sensitively so that front-line staff who will have gone through a stressful situation, imagining a real emergency, appreciate that this was worthwhile and leading to important outcomes.

Responsibility: MOA, seeking assistance from other agencies in developing the simulation exercise.

**Action 4: Resource Key Government agencies sufficiently to lead national early detection and response work.**

The Ministry of Agriculture (MOA) needs to receive adequate core funding to have enough staff & resources to be able to detect invasive species at the border or post-border. MOA, National Environment Service, Ministry of Marine Resources and Ministry of Health need sufficient staff to be able to coordinate a response to the arrival of agricultural, biodiversity-related, marine invasives, or human health vectors respectively. The agency responsible for ensuring sufficient resourcing is the Ministry of Finance and Economic Management (MFEM).

It is not practical for these agencies to have a budget allocation for mounting a response as the costs cannot readily be identified beforehand. This plan identifies procedures for response funding to be identified and provided through national disaster planning alongside other disasters such as cyclones.

Responsibility: MFEM

**Action 5: Incorporate detailed provisions for invasive species responses in Disaster Risk Management Plans for Constituencies of Rarotonga and Pa Enua islands.**

Many such plans identify invasive species as an identified hazard but include no information on how to address this. Information on the hazard and identification (and contact details) of the key people to respond is probably the minimum requirement. General information needs to be drafted on the hazard posed by invasive species, and liaison maintained with

EMCI to ensure that Disaster Risk Management (DRM) Committees incorporate this and identifies appropriate actions when they next revise their DRM Plans.

Responsibility: MOA - Agriculture invasive, NES – Biodiversity invasive, MMR – Marine invasive

**Action 6: Assess the cost-benefits of establishing an emergency store of equipment for catching/sampling and killing a range of invasive species on Rarotonga and other islands.**

Equipment and materials are key to carrying out an emergency response, however it is not possible to have all these stored as some will degrade and lose effectiveness if not used. Some equipment can be kept for high-risk species or those that are likely to breach the Cook Islands biosecurity such as:

- Insects – fruitfly, ants and beetles
- Molluscs – snails and slugs
- Mammals – mongoose
- Reptiles and amphibians including cane toad
- Plants
- Marine pests

A basic surveillance kit should be held at the Ministry of Agriculture office and one for marine invasives at the Ministry of Marine Resources.

Responsibility: MOA for most invasive species and MMR for marine species.

**Action 7: Staff training**

The periodic simulation exercise (Action 3) will act as a training tool for key staff involved in the operation of an emergency response providing an understanding of the actions required. However, regular training on surveillance, reporting sightings, identification, and the safe use of chemicals, traps and other equipment is required for staff of the key agencies.



**Photo: Invasive species Identification training on Pukapuka**

Responsibility: MOA, NES, MMR, MOH.

# Section 1: Introduction

## 1.1 Scope

This plan is intended to provide a framework for the early detection of any invasive species including pest animals and plants (weeds), pests of plants and diseases of plants and animals (excluding diseases of humans) that has passed across the border. Maintaining effective border control is still the single most important weapon against invasive species. However pests do pass through it and are detected, whether through an active surveillance programme or through a report from someone. It identifies Biosecurity Service, Ministry of Agriculture (MOA) as the key organisation to receive the detection. The Service will then pass the information to others to respond depending on the nature of the potential invasive species, whether guided by this document or their own plans (Table 1).

**Table 1: Responsibilities, guiding plans and legislation for different types of invasive species incursions**

<b>Nature of suspected arrival</b>	<b>Lead Agency to respond</b>	<b>Guiding plan</b>	<b>Empowering legislation<sup>1</sup></b>
Animal health related issues (e.g. diseases, parasites)	Livestock Division, MOA	CI Animal Health Emergency Response Plan 2011	Biosecurity Act 2008
Marine species <sup>2</sup>	Ministry of Marine Resources	Ballast water & hull fouling plans with Ministry of Transport  MMR is working with SPC on Cook Islands National Strategy on Aquatic Biosecurity.	Maritime Rules 2014
Vectors of human diseases (e.g. mosquito)	Ministry of Health	MOH procedures	Public Health Act 2004
Fruit flies	Research Division, MOA	This plan and specific section in annex 8	Biosecurity Act 2008
Other pest insects and invertebrates	Research Division, MOA	This plan	Biosecurity Act 2008
Plant disease	Research Division, MOA	This plan	Biosecurity Act 2008
Bird, mammal, amphibian, reptiles	Environment Service	This plan	Biosecurity Act 2008 (through MOA involvement)
Freshwater fish, invertebrate or	NES, MMR or MOA	This plan	Biosecurity Act 2008



plant			
Any invasive species on Suvarrow	Environment Service	Biosecurity Action Plan for Suvarrow National Park 2014 and this plan	Environment Act, Biosecurity Act, Customs Act.

1. The legislation that empowers officers to enter property, destroy infected material, impose movement controls, etc.

2. The following may be helpful in planning for aquatic pests: Rapid Response Planning for Aquatic Invasive Species - A Maryland example. Maryland Sea Grant College, US.

<http://ww2.mdsg.umd.edu/images/uploads/siteimages/MarylandPlanFinal.pdf>

## 1.2 Plans for different invasive species

Expanding on the previous analysis, the next section identifies the plans and approaches to be taken to respond to different types of invasive species.

### **Animal Health (AH) – implement AH Emergency Response Plan (2011 CM 11/0260)**

This plan describes the emergency response arrangements to manage an animal health emergency – i.e. when one or more animals are infected with or by the causal agent of an emergency animal disease.

Emergency animal diseases include foot & mouth disease, classical swine fever, rabies, Newcastle disease, as well as those caused by parasite infestations that affect animal health e.g. screw worm fly.

Prime responsibility: Chief Livestock Officer, MOA

### **Human Health**

#### **1. Possible vectors of human diseases – e.g. mosquitoes**

Responsibility for ensuring that high-risk areas (e.g. airports, seaports) are free from sources of infection, including vectors, lies with the Ministry of Health under the Public Health Act 2004 (part 5 Mosquito and other Regulated Pests) and the International Health Regulation 2005.

If anything unusual/suspicious is detected, the following steps are followed:

1. Notification of counterparts at Pacific Community (SPC) and World Health Organisation (WHO).
2. Samples sent to an expert (Medical Entomologist) for confirmation.

3. Destruction program applied over 300 - 400 metres radius from where the samples are identified - either a space focal spraying for adult mosquitoes or application of larvicide and source reduction within the vicinity of the property.

All incoming international flights or sea going vessels are sprayed on arrival by our Port Health Officers, with assistance and support from our Biosecurity Officers from MOA. Air New Zealand, Jetstar, Virgin Australia and Air Tahiti are exempted because they have been pre sprayed before arrival and this is confirmed with a Spraying Certificate that will be checked on arrival.

Prime responsibility: Community Health Services, Ministry of Health

## **2. Public health risk carried by people transiting the port or airport in Rarotonga**

1. Multi Agency Public Health Emergency Response Plan for a Contingency at Avatiu Harbour. 2014 Draft
2. Multi Agency Public Health Emergency Response Plan for a Contingency at Rarotonga (RAR) International Airport. 2014 Draft

Prime responsibilities:

1. Incident Commander Port Authority (EOC) and Medical Director.
2. Incident Controller located in the Airport EOC at the Control Tower supported by a Medical Director provided from the Public Health Services.

## **Marine Pests**

Use this plan together with Cook Islands National Strategy on Aquatic Biosecurity (in draft).

## **Terrestrial Pests**

Use this plan together with specifics for particular groups as follows:

- **Plant pests** – also refer to SPC general plan for plant pest incursions (Rapp 2001).
- **Insects**
  - Fruit-fly – use this plan and specifics in annex 8
  - Ants – use this plan plus the general one produced by SPC [http://www.issg.org/cii/Electronic%20references/pii/project\\_docs/papp/spc\\_ant\\_er\\_p\\_2008.pdf](http://www.issg.org/cii/Electronic%20references/pii/project_docs/papp/spc_ant_er_p_2008.pdf)

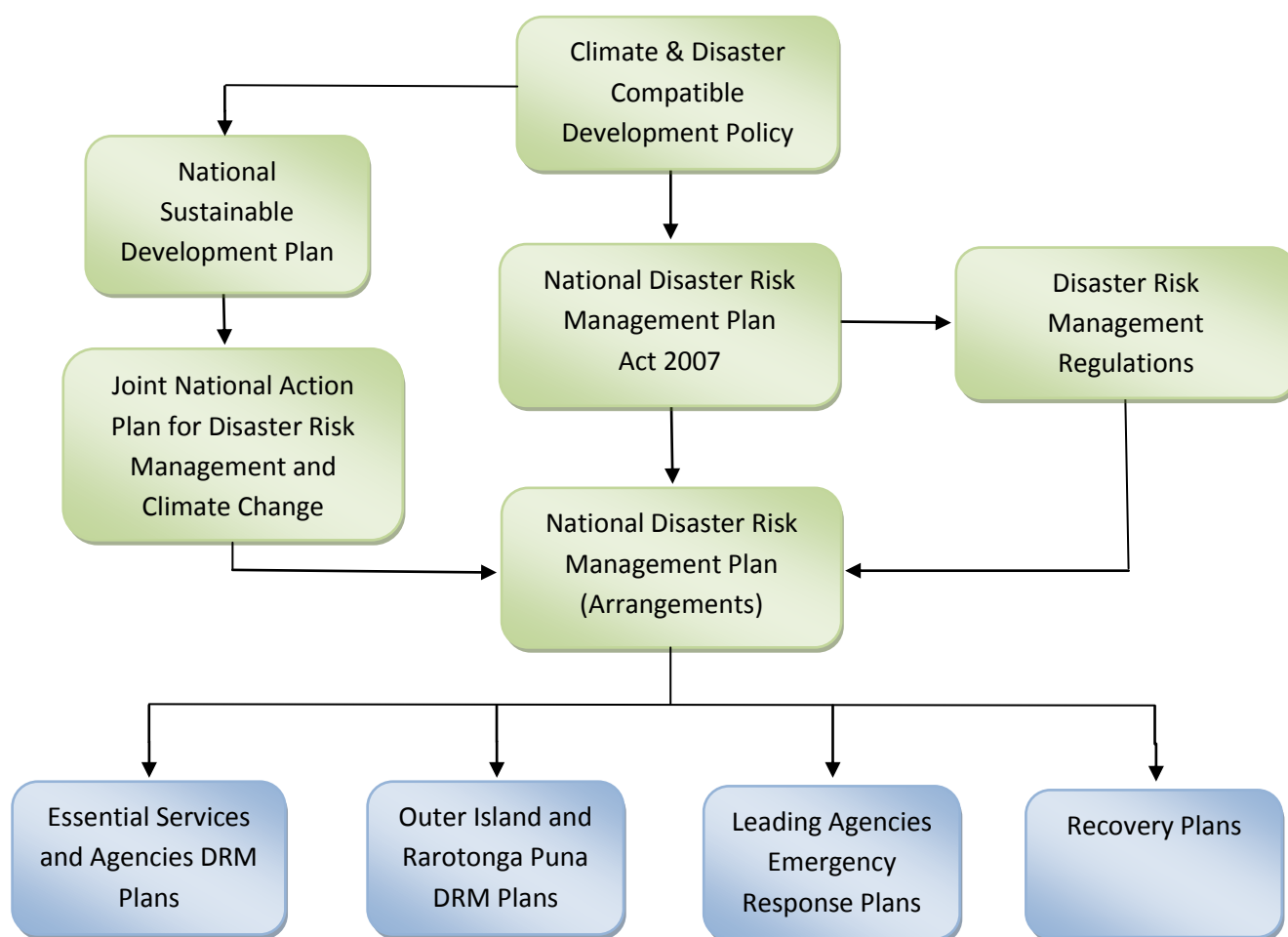
### 1.3 Linkages to other plans

#### Cook Islands National Disaster Risk Management Plan 2017

This plan has been developed under the Disaster Risk Management (DRM) Act to assist agencies to keep the country's people, properties and essential infrastructure safe and secure from hazards and risks that threaten to become emergencies or disasters. It lists 'Invasive Species' as one of the 'High-risk' hazards. There are many international examples of invasive species arriving in a country and causing major economic, environmental and or social impact.

The plan identifies the responsibility of the National Disaster Risk Management Council to formulate policy and advise Cabinet on DRM issues. Emergency Management Cook Islands (EMCI) is the central coordination agency for DRM and facilitates the implementation of the plan. The EDRR plan fits within the national framework for DRM as the national emergency response plan for invasive species (highlighted) (Figure 1).

**Figure 1: Cook Islands DRM Policy and Plans Framework**



It has been identified that the immediate response to disasters is typically a local one, particularly in the outer islands. The plan, therefore, includes provisions for the development of individual Island DRM Plans. It requires each island to establish an Island DRM Committee, as a committee of the Island Council, chaired by the Mayor to coordinate activities on the island; and to appoint an Island Disaster Coordinator. Rarotonga is divided into 10 Puna (districts) for disaster management purposes and each has to establish a Puna DRM Committee, Puna Disaster Coordinator and develop a Puna DRM Plan.

The response to an invasive species emergency will be most effective if the issue is specifically addressed in Island and Puna DRM Plans. The Island and Puna Disaster Coordinators can play important roles in EDRR, encouraging community members to report sightings and coordinating the inputs of local people into emergency responses, in support of national agencies.

### **The Cook Islands 2<sup>nd</sup> Joint National Action Plan – A sectoral approach to Climate Change and Disaster Risk Management 2016-2020 (JNAP II).**

The vision of the second JNAP is A Safe, Resilient and Sustainable Cook Islands. Its goal is to strengthen climate and disaster resilience to protect lives, livelihoods, economic, infrastructural, cultural and environmental assets in the Cook Islands in a collaborative, sectoral approach. It rates invasive species as a high-risk hazard and identifies increasing invasive species issues as one of the climate change vulnerabilities. It contains actions to eradicate and control invasive species and to improve biodiversity to increase resilience to climate change.

### **Disaster Risk Management Plans (DRMP) for the Outer Islands**

The Cook Islands Geo Portal [www.emci.gov.ck](http://www.emci.gov.ck) holds pdf's of the DRMP's for the Outer Islands developed in 2014 for Aitutaki, Atiu, Mangaia, Manihiki, Mauke, Mitiaro, Palmerston, Penrhyn, Pukapuka and Rakahanga. These plans deal largely with cyclones (and some with tsunamis), though several include drought and brush fires as hazards and have a section for other hazards to be included.

Invasive species emergencies need to be added to the hazards identified in each plan and any particular measures needed for them included. Agricultural and Environmental Officers are likely to play important roles in the initial response to an invasive species emergency.

## 1.4 Plan structure

This plan has two main elements:

**Early detection** – measures that the Cook Islands can take to increase the chances that a newly-arrived pest is detected early before it has a chance to increase in numbers and spread. Early detection is the key to successfully eradicating the pest.

**Rapid Response** – measures that the Cook Islands can put in place quickly to tackle the newly arrived pest with the aim of eradicating it.

The 'Early Detection' section includes both the finding and reporting of a new pest and the process of identifying it and assessing whether it poses a significant threat. The 'Rapid Response' section picks up from the point that a significant threat that requires a response has been identified.

The plan concentrates on pests new to the country, but it also addresses pests that are already present on some islands of the country, but not on others, and identifies measures to prevent their further spread. An example is preventing ship rats reaching Atiu where they would threaten the rare birds located there.

# Section 2: Early Detection.

## 2.1 Introduction

Early detection is based on two different approaches, active and passive.

### Active Detection

The Border Control work carried out by Biosecurity and Customs at the international airport is clearly active but is not considered in detail in this plan as it has its own systems and Biosecurity Manual in place. Active detection also involves organising **surveillance**: undertaking specific monitoring to detect specific pests that have been identified as high-risk which have got past the border. An example is the fruit-fly trapping supported by the Secretariat of the Pacific Community.

### Passive Detection

Passive detection relies on people finding an organism or observing something they don't recognise, e.g. unusual damage or discolouration of crop leaves, and reporting it. For this second strategy to be effective, the general public needs to be encouraged to report, and should be informed on how and to whom they should report.

Both approaches can be based on analysis of which pest species are the highest risk. Then surveillance programmes can be established for these species, if resources allow, and/or information can be provided to allow the public to keep a look out for them.

## 2.2 Species of highest risk to Cook Islands

The following list of 'highest-risk' species (Table 2) is based on the following criteria (modified from Atherton & Martel (2015)):

- Not in Cook Islands yet;
- Would have serious economic, environmental or social impacts if they become established in Cook Islands;
- Present in countries and trading partners that neighbour Cook Islands so there is a real chance that they can arrive in Cook Islands;
- Suited to Cook Islands' climate and likely to establish in Cook Islands if they arrive
- Includes pests impacting the environment and/or the economy through sectors such as agriculture, fisheries and tourism; and
- Includes pests impacting on human health.

**Table 2: List of highest risk invasive species not found in Cook Islands**

<b>Taxonomic Group and Common Name</b>	<b>Scientific Name</b>	<b>Pacific Region Countries where species is found</b>
<b>Terrestrial invertebrates</b>		
Rosy wolf snail	<i>Euglandina rosea</i>	American Samoa, French Polynesia, Guam, Kiribati, New Caledonia, RMI, Palau, PNG, Solomon islands, Vanuatu, Wallis and Futuna
Cuban Slug	<i>Veronicella cubensis</i>	American Samoa, CNMI, USA (Hawaii)
Taro beetle	<i>Papuana uninodis</i>	Fiji, New Caledonia, PNG, Solomon Islands, Vanuatu
Rhinoceros beetle	<i>Oryctes rhinoceros</i>	Fiji, Tonga, Samoa, American Samoa,
Termites	<i>Various species</i>	Pan Pacific
Exotic fruit flies	<i>Mostly Drosophila and Bactrocera spp</i>	Pan Pacific
Red Imported Fire Ant	<i>Solenopsis invicta</i>	Australia, China, Hong Kong, Taiwan, and USA (eradicated from NZ)
Little Fire Ant	<i>Wasmannia auropunctata</i>	Australia, French Polynesia, Guam, Hawaii, New Caledonia, PNG, Solomon Islands, Tuvalu, Vanuatu, Wallis and Futuna
Giant African snail	<i>Achatina fulica</i>	Samoa, American Samoa, French Polynesia
Citrus psyllid	<i>Diaphorina citri</i>	USA
Banana scab moth	<i>Nacoleia octasema</i>	Fiji. Tonga, Solomon Islands
Redback spider	<i>Latrodectus hasseltii</i>	Australia, New Zealand, Japan
Mosquito (malaria vector)	<i>Anopheles farauti</i>	Australia, PNG, Solomons, Vanuatu
Asian tiger mosquito (yellow fever vector)	<i>Aedes albopictus</i>	Fiji. Australia, New Zealand

<b>Taxonomic Group and Common Name</b>	<b>Scientific Name</b>	<b>Pacific Region Countries where species is found</b>
<b>Weeds<sup>1</sup></b>		
Miconia	<i>Miconia calvenscens</i>	French Polynesia, New Caledonia, PNG, Hawaii
Siam Weed	<i>Chromolaena odorata</i>	Australia, Guam, FSM, Palau, PNG, USA
Cogon grass	<i>Imperata cylindrical</i>	Fiji, Samoa, Tonga & others
Water fern (aquatic)	<i>Salvinia molesta</i>	Fiji, French Polynesia, New Caledonia, New Zealand, PNG, Vanuatu
<b>Amphibians</b>		
Cane toad	<i>Rhinella marina</i>	Australia, Fiji, French Polynesia, American Samoa & others
<b>Reptiles</b>		
Brown tree snake	<i>Boiga irregularis</i>	Australia, Guam
Green iguana	<i>Iguana iguana</i>	Fiji
<b>Mammals</b>		
Mongoose species	<i>Herpestes species</i>	Fiji, Japan, USA (Hawaii)
<b>Birds</b>		
Red-vented bulbul	<i>Pycnonotus cafer</i>	Fiji, Samoa, French Polynesia, Tonga & others
<b>Plant diseases</b>		
Banana bunchy top (virus)	<i>BBTV Virus</i>	Fiji, Samoa, Tonga & others
Taro leaf blight (fungus)	<i>Phytophthora colocasiae</i>	Samoa
<b>Diseases of birds (poultry)</b>		
The two diseases listed are not in the Pacific Islands but there are possible (low risk) pathways to the region via migrating birds.		
Bird flu (avian influenza)	<i>Orthomyxoviridae</i> virus	Bird flu has been recorded in several south-east Asian countries and Australia.
Newcastle disease	<i>Paramyxoviridae</i> virus	Newcastle disease has been recorded in Australia and Thailand.
<b>Diseases of animals</b>		
(pigs, cattle, goats etc.)	A range of viruses and bacteria are listed by the OIE (see Annex 5)	Not in the Pacific Region – none can be identified as particularly high risk.
<b>Marine</b>		
Green Crab	<i>Carcinus maenas</i>	Australia, Japan, USA
Diseases of species used for aquaculture (e.g. pearl farming)	Refer OIE list (see Annex 5)	

1. Space & Flynn (2002) identify 28 plant species, genera or groups that are priorities to exclude from the Cook Islands (Table 2 reproduced as Annex 1).

The list is preliminary and a detailed pathway exercise and risk assessment could be undertaken to develop a fuller list. However, for the purpose of this plan it identifies the different types of pest that need to be detected early and eradicated. The list should be kept under review, for example the arrival of a new pest in a neighbouring country with close trade links increases the risk of it reaching the Cook Islands.

## **2.3 Active Detection - proposed surveillance programmes**

The following programmes are in place or to be developed to actively detect arrivals of some of the high-risk species listed above.

### **2.3.1 Fruit flies**

A fortnightly surveillance programme for fruit flies is carried out on Rarotonga with 21 permanent trapping sites. Surveillance traps are dipped in lure twice a year. These traps consist of lures, methyl-eugenol to attract *B.xanthodes* and cue-lure to attract *B.melanotus* fruit flies. These fruit fly traps are checked, number of flies counted and recorded. The Ministry of Agriculture is looking at Geographic Positioning System each trap site to ensure surveillance sites are consistent and easier to monitor.

Fruit fly surveillance traps also extend to the Pa Enua in particular the southern islands. Fruit flies caught in traps are sent to the ministry on Rarotonga once a month for analysis.

### **2.3.2 Invasive ants**

Biosecurity Officers conducted an Ant species identification training in 2017 and following this training, discussions about establishing a surveillance programme for invasive ants at ports and airports were discussed. This is likely to be an outcome of a project supported by New Zealand Aid and SPC. The general public reports to the Ministry of Agriculture on any unusual sighting of ants or brings a sample of the ant to the Ministry for identification. The Ministry responds to any unusual sighting of ants using hot water in the nests.

### **2.3.3 Mosquitoes that are vectors of human disease**

The Ministry of Health has a mosquito surveillance, monitoring and destruction program conducted throughout the country every quarter (March, July & November). This includes all airports, seaports, hospital surroundings, and all waste disposal areas in the country. A thousand properties are randomly inspected on Rarotonga and 1000 on most of Te Pa Enua (Aitutaki, Mangaia, Atiu, Mauke, Pukapuka, Manihiki, Penrhyn and Rakahanga).

Mosquito larvae are collected and analysed under a microscope using the WHO Guidelines for Dengue Surveillance and Mosquito Control. If anything unusual is found then WHO or SPC are notified and technical assistant or expert opinion are sought including the possible dispatch of a medical entomologist to confirm the findings.

If appropriate a destruction program is initiated within a 300 - 400 metres radius of where the samples are identified, either through focal spraying for adult mosquitoes or application of larvicide to reduce the source within the vicinity of the property.

All sea going vessels are sprayed on arrival by Port Health Officers, with assistance and support from Biosecurity Officers of the MOA. Incoming international flights are also



sprayed on arrival except for those of Air New Zealand, Jet Star, Virgin Australia and Air Tahiti who are exempted due to pre-spraying before arrival which is confirmed by a Spraying Certificate checked on arrival.

### **2.3.4 Marine invasive species at international ports**

There is currently no surveillance programme for marine invasive species though there is some management of the pathways by which they might arrive through ballast water and hull-fouling. Survey of the ports at Rarotonga and Aitutaki for invasive species has been identified as priorities in the national invasive species strategy. Such surveys have proved valuable elsewhere and could lead to a surveillance programme.

A recent such example was a training exercise and port survey carried out at by an international team at Malakal Harbour, Palau (Campbell *et al.* 2016). The preliminary field survey detected 11 introduced, two cryptogenic and seven potentially introduced species, several of which were of concern as they could become pests or are known as pests elsewhere. These included hydroids, a bryozoan and possibly a Caribbean barnacle. It was considered that most likely these pests arrived as fouling on boat hulls.

### **2.3.5 Site-specific surveillance – Suvarrow National Park**

The Biosecurity Action Plan for Suvarrow National Park details surveillance for rodents, including the maintenance of bait stations at Anchorage and checks of all motu, and for invasive ants, other invertebrates and plants (Boudjelas *et al.* 2014).

## **2.4 Passive detection - proposed public awareness programmes**

Awareness programmes are designed to inform the public about the threat posed by new invasive species, so that they report anything new that they find, and tell them who to report to. Programmes can be focussed on high-risk pathways (1.4.1) and be designed for people on these pathways (1.4.2) as well as those who are more likely to find new species, e.g. farmers who might be the ones to detect a new livestock disease or food crop pest. They should also identify what specific high-risk species they particularly need to look out for.

Programmes need to identify a reporting system that is as simple as possible.

### **2.4.1 Identification of high-risk pathways**

#### **Rarotonga**

The Cook Islands NISSAP tabulates recent interceptions at the border and new pest occurrences in the country since 2000. Most international traffic by air and sea arrives to Rarotonga therefore, this island is the focus of this section. This information contributes to identifying high-risk pathways and key people on those pathways to be targeted by awareness material (Table 3).

**Table 3: High-risk pathways and their detections and awareness targets**

High-risk pathway	Detections & occurrences	Targets for awareness programmes
Shipping containers – accidental ‘hitchhikers’ inside and on outside	Pest invertebrates (snails including giant African, flies, redback spider)	Staff in freight warehouses where containers unloaded.  Business owners and individuals taking delivery of complete shipping containers.
Shipping containers – deliberately imported material	Import of cogon grass for roof thatching.  Aphids on imported lettuce.  Various established plant pests likely to have arrived in imported plant material by sea: e.g. orchid weevil, scale insects	Tourist accommodation developers  Fresh produce importers/retailers. Growers, importers of plant material for food crops or gardens
Inside international aircraft	Detection of pest insect (rhinoceros beetle)	Airline cleaners and maintenance staff  Airline passengers.
Various for imported fruit & vegetables	Pests of food crops, including fruit flies, thrips, scale insects	Airline passengers carrying fruit.  Yacht owners.  Cruise ship owners/passengers.  International waka crews.  Importers/retailers of imported fruit and vegetables
Various for imported ornamental plants for gardens	Source of significant number of weeds	Importers/ sellers of ornamental plants  Individuals importing seeds (in luggage, by post)

### **Pa Enua – the other islands**

The pathway that most pests would take to reach the Pa Enua is via Rarotonga, so the EDRR system needs to be strongest there. But there are some exceptions as shown in Table 4.

**Table 4: Direct High-risk to Pathways to Pa Enuu**

High-risk direct pathway	Islands involved
Inside or on the outside of shipping containers	Aitutaki
Yachts	Aitutaki, Suvarrow, Palmerston, Penrhyn,
Cruise ships	Aitutaki, Atiu
Vaka	Aitutaki
Charters to Cook Islands	Pukapuka, Penrhyn, Manihiki, Palmerston
Postal baggage	Aitutaki

## 2.4.2 Awareness material for high-risk pathways

**Table 5: Awareness material for different target groups**

Targets	Awareness material required
Staff in freight warehouses where containers are unloaded.	Rarotonga and Aitutaki – posters.
Business owners and individuals taking delivery of complete shipping containers.	Rarotonga and Aitutaki – Information attached to paperwork. If anything suspicious seen, close the container and contact Biosecurity
Tourist accommodation developers	Same as above for receiving shipper containers. Also provide advice on what ornamental plants and materials (e.g. thatch) not to use or allowed to import
Fresh produce importers/retailers.	Fact sheet on EDRR identifying what to look out for and how to report anything suspicious. Permitting requirements for import of plants and seeds.
Growers, importers of plant material for food crops or gardens	Fact sheet on EDRR process, what to look out for and how to report anything suspicious. Permitting requirements for import of plants and seeds.
Airline cleaners and maintenance staff	Awareness workshop with cleaners and maintenance staff to identify and report anything suspicious
Airline passengers.	Biosecurity announcement on all airlines and posters at airport arrival. Fact sheet on EDRR to report anything suspicious.

Yacht owners.	Update information on yacht website and provide fact sheet on EDRR identifying what to look out for and how to report anything suspicious.
Cruise ship owners/passengers.	Information available for announcement on ship and information attached to paperwork.
International Vaka crew.	Information available for announcement to crew and attached to paperwork
Importers/retailers of imported fruit and vegetables	Information attached to paper work
Importers/ sellers of ornamental plants	Information attached to application forms/paper work
Individuals importing seeds (in luggage, by post)	Information attached to application forms/paper work. Fact sheet on EDRR identifying what to look out for and how to report anything suspicious.

### 2.4.3 Education

School pupils can be effective ears and eyes to detect incursions today and raising their awareness will contribute to effective invasive species management and control in the longer-term. Teachers have been trained on the use of the Live and Learn biodiversity teaching system and kits were sent to all primary schools. The Extension officer with the Ministry of Agriculture carries out school visit and various programs.

### 2.4.4 Reporting systems – ‘Pest Alert’

Awareness material must identify what people should do if they detect anything suspicious. It should be in Cook Islands Maori and English languages.

#### Who to report to?

**Rarotonga** – All possible invasive species – Ministry of Agriculture, Arorangi, Phone 28711, 28710. The first phone is the Ministry’s main number and the second is Biosecurity Service. Specific staff phones are currently: Head of Ministry - 57499, Director Biosecurity Service - 80553, Research Director -79086, Entomologist – 23548, Livestock - 50582.

**Pa Enua** – Executive Officer, Island Council (EO) or Agriculture, Environment or Marine Officers who will report to EO.

## What action to take?

It may be important to contain the situation to not make matters worse as identified in the poster below (Figure 2).

### 2.5 Completion of Early Detection

The Early Detection phase ends when a report reaches the Ministry of Agriculture on Rarotonga or the Executive Officer on an island in the Pa Enua. The Investigation Phase then begins with the report being passed over to an Investigator in the appropriate agency to follow it up.

**Figure 2: Pest detection advice poster.**

**What to do if you detect a possible pest**

**A. Contain the situation**

Don't take it to the authorities. Contain it and get the authorities to come to you.  
Keep yourself safe – do not take risks if dealing with a possibly dangerous pest.

If a living animal: Catch it alive if easy (e.g. snail) and place in a secure container. If not easy to catch, contain it (e.g. by closing a shipping container or box of imported goods). If not possible to contain (e.g. a bird) then have someone keep it under close observation while you report it.

If a flying insect: Contain it immediately if possible (e.g. by closing a shipping container or box of imported goods). If not possible, catch it and place in a secure box or jar. If not possible, kill it with fly spray or other non-destructive means and keep the body. **DO NOT SQUASH IT!** To identify insects they need to be in as good a condition as possible with wings, legs, antenna etc. all intact.

If a diseased animal: isolate it from other animals.

If a plant: leave in place and mark the spot.

If a plant disease or scale: collect leaves, fruit and seal in polythene bags or leave in place and mark the spot.

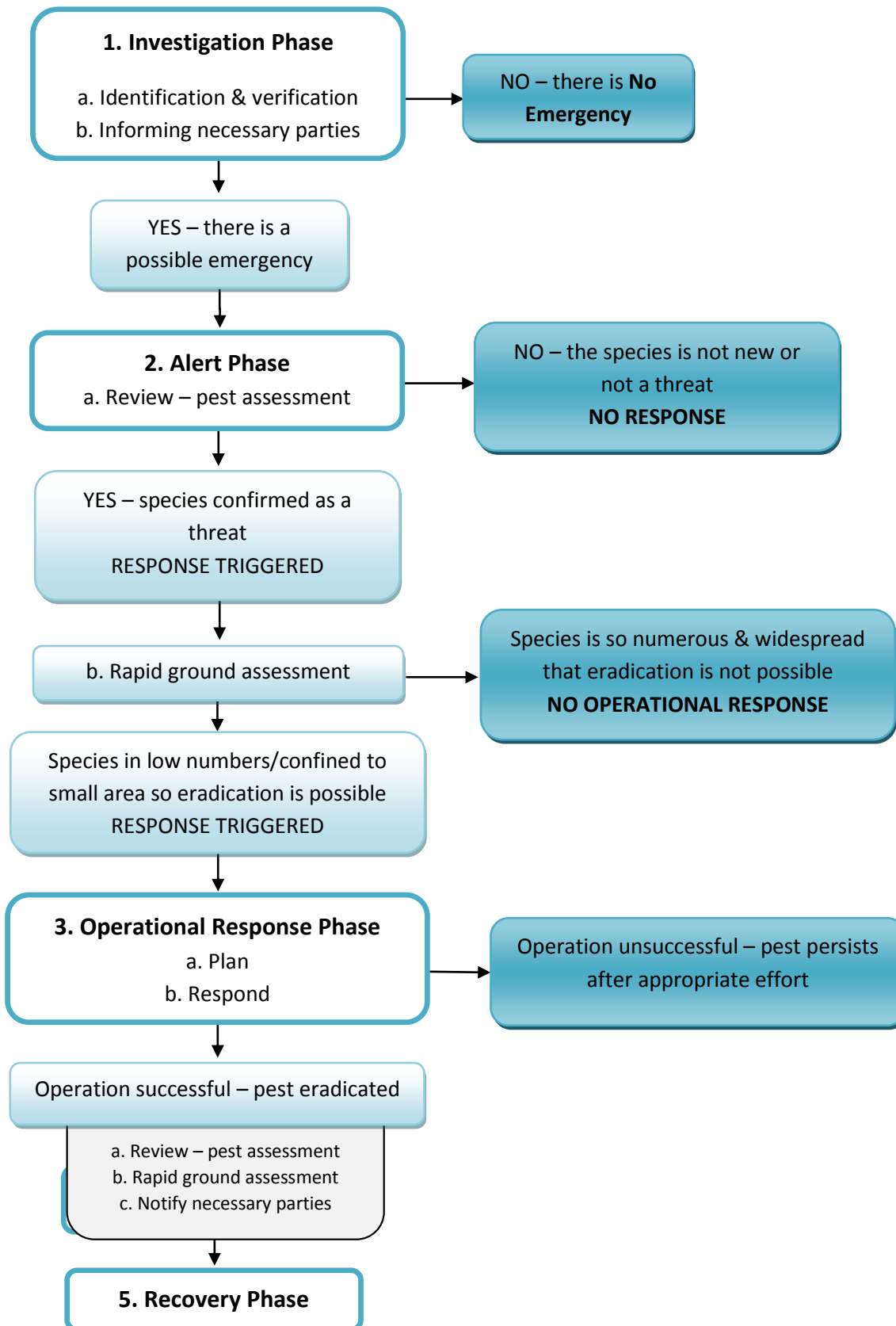
**B. Report**

Contact Biosecurity Service, Ministry of Agriculture immediately

**MOA Office: 28711    Biosecurity: 28710    Duty Officer (24 hrs) Head of Ministry - 57499, Director Biosecurity Service - 80553, Research Director -79806, 29206, Entomologist – 23548, Livestock 50 582**

## Section 3: Rapid Response

The response includes five phases and decision points as follows:



## 1. INVESTIGATION PHASE

Begins when report is received that COULD BE an invasive species emergency.

It has 4 elements:

**1. Identification** – by talking to the person who reported the sighting, making a visit to where the sighting occurred, and checking with local experts and local and international database, and using internet-based groups. There may be complete confidence with the identification or it may need verification.

**2. Verification** – an international expert confirms the identification by detailed examination of a specimen, by comparing it with museum and herbarium collections, or, as in the case of fruit flies, arranging a DNA analysis to determine the exact species.

**3. Informing key people** – a small number of people need to be informed at this stage that there could be a problem.

**4. Collecting other initial information** and making an initial response.

Key personnel: First Responder, Technical Adviser.

### 1.1 Responding to report and identification

On Rarotonga this report is most likely to be received by the Ministry of Agriculture (MOA) by phone (28711 or 28710) if it is during office hours. On Pa Enua it is likely to come to the Island Administration or Agriculture, Environment or Fisheries Officers.

#### **Actions to take by Receptionist or whoever receives the call:**

The recipient of the call should do one of the following:

- Thank the caller, write down their name and phone number.
- Attempt to forward the call on to an appropriate officer to respond (First Responder) (list below).
- If unable to locate an officer, let the caller know that someone will call them back as soon as possible.
- Pass caller details on to appropriate officer as soon as available.

*List of appropriate contacts - 'First Responders':*

## Rarotonga

- Agriculture pest – Matairangi Purea/Ngatoko Ngatoko/William Wigmore.
- Marine pest – Ben Ponia/Kori Raumea.
- Health pest – Tata Vaeau/Charlie Ave.
- Biodiversity – Gerald McCormack, Joseph Brider/Elizabeth Munro.

## Pa Enua

- Island Executive officer.
- Agriculture Officer – if it is likely to be an agricultural pest.
- Environment officer – if it is likely to be a biodiversity pest.
- Marine Officer – if it is a marine sighting.

Requirement: laminated prompts by all phones that might receive the 28711 call, and at front desk, about who to pass it on to.

The report might be made in person at the MOA Arorangi office in Rarotonga or Island Administration office in Pa Enua which case an appropriate officer should be found to talk to them.

### **Actions to take by First Responder who has the contact passed on to them:**

1. Assess which agency is responsible for responding (as Table 1 p.8).
2. Respond to the report with a follow-up call if the likely pest is one for which Ministry of Agriculture is lead agency, or pass the contact on to Ministries of Health, Marine Resources, or Environment Service if it is not.

### ***Follow-up call from First Responder***

The First Responder will:

1. Receive the call from or ring back the person who made the report.
  - Thank them for the report and reassure them if necessary.
  - Advise the caller of any immediate action to take.
  - Obtain further details of the sighting.
  - Advise the caller of the next steps to be followed:
    - He/she will come and visit them now – obtain directions.
    - Their report will be passed on to another agency who deals with this type of pest (e.g. MMR for marine pest) who will contact them.
    - Their report will be passed on to someone else in the MOA who will contact them.
  - Ask the caller of their immediate plans to ensure they will be contactable on the phone number given over the next hour.
  - Ask if they have any questions at this stage.



**NOTE: This first conversation is very important.** The caller may be nervous that he/she is wasting time by reporting something that is not an invasive species pest at all, or that the Ministry might think he/she was responsible or be faced by a dangerous situation. It needs to be made clear that the Ministry is very appreciative of the call, not concerned if it later turns out not be a problem. The person may need reassurance that the possible pest poses them no danger, or advice if a dangerous situation exists. If this conversation is positive for the caller, the more likely they and the people they know are likely to make reports in the future.

### ***Site visit***

The site visit is made by First Responder ideally accompanied by a Technical Adviser (these may be the same person).

In making the site visit the following concerns should be considered:

A. Identification – obtaining a good specimen, or photo, or the best possible description is the priority. Table 6 provides information on obtaining and handling specimens to make sure that you don't make the problem worse.

B. Health & Safety – don't put anyone at risk. Use gloves to handle dead animals, etc. (Table 6).

C. Extent of problem and possible containment – obtain a preliminary idea of the size of the problem – no. of individuals and/or area covered. Consider if you can take any immediate action to prevent further movement or spread.

D. Pathway – can any evidence be collected by interviews or observing the scene to determine how the possible pest got there – i.e. its pathway.

During the visit the observer will be informed that you will contact them again as soon as you have more information. Give them your number so they can call you if they make further observations or remember any more details.

### ***What to take on visit***

Prior to making the visit the First Responder should consider what to take with them and take advice on this. It might include the following depending on what was reported.

- Possible means to obtain specimen/capture what was seen – traps, gun, fly spray, etc.
- Appropriate containers to hold specimen(s).
- GPS, if available.
- Cell phone and camera with good zoom/macro capabilities, if available.
- Safety equipment (gloves, etc.).

- Notebook.
- Binoculars.
- More people to assist in the search.

### **Actions following visit**

- Write up an account of the initial report and site visit.
- Meet and brief key staff.
- Work with a Technical Adviser to organise identification and verification.

### **Collecting specimens**

Precautions need to be taken during the collection of certain specimens including measures for health and safety and to ensure that the problem is not spread (Table 6).

**Table 6: Measures to be taken into account when collecting specimens.**

<b>Measure</b>	<b>Comments</b>	<b>Measures</b>
Health & Safety	<p>Safety of those collecting specimens is a priority:</p> <ul style="list-style-type: none"> <li>• Any live snake should be treated as venomous.</li> <li>• Mammals such as rats, mongooses carry diseases that can be transferred by urine, faeces and biting.</li> <li>• Mosquito could be carrying disease.</li> </ul>	<p>Snake – set traps to capture without risk of contact unless an experienced snake handler.</p> <p>Live mammal – take measures to avoid being bitten and wear gloves.</p> <p>Use protective clothing and insect repellent.</p>
Prevent spread of pest	Insect pest of plants	<p>Kill any insects found without damaging them.</p> <p>Contain any potentially infested fruit or damaged leaves.</p>
	Possible soil-borne plant disease	<p>In the case of soil-borne plant diseases (for example fusarium wilt of bananas), the movement of soil and plant material from the infested area needs to be prevented as follows:</p> <ul style="list-style-type: none"> <li>• Any vehicles and equipment leaving the infested area must first be thoroughly washed and disinfected to remove all traces of soil and plant material.</li> <li>• Boots and shoes of any person leaving the infested area must be thoroughly cleaned of soil and disinfected (using a foot bath with sodium hypochlorite or other suitable disinfectant).</li> <li>• Anyone who has contact with</li> </ul>

		<p>potentially infested plants or soil must wash and disinfect their hands before leaving the infested area.</p> <ul style="list-style-type: none"> <li>Any equipment with contact with plants or soil should not be moved out of the infested area, or must be thoroughly cleaned and disinfected beforehand.</li> <li>No host plant material should leave the infested area, unless as samples for the purpose of identification. These must be placed in leak-proof containers at the place of examination, and destroyed or kept under security after examination.</li> </ul>
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### Instructions for labelling specimens

All specimens submitted for identification should be clearly labelled with basic information on:

- Date collected; name of collector and organisation.
- Locality (site) (including the nearest place likely to be recorded on maps).
- Habitat type: type of area and dominant vegetation.
- Information on host plants (if insect or disease) including any impacts (e.g. plant dying, leaf discoloration)
- Additional description. Describe anything which cannot be seen from the specimen e.g. if a plant describe growth habit (tree, grass, vine, herb), approximate height, flowers & fruits.

### To identify specimen(s) in country

- Check with Cook Islands Heritage Biodiversity Database <http://cookislands.bishopmuseum.org> and Cook Islands Nature Heritage staff.
- Consult with other local experts.
- Check Global Invasive Species Database [www.iucngisd.org](http://www.iucngisd.org)

### Sources of assistance for identification

Annex 3 lists other resources that can be used to identify the species locally.

## 1.2 Verification of identification

- Send photos or specimen to an overseas expert (see list in Annex 4).
- If no expert known, put details/photos online through PestNet [www.pestnet.org](http://www.pestnet.org) (see box for how to join).

**How to Join PestNet**

PestNet is an informal network of people worldwide who have an interest in plant health and plant protection. Membership to the network is free. You can join by email or via the Yahoo!®Groups website.

**Join by email**

Send an email addressed to [PestNet-subscribe@yahoogroups.com](mailto:PestNet-subscribe@yahoogroups.com) including your name, who you work for; and the address of your employer, including the country.

**Join via the Yahoo!®Groups website**

Go to [Yahoo!®Groups](https://www.yahoo.com/groups), click on Join This Group! and sign up.

If you are already a Yahoo! user, enter your ID and password to sign in. But again provide the information listed above.

### 1.3 Informing others

The Secretary of the Ministry of Agriculture, or the departmental head and relevant Minister if the issue is the responsibility of a different agency, need to be informed of the possible sighting. A record needs to be written identifying who was informed and when.

They may need to inform people in the area of the sighting, or involve the public via the media if their assistance is required to locate a fast-moving animal so that it can be identified and captured.

### 1.4 Special cases when identification begins the response

EDRR plans are typically structured into separate phases of identification (identifying species), alert (working out the risk and what can be done) and response. However, the full response can begin with the original sighting, as in the example used in a recent simulation (Annex 7) of a snake being seen. The search in such a situation has the aim of killing the animal and ending the incursion, as there's no doubt that a terrestrial snake is new to the country and unwanted, in addition to identifying the particular species.

In a remote situation such as Suvarrow Island where a response will be particularly difficult, a conservative approach can be taken. The following procedures are identified in the Suvarrow National Park Biosecurity Action Plan with an emphasis on killing something found to be new and unusual, then having it identified, rather than wait for identification:

**Rodents:**

- Deploy traps and bait stations.

- Fill out detailed sheet for any captures – identify species.
- Contain outbreak and restrict access.
- Notify NES immediately.

#### Invasive Ants

- Collect specimens for identification – using hand lens, etc. Take and transmit back to MOA a photo if suitable equipment is available.
- If ID clear, locate any nests (ants) and destroy with boiling water.
- If ID unclear, collect specimens in vials with ethanol, deliver to Rarotonga.
- If infestation over a large area discuss details with NES – who will discuss with specialists.

#### Other invasive invertebrates

- If in doubt that it may be new/invasive, kill the animal in preservative taking care not to damage it to make it possible to identify later, and then deliver to Rarotonga. Snail baits are held in store for use in area around any find.

#### Invasive plants

- Identify any new/unusual plant if possible to confirm if it is new to Cook Islands.
- If in doubt, photograph, remove and burn plant taking care to include every seed.
- Radio details to NES to contact experts.

A similar approach may also be appropriate on other islands not served by a regular air service where expert follow-up to a sighting and any response will take some time to organise.

## **2. ALERT PHASE**

The Alert Phase begins when investigations suggest an invasive species emergency is **LIKELY**. More information is collected on the pest (risk assessment) and the area where it is found is surveyed to define it (delimiting survey) or a search is mounted. This is then used to decide whether an operation to eliminate the threat is feasible.

### **2.1 Review – pest assessment**

This assessment identifies what is known about the species, its likely impact, methods to manage it and identifies who has experience with it in similar countries. Possible pathways through which it entered the country can be identified and measures taken to ‘close’ these to any similar arrivals. The Global Invasive Species Database ([www.iucngisd.org](http://www.iucngisd.org)) is a key resource, searchable by species name. It has sections on ‘distribution’, ‘impact’ and ‘management’. The assessment could also consider whether the species would be likely to

establish in Cook Island conditions, but a precautionary approach should be taken and it should be assumed that it may survive and adapt even if conditions are not considered ideal.

## 2.2 Rapid Assessment of infestation

This assessment is designed to quickly identify the scale of the problem. In the case of an arrival like an insect or a plant disease, a survey is used to define the area it is occupying using direct observations, searching for host plants or fruit, or trapping (e.g. fruit fly trap) – a ‘delimiting survey’. In the case of a fast-moving animal like a bird, mammal or snake, detection will be more difficult and the survey is more like a search. In both cases, information on how the species disperses is used to design the survey.

### Delimiting Survey

Defining the size of area occupied by the arrival, and the number of such areas, provides key information on the effort likely to be needed to achieve eradication.

Step 1 is to work outwards from the site of the initial observation to see how wide an area is occupied around this. Step 2 is to look more widely to see if any other areas infested on the same island or on other islands if the likely pathway through which the species arrived put them at risk.

The delimiting survey information is likely to be used to create zones for an Operational Response. In the case of a fruit fly outbreak three response zones are defined as follows:

- **Zone A** has a minimum radius of 1km<sup>2</sup> around the fruit fly find.
- **Zone B** has a minimum radius of 2.5 km<sup>2</sup> around the fruit fly find.
- **Zone C** has a radius defined by the controlling officer at the time of the response.

### Search for a faster-moving animal

If a fast moving animal has been sighted a search will be needed to be mounted as quickly and thoroughly as possible, working outwards from where the sighting was made. This search is likely to involve:

- Visuals searches of likely places where the animal usually lives e.g. buildings or gardens or forest. These searches need to take into account the habits of the animal – e.g. is it only active at night?
- Putting out devices that the animal may use to shelter in, food that it may be attracted to, or traps when these are available.
- Providing information to members of the public so that they can keep a look out and report possible sightings. This needs to be done carefully, as their help is sought even though it’s not yet confirmed that an emergency response will be put in place.

## 2.3 Contain

### Take further containment measures

At this stage that it is likely that an emergency exists, there may be some further action to contain the situation until the full response is organised. This could include movement controls of goods from within a zone around the original sighting, depending on the means the species uses for dispersal.

### Start work to identify and block the pathway.

Even if the species is not assessed as a threat, e.g. because it will not establish in Cook Islands, a new organism has arrived somehow. Similar more dangerous organisms may arrive by the same pathway. Or it may be that only one animal arrived and killed, and this has been confirmed by monitoring, but further individuals are likely to arrive the same way.

Efforts should start now to identify the pathway, then block it by enhanced procedures both in the Cook Islands and in the country/countries where the organism came from and (if relevant) through which it passed.

## 2.4 Notify

Several notifications should be made now that an Alert Phase has been reached, several of which aim to line up support for an operational response as follows:

### 2.4.1 Emergency Management Cook Islands (EMCI)

The EMCI should be notified of any invasive species incursion that reaches the Alert Phase.

The Cook Islands National Disaster Risk Management Plan 2017 recognises three levels of response:

- **Incident** - routine events responded to by a single or small number of agencies, low in resource needs and coordinated on scene.
- **Emergency** - few in number - events that are larger and more complex than incidents requiring a multi-agency response with significant resources but not on a scale involving a national response. Declaration of a State of Emergency allows the development of any powers necessary for the response.
- **State of Disaster** – rare - a widespread large-scale event involving national resources.

A State of Emergency or a State of Disaster is declared by the Prime Minister, who chairs the National Disaster Risk Management Council which provides support and advice to Cabinet.

Section 20 of the Disaster Risk Management Act 2007 states:

*State of Emergency – A State of Emergency exists when –*

- (a) declared by the Prime Minister on recommendation from the Director;*
- (b) the Director, in exceptional circumstances, determines that an immediate, co-ordinated, multi-agency Response is required to deal with an emergency event;*

The notification to EMCI will require a situation report, a possible plan of action, and identification of the resources required (human and financial) to address the issue.

#### **2.4.2 Local constituencies**

If local bodies have not been involved in the identification phase they should be now, typically through EMCI. Notification should go to the Disaster Risk Management Committee(s) of the relevant Puna (constituencies) on Rarotonga through their Chair/Coordinator(s) or on an island in the Pa Enua.

#### **2.4.3 CROP Agencies**

CROP Agencies may play significant roles assisting with a response including providing expertise and resources, including funds. They should thus be alerted at this stage that an invasive species emergency may exist.

- The Pacific Community (SPC) – for pests of agriculture.
- Secretariat for the Pacific Regional Environment Programme (SPREP) – for pests whose prime impact is on biodiversity.

#### **2.4.4 NGO's**

NGO's involved in biodiversity conservation may also be able to assist with a response. For example both Birdlife Pacific and Island Conservation are assisting Tonga to respond to an incursion of mongooses in a shipping container from Fiji.

#### **2.4.5 Trading partners (if required)**

The MOA will be required to notify trading partners of the arrival of certain agricultural pests, e.g. fruit flies, giant African snails. An official letter of notification on the outbreak in the Cook Islands will be sent to Biosecurity Authorities in New Zealand and to SPC to alert other countries depending on the product and type of trade.

### **2.5 Assess Feasibility of Eradication**

This assessment involves a review of what is known about managing the species and researching other countries/islands that have faced the same problem and what result they achieved.



There may be a cost/benefit assessment required in instances when eradication would be difficult and expensive. The more devastating the consequences of the pest establishing in Cook Islands, the more need there is to try eradication however challenging and costly it would be.

### 3. OPERATIONAL RESPONSE PHASE

This phase begins when invasive species emergency is CONFIRMED or PRESUMED TO EXIST based on assessments.

#### 3.1 Develop Response Plan

In planning the response it is useful to look at examples already produced overseas and adapt them to the local situation. The following were identified while preparing this EDRR and others could be located by talking to regional and international agencies involved in this field (Table 7). They can typically be used to assist in identification, understanding the biology of the species and its pathways, survey methods and control techniques.

**Table 7: Response plans for specific species that are threats to Cook Islands**

Species	Response Plan or Policy
Rhinoceros beetle	USDA New Pest Response Guidelines – Coconut Rhinoceros Beetle. <a href="https://www.aphis.usda.gov/import_export/plants/manuals/emergency/downloads/nprg-o_rhinoceros.pdf">https://www.aphis.usda.gov/import_export/plants/manuals/emergency/downloads/nprg-o_rhinoceros.pdf</a>
Giant African snail	<a href="https://www.aphis.usda.gov/import_export/plants/manuals/emergency/downloads/nprg_gas.pdf">https://www.aphis.usda.gov/import_export/plants/manuals/emergency/downloads/nprg_gas.pdf</a>
Invasive ants	General Emergency Response Plan for Invasive Ant Incursions. Pacific Invasives Initiative. <a href="http://www.issg.org/cii/Electronic%20references/pii/project_docs/papp/spc_ant_erp_2008.pdf">http://www.issg.org/cii/Electronic%20references/pii/project_docs/papp/spc_ant_erp_2008.pdf</a>
Brown tree snake	Brown Tree Snake Control Plan <a href="http://www.anstaskforce.gov/Species%20plans/Brown%20Tree%20Snake%20Mgt%20Plan.pdf">http://www.anstaskforce.gov/Species%20plans/Brown%20Tree%20Snake%20Mgt%20Plan.pdf</a>
Plant pests	General Emergency Response Plan for Plant Pest Incursions. SPC.
Plant pests	Hawaii Collaborative Plant Health Emergency Response Plan <a href="http://www.cgaps.org/wp-content/uploads/Hawaii-Plant-Health-Emergency-Response-Plan-Final-12-30-2013.pdf">http://www.cgaps.org/wp-content/uploads/Hawaii-Plant-Health-Emergency-Response-Plan-Final-12-30-2013.pdf</a>
Phytophthora fungi (incl. taro leaf blight)	<a href="https://www.aphis.usda.gov/import_export/plants/manuals/emergency/downloads/nprg-genericphytophthoras.pdf">https://www.aphis.usda.gov/import_export/plants/manuals/emergency/downloads/nprg-genericphytophthoras.pdf</a>

Bird diseases	Technical Response Policies for Avian Influenza Viruses of Regulatory Concern. Biosecurity New Zealand. <a href="http://www.biosecurity.govt.nz/files/pests/avian-influenza/response-policies.pdf">http://www.biosecurity.govt.nz/files/pests/avian-influenza/response-policies.pdf</a>
Marine pests	Australian Emergency Marine Pest Plan (EMPPPlan) Rapid Response Manual Generic manual. Dept. of Agriculture & Water Resources, Australia. <a href="http://www.agriculture.gov.au/SiteCollectionDocuments/pests-diseases-weeds/marine-pests/empplan-rapid-response-manual.pdf">http://www.agriculture.gov.au/SiteCollectionDocuments/pests-diseases-weeds/marine-pests/empplan-rapid-response-manual.pdf</a>
Green Crab	<a href="http://www.agriculture.gov.au/SiteCollectionDocuments/pests-diseases-weeds/marine-pests/empplan-rapid-response-manual-carcinus-maenas.pdf">http://www.agriculture.gov.au/SiteCollectionDocuments/pests-diseases-weeds/marine-pests/empplan-rapid-response-manual-carcinus-maenas.pdf</a>

### 3.1.1 Establish technical methodology

Techniques need to be identified to be used for both the eradication and for monitoring to determine when success has been achieved. Eradication depends on putting all of the target species at risk and killing individuals faster than they can be replaced by breeding – or arriving.

One factor that needs to be assessed in choosing techniques is their impact on non-target species and on the wider environment.

### 3.1.2 Establish staffing and management structure

#### Key roles and tasks:

#### **Head of Lead Agency (HOM)**

- Chair the Emergency Response Management Committee
- Keep Minister informed
- Supervise and support Response Manager
- Liaison with regional agencies particularly SPC and/or SPREP

#### **Response Manager (DBS)**

- Lead development of response plan
- Review legal requirements for the response
- Develop a communication plan
- Report regularly to Head of Agency and ERM
- Select other response personnel together with Agency Head
- Liaise with other agencies, nationally and regionally
- Manage day to day response
- Brief response personnel and manage their activities
- Coordinate with other sections of lead agency: administration, finance & procurement, GIS/mapping to ensure their timely support of the response
- Keep the person who originally made and reported the sighting informed

### **Technical Adviser**

The Technical Adviser during the Response should ideally have specific knowledge of the pest being targeted. This may mean bringing in someone from overseas if that expertise is not available in the Cook Islands, as in the recent example of mongooses arriving in Tonga when an expert from Birdlife Pacific based in Fiji was brought in to advise. Alternatively, a locally-based adviser can undertake the role by maintaining close contact with a specialist overseas.

#### **Tasks**

- Identify other technical expertise required
- Contribute to development of response plan
- Manage the collection and analysis of data to measure progress in the eradication
- Train field controller and field teams in techniques required
- Assist the response manager in decision-making as the response proceeds
- Act as a spokesperson on technical matters and provide technical material for media release as required
- Brief Response Manager regarding necessary response procedures

### **Field Coordinator**

Whether this position is required may depend on how remote the affected area is from Avarua and on the scale of the response required. On Rarotonga it may be possible for the Response Manager to manage field teams directly, but on another island a Field Coordinator is likely to be needed.

#### **Tasks:**

- Manage operational activities of field teams
- Select field teams together with response manager and ensure they have the training and authority required.
- Identify field resources required and obtain these
- Report on progress in field to Response Manager

### **Field team leaders**

If the response involves a single field team, this can be managed by the Field Coordinator. For responses with multiple teams it may be more efficient to appoint a team leader for each who reports to the Field Coordinator.

### **Field teams**

These teams implement the response on the ground according to the plan and the instructions of a Leader or the Field Supervisor.

**Financial manager**

Oversee financial management of response.

**Emergency Response Management Committee (ERMC)**

An ERMC should be established to bring together representative of the key stakeholders involved in the response, including the heads of the key Government Agencies or representatives delegated by them. The ERMC plays a key role in the Response Phase, facilitating and monitoring the operation, and it could be involved in determining any compensation arrangements in the Recovery Phase.

**Composition of Committee**

- Chairperson – Head of the Department managing the response, typically the Secretary of Agriculture
- Director of Biosecurity
- Divisional Directors of lead agency
- Director, Emergency Management Cook Islands
- Representatives of the Office of the Prime Minister– EMCI and Pa Enea Officer
- Director of Community Health – if public health issues are likely due to the pest itself or measures to eradicate it
- Commissioner, Police Service – if measures impacting on the public are required – e.g. movement control
- Head of any other agencies involved – e.g. Environment Service, Port Authority, Airport Authority
- Chair of Disaster Risk Management Committee of constituencies of Rarotonga or Pa Enea islands
- Representatives of NGO's – e.g. Cook Islands Natural Heritage Trust; Growers Associations for a pest of food crops.

**Role of Committee**

- Appoints people to key positions.
- Facilitates the inputs of all agencies into the response.
- Keeps plan under review as response proceeds and approves changes as needed.

**Secretary to the committee – Director (or delegate) of the agency leading the response**

- Organises meetings
- Takes minutes

### **3.1.3 Review the legislative basis for the operation.**

This step reviews the powers available within legislation (primarily the Cook Islands Biodiversity Act 2008 and Disaster Risk Management Act, Regulations and Arrangements) to undertake all the activities necessary for the response including entering private property, requiring a property owner to take action, destroying fruit or crops, controlling the movements of goods or people.

If there are some specific additional powers likely to be needed these can be sought from Cabinet as Emergency Powers through the declaration of the event as a State of Emergency.

### **3.1.4 Establish communication strategy**

Lead agency: responsible for providing accurate information on the emergency to the media and public with support from specialist public information services as required.

Ministry of Health will, in consultation with the Lead Agency, prepare and disseminate relevant information when there are public health implications associated with an incursion (e.g. disease vector, dangerous animal (e.g. snake) animal disease).

### **3.1.5 Review and sign-off plan**

The draft plan should be sent for peer-review to those internationally who have managed responses to the same pest. It will then be signed off by the lead agency and put into operation.

## **3.2 Implement Response**

### **3.2.1 Obtain the necessary resources and establish the necessary administration**

The Response Manager will assemble all the people, transport and equipment needed for the response, organise training of field personnel. A budget will need to have been secured and administration arrangements put in place for human resources (appointing any new personnel needed), finances, and organising logistics.

### **3.2.2 Secure regional assistance with technical expertise and funding**

SPC or SPREP can play a regional coordination role in an invasive species emergency (as required) to:

- Provide technical assistance.
- Liaise with regional and/or international reference laboratories.
- Facilitate the mobilisation of suitably qualified personnel from other countries to assist in an Operational phase response.
- Facilitate emergency access to regional stockpiles of pharmaceuticals, protective equipment, chemicals and other items that may be required during an Operational phase response.

- Provide assistance with notification, both within the Pacific Island Region and internationally.

Whether direct assistance will be required or not will depend on the nature of the incursion and the scale of the response required. Securing outside assistance may be easier if a State of Emergency has been declared by the Prime Minister under the National Disaster Risk Management Arrangements 2009.

The following example identifies the process to seek support from the Pacific Community (SPC) for an animal health emergency (MOA 2011).

*Where human and/or other resources within the Cook Islands are inadequate to effectively manage an animal health emergency, the Chairperson of the Emergency Response Management Committee is to submit a Request for Assistance to SPC's Animal Health and Production Adviser. The Request for Assistance is to:*

- *Include an estimate of the human resource requirements needed and highlight any particular skills/proficiencies that would be beneficial.*
- *Highlight any anticipated deficiencies/ inadequacies in equipment, materials and other non-human resource requirements.*

#### **4. STAND-DOWN PHASE**

Begins when a suspected invasive species is found not to be present, the species is eradicated, or eradication has failed and the species is declared to be established. In each case, a review needs to be carried out of what occurred and a detailed report written by the Response Manager and Technical Adviser including any lessons learned. The procedures in this EDRR plan may need to be adjusted in light of the report's findings. Efforts will be made to strengthen the barriers on the pathway along which the species is thought to have arrived, to prevent further individuals of the same species or similar species from crossing the border.

Also during this phase all expenditure and funding is reconciled and reported on and any unspent funds distributed as appropriate.

All individuals and agencies informed of the operational response need to be informed of the stand-down.

## 5. RECOVERY PHASE

This phase may begin in the Operational Phase and continue beyond the Stand-down phase and will be required for responses that have caused significant disruption to people or their businesses resulting in financial loss.

The recovery phase addresses the following:

- Those who have suffered financial loss because of the response operation.
- Lost production.
- Loss of crops and plantings destroyed during the operation.
- Loss of livestock and associated infrastructure destroyed during the operation.

As an example of principles that may be applied to compensating people, the Animal Health Emergency Response Plan has the following:

- No person should be better or worse off due to reporting of an emergency disease incident.
- Replacement of losses will be linked to cooperation with the emergency response.

Responsibility is assigned to the Emergency Response Management Committee to determine whether or not replacement arrangements for crops or livestock should be provided to affected producers, and if so, the nature and level of replacement and the administrative arrangements for implementation.

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## Annex 1: Priority invasive plant species for exclusion from Cook Islands

(Source: Space & Flynn 2002)

Scientific name	Common Name(s)
<i>Albizia chinensis</i>	Chinese albizia, silk tree
<i>Castilla elastic</i>	Panama rubber tree
<i>Chromolaena odorata</i>	Siam weed
<i>Clerodendrum quadriloculare</i>	Bronze-leaved clerodendrum
<i>Clidemia hirta</i>	Koster's curse
<i>Coccinia grandis</i>	Ivy gourd, scarlet-fruited gourd
<i>Cordia alliodora</i>	Ecuador laurel
<i>Elaeocarpus angustifolius</i>	Blue marble tree
<i>Funtumia elastic</i>	African rubber tree
<i>Hiptage benghalensis</i>	Hiptage
<i>Imperata cylindrical</i>	Cogon grass
<i>Kyllinga polyphylla</i>	Navua sedge
<i>Ligustrum spp.</i>	Privet
<i>Maesopsis eminii</i>	Umbrella tree
<i>Melaleuca quinquenervia</i>	Melaleuca, paper bark tree
<i>Melinis minutiflora</i>	molassas grass
<i>Miconia calvescens</i>	miconia
<i>Mucuna pruriens</i>	cow itch
<i>Passiflora tarminiana</i>	banana passionfruit
<i>Pimenta dioica</i>	allspice, pimento
<i>Piper aduncum</i>	spiked pepper
<i>Piper auritum</i>	eared pepper, false kava
<i>Pithecellobium dulce</i>	Madras thorn, Manila tamarind
<i>Pluchea carolinensis</i>	sour bush
<i>Rubus species</i>	blackberries, brambles
<i>Schinus terebinthifolius</i>	Christmas-berry, Brazilian pepper
<i>Solanum torvum</i>	prickly solanum
<i>Tibouchina herbacea</i>	glorybush
All grasses	all other grass species not already present
All melastomes	all other melastomes

## Annex 2: Information sources for local identification

### Key Websites

<http://cookislands.bishopmuseum.org> (Cook Islands Biodiversity Database has a comprehensive listing of species found in Cook Islands and includes searchable specification of those recorded as invasive).

<http://www.hear.org/pier/> (Invasive plant information for Hawaii and the Pacific)

<http://www.iucngisd.org> (The Global Invasive Species Database holds information on invasive species including identification and management)

<http://www.mpi.govt.nz/protection-and-response/> (Information on the NZ Government's biosecurity protection and response processes)

<http://www.reportapest.org/> (The Hawaii Early Detection Network was created to increase public awareness of invasive species and engage communities in the monitoring of their own neighbourhoods. It is a good example of how to involve the public in invasive species detection)

<http://pestnet.org> (Network of experts and practitioners who can assist with identifications based on circulation of photos or descriptions).

### Annex 3: Local Contacts for Pest & Disease Identification

Table correct as of February 2018

<b>Taxonomic Group/Theme</b>	<b>Expert Name and address</b>	<b>Expert Phone Number and Email</b>
<b>Animal Health</b>	<b>Tiria Rere</b> Chief Livestock Officer, MOA	<b>T:</b> +682 28711 <b>E:</b> <a href="mailto:tiria@agriculture.gov.ck">tiria@agriculture.gov.ck</a>
<b>Insects</b>	<b>Dr Maja Poeschko</b> Entomologist, MOA	<b>T:</b> +682 28711/25403 <b>E:</b> <a href="mailto:maja.poeschko@agriculture.gov.ck">maja.poeschko@agriculture.gov.ck</a>
<b>Land snails</b>	<b>Gerald McCormack</b> Natural Heritage Trust	<b>T:</b> +682 24894 <b>E:</b> <a href="mailto:gerald.rarotonga@gmail.com">gerald.rarotonga@gmail.com</a>
	<b>William Wigmore</b> Director Research, MOA	<b>T:</b> +682 28711/25403 <b>E:</b> <a href="mailto:william.wigmore@agriculture.gov.ck">william.wigmore@agriculture.gov.ck</a>
<b>Land Plant</b>	<b>Gerald McCormack</b> Natural Heritage Trust	<b>T:</b> +682 24894 <b>E:</b> <a href="mailto:gerald.rarotonga@gmail.com">gerald.rarotonga@gmail.com</a>
	<b>William Wigmore</b> Director Research, MOA	<b>T:</b> P+682 28711/28710 <b>E:</b> <a href="mailto:william.wigmore@agriculture.gov.ck">william.wigmore@agriculture.gov.ck</a>
	<b>Joseph Brider</b> Director NES	<b>Ph:</b> +682 21256 <b>E:</b> <a href="mailto:joseph.brider@cookislands.gov.ck">joseph.brider@cookislands.gov.ck</a>
	<b>Elizabeth Munro</b> NES Biodiversity Officer	<b>T:</b> +682 21256 <b>E:</b> <a href="mailto:elizabeth.munro@cookislands.gov.ck">elizabeth.munro@cookislands.gov.ck</a>
<b>Plant Diseases</b>	<b>William Wigmore</b> Director Research, MOA	<b>T:</b> +682 28711/28710 <b>E:</b> <a href="mailto:william.wigmore@agriculture.gov.ck">william.wigmore@agriculture.gov.ck</a>
	<b>Dr Matairangi Porea</b> HOM Ministry of Agriculture	<b>Ph:</b> +682 28711/28710 <b>E:</b> <a href="mailto:mat.porea@agriculture.gov.ck">mat.porea@agriculture.gov.ck</a>
<b>Bird, Mammal, Reptile</b>	<b>Gerald McCormack,</b> Natural Heritage Trust	<b>T:</b> +682 24894 <b>E:</b> <a href="mailto:gerald.rarotonga@gmail.com">gerald.rarotonga@gmail.com</a>
<b>Marine</b>	<b>Ben Ponia,</b> HOM Ministry of Marine Resources	<b>T:</b> +682 28721/28722 <b>E:</b> <a href="mailto:b.ponia@mmr.gov.ck">b.ponia@mmr.gov.ck</a>
	<b>Koroa Raumea</b> Director of Inshore Fisheries & Aquaculture, MMR	<b>T:</b> +682 28721/28722 <b>E:</b> <a href="mailto:k.raumea@mmr.gov.ck">k.raumea@mmr.gov.ck</a>
<b>General Invasive Species Identification and Management</b>	Gerald McCormack Natural Heritage Trust	<b>T:</b> +682 24894 <b>E:</b> <a href="mailto:gerald.rarotonga@gmail.com">gerald.rarotonga@gmail.com</a>
	Elizabeth Munro NES Biodiversity Officer	<b>T:</b> +682 21256 <b>E:</b> <a href="mailto:elizabeth.munro@cookislands.gov.ck">elizabeth.munro@cookislands.gov.ck</a>

## Annex 4: International Contacts for Pest Identification

<b>Taxonomic Group/Theme</b>	<b>Expert Name and address</b>	<b>Expert Phone Number and Email</b>
<b>Animal Health</b>	Dr Ken Cokanasiga Animal Health and Production Advisor SPC Campus, Nabua, Fiji	Tel: (+679) 3370733 Ext: 35354 Fax: (+679) 3370021 E-mail: <a href="mailto:CokanasigaK@spc.int">CokanasigaK@spc.int</a>
<b>Insects</b>	Mr Mclean Vaqalo Entomologist SPC Campus, Nabua, Fiji	Tel: (+679) 3370733 Ext: 35431 Fax: (+679) 3370021 E-mail: <a href="mailto:McleanV@spc.int">McleanV@spc.int</a>
<b>Land Plant</b>	Plant Identification Service Landcare Research, Canterbury Agriculture & Science Centre, PO Box 69040, Lincoln 7640, New Zealand	Tel: (+64) 3 321 9999 <a href="http://www.landcareresearch.co.nz/resources/identification/plants/plant-identification-services">www.landcareresearch.co.nz/resources/identification/plants/plant-identification-services</a>
	Mr. Marika Vuli Tuiwawa, Acting Curator South Pacific Regional Herbarium, Institute of Applied Sciences, P O Box 1168, Suva, Fiji.	Tel: (+679) 212 874, Fax: (679) 300 373 E-mail: <a href="mailto:Tuiwawa.M@usp.ac.fj">Tuiwawa.M@usp.ac.fj</a>
<b>Plant Diseases</b>	Mr Visoni Timote Plant Pathologist SPC Campus, Nabua, Fiji	Tel: (+679) 3370733 Ext: 35220 Fax: (+679) 3370021 E-mail: <a href="mailto:TimoteV@spc.int">TimoteV@spc.int</a>
	Dr. Eric McKenzie, Plant Pathologist, Landcare Research, Private Bag 92170, Auckland, New Zealand,	Tel: (64) 9 815 4200, Fax: (64) 9 849 7093 E-mail: <a href="mailto:MckenzieE@landcare.cri.nz">MckenzieE@landcare.cri.nz</a>
<b>Reptile</b>	Dr Robert Fisher U. S. Geological Survey San Diego Field Station 4165 Spruance Road, Suite 200 San Diego CA 92101-0812, USA	Tel: (+1) 619-225-6422 Tel: (Admin): (+1) 619-225-6451 Fax: 619-225-6436 Email: <a href="mailto:rfisher@usgs.gov">rfisher@usgs.gov</a>
<b>Marine</b>	Mr Anthony Talouli Pollution Adviser, SPREP, P.O. Box 240 Apia, Samoa	Tel: (+685) 21929 Fax: (+685) 20231 Email: <a href="mailto:anthonyt@sprep.org">anthonyt@sprep.org</a>
<b>General Biosecurity</b>	Mr Lesio Saurara, Biosecurity Officer, Plant Protection Service, SPC Campus, Nabua, Fiji	Tel: (+679) 3370733 Ext: 35223 Fax: (+679) 3370021 E-mail: <a href="mailto:LesioS@spc.int">LesioS@spc.int</a>
<b>General Invasive Species Identification and Management</b>	David Moverley Invasive Species Adviser SPREP, P.O. Box 240 Apia, Samoa	Tel: (+685) 21929 Fax: (+685) 20231 E-mail: <a href="mailto:davidm@sprep.org">davidm@sprep.org</a>
	Souad Boudjelas Programme Manager Pacific Invasives Initiative C/- School of Biological Sciences University of Auckland Private bag 92019, Auckland, NZ	Tel: (+64) 9 923 6805 Fax: (+64) 9 373 7042 E-mail: <a href="mailto:s.boudjelas@auckland.ac.nz">s.boudjelas@auckland.ac.nz</a>

## Annex 5: OIE-listed diseases

The World Organisation for Animal Health (OIE) <http://www.oie.int/> was formed in 2003 from the Office that was established in 1924. It is the intergovernmental organisation responsible for improving animal health and fighting animal diseases worldwide. It is recognised as a reference organisation by the World Trade Organization (WTO) and in 2017 has a total of 181 Member Countries.

The OIE maintains a list of notifiable terrestrial and aquatic animal diseases which currently contains 116 diseases, infections and infestations. All events of epidemiological significance must be notified immediately to the OIE which are defined as:

- the first occurrence of a listed disease or infection in a country or compartment;
- the re-occurrence of a listed disease or infection in a country or compartment following a report by the Delegate of the Member Country declaring the outbreak closed;
- the first occurrence of a new strain of a pathogen of a listed disease in a country or compartment;
- a sudden and unexpected increase in morbidity or mortality caused by an existing listed disease;
- emerging diseases with significant morbidity/mortality or zoonotic potential;
- evidence of a change in the epidemiology of a listed disease (including host range, pathogenicity, strain of causative pathogen), in particular if there is a zoonotic impact.

The list comprises diseases of:

- multiple species
- cattle
- sheep & goats
- equine (horse)
- swine (pig)
- avian (bird)
- lagomorph (rabbits & hares)
- bee
- fish
- mollusc
- crustacea
- amphibians.

## Annex 6: Disinfection protocol for plant diseases

Source: Abridged from USDA New Pest Response Guidelines *Phytophthora* fungispp.

**Introduction** Plant pathogens can persist on pruning shears, knives, harvesters, tractors and other implements used for cutting, digging, or taking soil samples. Any piece of equipment that comes in contact with plant material or soil could potentially harbour *Phytophthora* spp. Disinfection of all equipment and footwear is required prior to leaving a site.

### Instructions Quaternary Ammonium Compounds

For safety and comfort, applicators are required to wear rainwear such as hats, coats, rubber boots and face shields. Soil should not be removed from equipment before treatment if there is a possibility the soil will contaminate the site. Once soil is saturated with quaternary ammonium or 10 percent sodium hypochlorite solution (bleach), it is no longer considered contaminated.

Follow all label directions. Use of any product inconsistent with label directions is illegal and may be dangerous.

Detailed instructions:

- To disinfest storage areas, drench area thoroughly with a solution of quaternary ammonium solution at labelled rates or 10 percent sodium hypochlorite solution. Do not rinse.
- To disinfest vehicles, portions of vehicles where soil is likely to adhere, such as tires, wheel wells, and under the chassis, should be washed thoroughly with a 0.15 percent solution of quaternary ammonium. Do not rinse for at least 1 hour (hr). After 1 hr, equipment should be rinsed only if specifically required by owner or operators. Because quaternary ammonium can kill vegetation on contact, it should be used to wash equipment in a non-planted area. Equipment should be dry at the time of treatment to facilitate efficacy of the solution. For large pieces of equipment, a high pressure wash system is recommended to penetrate the soil and debris which may still adhere. Equipment must be wet to saturation with the quaternary ammonium solution.
- To disinfest tools and boots, remove adhering soil and thoroughly wet them with a 0.15 percent quaternary ammonium solution. Do not rinse.

## Annex 7: Incursion Response Simulation Exercise 2016

### Introduction

The exercise was developed by a team of Elizabeth Munro (NEC), Ngatoko Ngatoko and Pavai Taramai (Biosecurity) under the guidance of International Consultant, Dr David Butler. The Director of NES, Joseph Bridger and the Secretary of MOA, Matt Porea were made aware of the exercise and the former provided advice based on his experience running an environmental law enforcement scenario. The latter informed the Minister of Agriculture that there was to be an exercise but not its details. Staff at Emergency Management Cook Islands were also informed.

The scenario was based on the supposed arrival of brown tree snakes (*Boiga irregularis*) via a container that had arrived at the port on Rarotonga a few days earlier with the first detection occurring outside the restricted area at the Port. The Head of the Port Authority was also pre-informed that an exercise would take place. Because the nearest, more likely source of a brown tree snake to Cook Islands was from Australia, a letter was sent beforehand to the Australian High Commission (Appendix 1).

This was considered a difficult scenario to deal with compared to the incursions of insects such as fruit flies that have generated real-life emergency responses from the MOA. Firstly until the snake was identified it was not known whether it was venomous or not, which raised some challenging decisions about informing the public. Secondly it was not contained, unlike a fruit fly in a trap, which meant that identifying the snake depended on the task of catching an animal capable of quite rapid dispersal. Without identification it was also unknown whether this was a nocturnal or diurnal snake which was important information for managing the incursion.

The scenario was planned based on three notifications by members of the public. The first reported a snake seen escaping from a premises with limited description of size and colour. The second quite soon afterwards came from a location in Avarua and included a photo held on a cellphone of a snake up a tree – its head not clearly visible as below.



This was to convey two pieces of information: firstly that there were at least two snakes (too far from the first and too soon for it to have moved there between reports, and also reportedly larger) and secondly that it was tree-dwelling snake – this and the photo indicating a possible identification of the brown tree snake a slightly venomous species not considered a threat to adults. The third report came from the market quite near the first report and indicated that a snake has been found apparently sleeping in a container of clothes and that the lid had been closed on it before it

escaped. The scenario came to an end before a staff person arrived at this location where they would have been confronted with a very real looking snake (head and neck cut out from tracing around a photo projecting from clothes partly visible through the semi-opaque lid of the box). This was designed to test whether an appropriate response was made, and when it was, would yield an identification.

## **Report on response (abbreviated) – compiled by Heiarii Syme**

08.10 Tavake received report from GAS on the wharf from Manager Tamatoa Tinirau of a sighting of a snake spotted at that yard and request for someone to come and check on the sighting.

08.42 Ngatoko arrived in office and Tavake relayed the message of possible snake sighting at GAS.

08.44 Ngatoko received call from Tereinga at GAS with similar information. He reports 'not to panic' as snake has reportedly escaped under a container. He requests further assistance from the office and that Maja be contacted.

09.10 The Response team was activated in the MOA Conference Room consisting of Ngatoko Ngatoko, Dr Matairangi Pura, Pavai Taramai, Entomologist Dr Maja Poeschko and Biosecurity staff. The team's initial task was to contain the situation.

### Team assessment of the situation:

A snake of brownish colour about 40cm long was apparently under a container. The team discussed several options for addressing the situation:

- contacting Henry Wichman Pest Control Agency to spray area with toxic chemical to kill snake
- blocking off area around container with posts and roofing iron
- deploying staff where the snake had been reported

and several options for seeking advice:

- contacting Esther Honey Foundation veterinarian to find out if any snake expert in their organisation or on the island
- contacting a snake expert in NZMPI to guide the team
- contacting Health & Safety expert Ron Bird for advice
- 'googling' snake information

9.35 A second observer reported another snake at the Atukura Ground and a Biosecurity office Ngai was immediately sent to the site. A cellphone photo of it was obtained but no snake found.

Biosecurity staff were then recalled back to the Control Centre for briefing and discussion of necessary precautionary measures around health & safety, discussion of snake identification from the photo, preliminary extent of the problem and possible containment, and pathways by which the pest might have got there.

Confirmation had been received from Esther Honey Foundation that they did have someone with skills and knowledge of dealing with snakes.

10.05 a call is made to Biosecurity's Airport office where only Takapi is on duty. An instruction goes out to all Biosecurity staff on leave to return to work. Ngatoko and Tereinga are joined at Atukura by Sherro, Manu and Ngai.

10.48 Elizabeth Wright-Koteka, Prime Minister's Chief of Staff rings the office to check on the situation and is informed that staff have been mobilised at GAS yard and Atukura.



10.50 Talk of a snake sighting has reached social media with a posting on Facebook.

c.11.30 Third person called office to report a snake caught in a large box at Punanga Nui Market, (quite close to first sighting).

11.44 Situation revealed to have been an exercise prior to someone being sent to the Market.

12.15 De-brief held in main MOA office.

Ngatoko first thanked the staff and apologised for putting them through a high pressure few hours. It was the only way to make the exercise real and it had been an effective wake-up call in the event of facing a real life scenario like a snake or a mongoose (as currently being experienced in Tonga).

Mat described how the exercise had got to a stage when financial provisions for purchase of equipment needed to be made. Whereas more than one sighting was unusual in terms of a fruit fly incursion [fly found in a trap] it was probably realistic in case of a snake or mongoose.

Sherro reported on her experience. She was very nervous throughout the exercise as she hates snakes but was determined to protect the people.

Tereinga reported the exercise a good experience and Maru noted that the health of the people was an issue if it had been real and the hospital would need to upgrade their medication in case someone was bitten.

Maja found it a good experience and would have liked it followed through to the end. She considered the team could have mounted a good response given the necessary equipment, transport and staff. She and another staff person was concerned that someone should have remained at the scene of the first sighting rather than being called away after a period to go to second.

There was some discussion about how the exercise would move into a response phase. Clearly identifying the snake was a first challenge and this along with keeping people safe were the priorities. The photo of one in the tree provided an opportunity to circulate this to experts overseas and the fact that it was in a tree narrowed down the possibilities.

Once one was in a box, staff correctly identified that the next step was not to open the box but place it secured into a freezer if available (to kill) or a coldstore (to immobilise it and allow someone with some knowledge to handle it safely) to take photos and write a description.

Once identified as a brown tree snake the public could be fully informed to assist in locating the other snake(s) and to take precautions to stop the spread. MOA could communicate that it was only slightly venomous, but that people should not try to pick it up but call the Ministry, and it was nocturnal. [Considered to be possible risk to very young children/babies]. Knowing it was nocturnal would help and night searches could be conducted– but this means it move during the night into a car/machinery parked in Avarua and be moved elsewhere on the island when this moved during the day – some containment system would be needed while one was still at large. [Clearly if there were two snakes there could be more].

Once identified, expertise and potentially experienced personnel could be brought in from Guam (major efforts to control the species there and stop spread to other islands – including use of traps with live mice) and Australia (where it is originally from).

While a response continued, two other actions could be taken. One would be to identify the likely arrival pathway and block it – in this scenario a container arrived from Australia and opened a few days earlier or perhaps a large piece of machinery arrived as deck cargo. The second while a snake was active in the port area to take steps to lower the risk that it (and any others) would get on to another ship and have the problem transferred elsewhere!

### **Organiser Comments – Dave Butler**

The organising team were delighted that the scenario remained 'live' as long as it did – over 3 ½ hours – as lessons can be learned from this that can never be identified in a desk-top exercise. Credit goes to the senior staff who were involved in organising the exercise who led the response for so long without revealing the truth. Ideally one less of the senior team would have 'known' in future to further test response leadership. Hearing from the staff who faced the situation as real was very rewarding, identifying the commitment and emotion involved. It was very impressive how staff who were on leave immediately dropped what they were doing and came in to assist when called. For a small team, inexperienced in such a situation, the overall effort was excellent.

Some specific observations:

- Initial delay in response – it was made deliberately difficult to contact the top managers when the first call came. There was a gap of 30 mins until the Director, Ngatoko arrived and was informed and the response started. Ideally other staff would have been contacted to respond straight away.
- Seeking advice – the team did well to identify people in country with specific skills that could assist the operation. I would have expected a call to National Environment Service in this situation as a snake is more within the experience of them and the organisations they link to (e.g. SPREP) and I imagine this would have happened if the response leaders had not already known that NES had been involved in planning the exercise. Responders did identify overseas organisations to contact and I am sure this would have happened early on had this not been an exercise.
- I agree with staff comments that someone should have stayed and continued to search around the initial sighting near the port. This was clearly a resourcing issue – not enough people available.
- There was a difficult call to make about involving the public who could immediately provide more eyes to find the animal. In this case the team chose to search the areas without revealing what they were doing. I do not know the answer and would expect overseas experts to have advice on how long to keep searching as a team and at what point to inform the public and how to do so without alarming them.
- With social media this difficult call could be forced on the team early. With chatter already beginning on Facebook it could only have been a short matter of time before the press rang up enquiring if there was any truth behind the rumour. So planning for communication with the public needs to be considered as part of the EDRR plan to be ready for a future incursion. Clearly one specific contact person needs to be identified to deal with all media enquiries in a situation like this.
- I am sure that the photo obtained would have been circulated confidentially through selected overseas networks (e.g. SPREP) to obtain a likely identification had this not been an exercise.

Overall Lessons learned:

- The exercise indicates that MOA/Biosecurity Service is short-staffed for the key role they have to provide in a country with many international movements of people and goods due to its emphasis on tourism
- Detailed procedures do need to be written down for responding to a call or report with detailed instructions of what to do beside all office phones including cellphone numbers of key staff to contact.
- The more the team are prepared for such an event the better the response. This exercise can be used to improve procedures, generate instructional material, and similar such exercises should be conducted – both desk-top and 'live'. It would be a very useful exercise for a start for the team to work out a process if the snake had been sighted after work hours or on the weekend, or if it had arrived at the container port on Aitutaki rather than Rarotonga.

I would like to add my thanks and congratulations to all involved. You have improvements to work on but overall proved to me that you are a capable and committed team.

#### **Appendix 1: Letter to Australian High Commission.**

Australian High Commissioner to New Zealand  
 Australian High Commission  
 Wellington  
 New Zealand

Subject: Cook Islands Biosecurity Mock Exercise – Brown Tree Snake

Kia Orana Sir

This notification is to inform you that the Cook Islands National Environment Service, in conjunction with the Cook Islands Ministry of Agriculture – Biosecurity Division intend to undertake a mock exercise to test biosecurity and quarantine response in the event of an invasive animal being discovered in the Cook Islands.

The exercise premise will involve the discovery of a Brown Tree Snake (*Boiga irregularis*) around the main port area of Avatiu on Rarotonga, Cook Islands. Given current shipping routes, Australia will likely be identified as the origin of the snake. The Cook Islands Minister for Environment and Agriculture, the Secretary of the Ministry of Agriculture, the Director of Cook Islands Biosecurity, and the CEO of the Cook Islands Port Authority are aware of this mock-exercise and it is expected for all other involved parties that this will be a live and actual event.

The exercise is expected to run from 8:15am to 11:00am on Tuesday 28th June 2016 (Cook Island time).

We recognise that Australia has very strong biosecurity systems, so this scenario is a very unlikely one. It has been chosen to provide a challenging situation until the snake is identified, and then generate a simulated national emergency response due to the threat this species poses to Cook Island biodiversity.

Recognising that with social media and improved communication connectivity, information often moves quickly without fact-checking, there is a possibility that Australia could receive questions or comments relating to this exercise. We will notify local media before their daily print deadlines and

release a statement at the conclusion of the exercise to notify those involved and the public that this was a mock exercise and that the Cook Islands remains free of any terrestrial snake species, including the Brown Tree Snake. We will also comment on Australia's strong biosecurity programmes where appropriate.

Kia Manuia,

Joseph Brider  
Director  
National Environment Service

cc: Hon. Kiriau Turepu (Minister of Environment, Agriculture and Business Trade)  
Matairangi Pura (Secretary of Agriculture)  
Bim Tou (CEO – Cook Islands Ports Authority)

**Appendix 2: Examples of letter of instruction for members of public participating in scenario.**



Monday 27<sup>th</sup> June 2016

Kia Orana

**Re: Request for your assistance to take part in an Invasive Alien Species Early Detection and Rapid Response Simulation Exercise**

We are requesting for your assistance to take part in an Invasive Alien Species Early Detection and Rapid Response Simulation Exercise by the National Environment Service and Biosecurity.

The purpose of this exercise is to test the response procedure of Biosecurity officers on early detection of invasive species to our shores. This exercise once completed will guide the Cook Islands Biosecurity better respond, understand and address new invasive to our shores.

Your role in this exercise is detailed below.

We thank you in advance for your participation with this exercise.

Meitaki Maata

Elizabeth Munro  
Invasive species simulation exercise coordinator

### **Your Role in this exercise**

Your role in this exercise is to make a call to the Ministry of Agriculture and report on a sighting of a snake curled up amongst the gas bottles next to the fence and when disturbed it disappeared. You are reporting on this incident and would like to request for more information on what to do with it.

Call from member of public – 1<sup>st</sup> Observer.

Make a call to the Ministry of Agriculture – **28-711** between **8:15 & 8:30am** and report on a sighting of a snake in a panicked voice.

“When I went to take a gas bottle where we leave all our bottles, I saw a curled up rope on the floor. When I dropped the bottle i was holding the rope moved. When I looked it was a snake and it took off in that direction (come up with one). I was so scared and I tried to follow it but it had disappeared so I thought I better ring you. What should I do?”

When asked to provide any more information of the sighting just say “It all happened so fast that I did not get a good view but it was brownish, quite thin and perhaps half a metre long”.

If asked how it got there just say you do not know but it is close to the restricted area of the Port and it could come off the boat last week.

### **Next**

If you are told that someone will call you back and you do not receive a call within 10mins call 28711 again in a panicked voice and ask whats happening.

### **Next**

If you are told that someone will be send to visit you and check and that person has not arrived around within 20 minutes call 28711 again in a panicked voice and ask what’s happening?

# Press Release

Contact: Elizabeth Munro

Phone: (682) 21256

Email: elizabeth.munro@cookislands.gov.ck

FOR MEDIA

INFORMATION/CONSIDERATION

2 P.M. CKI, June 28, 2016

## **BIOSECURITY EMERGENCY DETECTION RAPID RESPONSE SIMULATION EXERCISE**

RAROTONGA, JUNE 28, 2016: At 8:20am the Cook Islands National Environment Service, in conjunction with the Cook Islands Ministry of Agriculture – Biosecurity Division undertook a Biosecurity Emergency Detection Rapid Response Simulation Exercise to assess the effectiveness of first response systems and to inform the development of the Cook Islands Emergency Detection Rapid Response Plan that is currently being drafted.

This simulation exercise concluded at 11:30am and closed the final part of a training workshop on biosecurity responses held at the Takuvaine Assembly of God Hall on Wednesday 22 June, 2016.

The simulation exercise tested the Government's ability, led by the Ministry of Agriculture – Biosecurity Division (MoA), to respond to a major exotic pest introduction, in this scenario – the Brown Tree Snake (*Boiga irregularis*). The scenario involved three phone call notifications of an unidentified Snake being spotted at the Gas Cook Islands facility at Avatiu Harbour, another being spotted at Te Atukura Grounds in Tutakimoa and a snake being captured at the Punanga Nui.

Following this exercise to test first response, MoA and NES staff will now complete the simulation exercise by planning a multiagency operation to eliminate the supposed threat.

The Brown Tree Snake, a native species to Australia, Indonesia and Papua New Guinea, is infamous for being an invasive species and is responsible for the decimation of bird and lizard species on Guam, irreversible changes to the island's ecosystem, and the expenditure of millions of dollars to stop the spread of the snake across Guam and to other Pacific Islands. The Brown Tree Snake is considered slightly venomous and a possible risk to infants. With Australia being the most direct connection with the Cook Islands of the countries where the snake is found, and recognizing that that Australia has very strong biosecurity systems, this scenario is a very unlikely one. It has been chosen to provide a challenging situation until the snake is identified as deadly or not, and then generate a simulated national emergency response due to the threat this species poses to Cook Island biodiversity.

The operation was a success in the sense that the simulation exercise objectives were met and MoA's existing emergency response systems were shown to require further improvement. The simulation exercise will be reviewed in order to help government strengthen future responses and ensure that its

emergency response systems operate continuously. Lessons learnt will be incorporated in the Early Detection and Rapid Response Plan.

A number of lessons learnt were identified during analysis of the simulation exercise. These include:

- The staff of Ministry of Agriculture demonstrated high commitment to respond, with on-leave staff coming in to assist;
- Insufficient resources, including personnel, to respond effectively;
- Vigilant monitoring of the initial report site was insufficient;
- A need for more preparedness material;
- Need for strengthened internal and external communications; and
- Managing public communication in social media needs more consideration

The fundamental message arising from the simulation exercise is that Government must improve its preparedness for and ability to respond to a major exotic pest outbreak. MoA currently does not have the resources or funding necessary to lead this work.

The National Environment Service and Ministry of Agriculture would like to acknowledge Tamatoa Tinirau, Rosita Taikakara and Roi Iona for their support and participation in this simulation exercise.

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## **Annex 8: Fruitfly Emergency Response Plan**

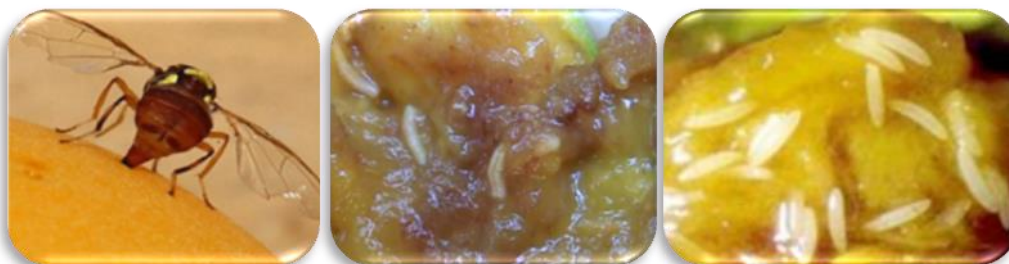


## COOK ISLANDS



## FRUIT FLY

## EMERGENCY RESPONSE PLAN



Ministry of Agriculture

Ministry of Agriculture  
P.O. Box 96  
Arorangi, Rarotonga  
**COOK ISLANDS**  
**Feb 2018**



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## INTRODUCTION

Fruit flies are one of the world's most economically significant pest of horticulture and attack a wide range of fruit and vegetables. A majority of these fruit fly species are exotic to the Cook Islands and many of these are found in neighboring Pacific Island countries such as French Polynesia, Samoa, Tonga etc. The Cook Islands has only two types of fruit fly species, *Bactrocera melanotus*, an endemic species of the Cook Islands, and *Bactrocera Xanthodes* commonly found throughout the Pacific.

Fruit flies damage fruits by laying eggs in the fruit or on the outside skin. Larvae emerge from the eggs and immediately burrow into and feed on internal structures of the fruit. Bacterial infection often results in the partial or complete degradation of the fruit. Larvae eventually emerge at the surface of the fruit and drop to the ground where they pupate in soil until they emerge as adults. Fruit fly life cycles vary according to species and environmental conditions.

Fruit flies cause direct damage to fruits and vegetables which lead to yield loss depending on fruit fly species, population and season. In addition, fruit fly infestation can result in serious losses in trade value and export opportunities due to strict quarantine regulations imposed by most importing countries. As a result, it is critical that fruit fly species are adequately managed to ensure producers can maintain, enhance and develop access into domestic and international markets.

When prevention of exotic fruit fly incursion fails, eradication is the preferred course of action. Eradication can be successful and cost effective solution in response to an early detection of exotic fruit fly incursion.

Managing fruit flies requires a combination of procedures and these include:-

1. Monitoring
2. Baiting
3. Trapping
4. Fruit collection

These procedures are issued subject to Part 9 of the Biosecurity Act 2008 to respond to any Biosecurity emergency measures.

The application of biosecurity measures to manage fruit flies in the field and in trade is a significant cost to the Cook Islands Government. The recent Oriental fruit fly (*Bactrocera dorsalis*) eradication program cost the Cook Islands \$246,000NZD dollars.

## AMENDMENTS

This is an evergreen document that will need to be reviewed and amended from time to time or after a Fruit Fly Emergency Response has been carried out to ensure up to date information is documented for effective and efficient response to fruit fly emergencies.

The Ministry of Agriculture is responsible for maintaining, updating and distributing the amended versions of the plan.

### **Version II as at February 2018**

## ACKNOWLEDGEMENTS

The National Environment Service (NES), in cooperation with the Ministry of Agriculture gratefully acknowledges the financial assistance provided by the Secretariat of the Pacific Regional Environment Programme (SPREP), United Nations Environment Program (UNEP) and the Global Environment Facility (GEF). This document was produced as part of the Cook Islands Invasive Alien Species Project under the regional GEF #3664 Prevention, control and management of invasive alien species in the Pacific Islands.

This document, the Cook Islands Fruit Fly Emergency Response Plan 2018 is written and prepared by Elizabeth Munro (NES - Senior Biodiversity Officer), to ensure that all components required to effectively and efficiently respond, to a fruit fly incursion is captured and made easy to follow and implement.

To ensure this document is in-line with the Ministry of Agriculture Policies and the Biosecurity Act 2008, appreciation goes to Ngatoko Ngatoko (Director of Biosecurity Services) and Pavai Taramai (Senior Biosecurity Officer) for their assistance.

The baseline information for the development of this document was collated from the production of the Agriculture Field Report released by the Ministry of Agriculture and gratitude goes to Dr Matairangi Porea (HOM) and the staff of the Ministry of Agriculture.

## ACRONOMS

BSD	Biosecurity Director
EMCI	Emergency Management Cook Islands
ER	Emergency Response
FAO	Food and Agriculture Organization
FBM	Fruit fly Base Manager
FF	Fruit Fly
FFM	Fruit fly Field Manager
FOM	Fruit fly Operations Manager
GEF	Global Environment Fund
HOM	Head of Ministry
MOA	Ministry of Agriculture
SPREP	Secretariat of the Pacific Regional Environment Programme
UNEP	United Nations Environment Program

## DEFINITIONS

<b>Bactrocera melanotus</b>	Native fruit fly species of the Cook Islands
<b>Bactrocera xanthodes</b>	Introduced/established fruit fly species into the Cook Islands
<b>Biosecurity Director</b>	Biosecurity Director, designated under section 74 of Biosecurity Act 2008
<b>Biosecurity Zone</b>	Area declared in response to a biosecurity emergency under section 69 of the Biosecurity Act 2008
<b>Detection</b>	Confirmed identification of exotic fruit fly find
<b>Eradication</b>	The application of measures to eliminate a pest or disease from an area
<b>Exotic fruit fly</b>	species of fruit flies <u>other</u> than <i>Bactrocera melanotus</i> ( <i>endemic species</i> ) and <i>Bactrocera xanthodes</i> (Pacific fruit flies)
<b>Hot spot</b>	Area or site where an exotic fruit fly has been trapped. The area could be either one or more traps.
<b>Island Council</b>	Island Council established under the Outer Islands Local Government Act 1987
<b>Ministry</b>	Ministry of Agriculture
<b>Officer</b>	any officer of the Ministry of Agriculture
<b>Pa Enua</b>	Those islands of the Cook Islands except Rarotonga
<b>Quarantine Zone</b>	A restricted area imposed by an Authorised officer where by the movement, production or existence of an exotic fruit fly or any fruit fly host is brought under regulation in order for the introduction or spread of an exotic fruit fly is prevented, controlled or eradicated to prevent further damage by the exotic fruit fly.
<b>Response</b>	Actions undertaken by the ministry as a result of the detection of fruit fly species in the Cook Islands, to demonstrate that the pest has not established itself or to contain and eradicate it and demonstrate that this action has been successful.
<b>Secretary</b>	Secretary of the Ministry of Agriculture
<b>Specimens</b>	An organism or part of an organism collected and preserved for scientific research
<b>Surveillance</b>	The fruit fly trapping and host fruits surveys that is undertaken to collect, record and monitor data on the presence or absence of an exotic fruit fly species.

## SCOPE

The Cook Islands Fruit Fly Emergency Response Plan defines the processes to be followed should there be a detection of an exotic fruit fly that has breached our biosecurity system. This plan is a guide to respond quickly and effectively to a fruit fly outbreak before the species spread and become established.

The scope and purpose of the fruit fly emergency response plan is to:

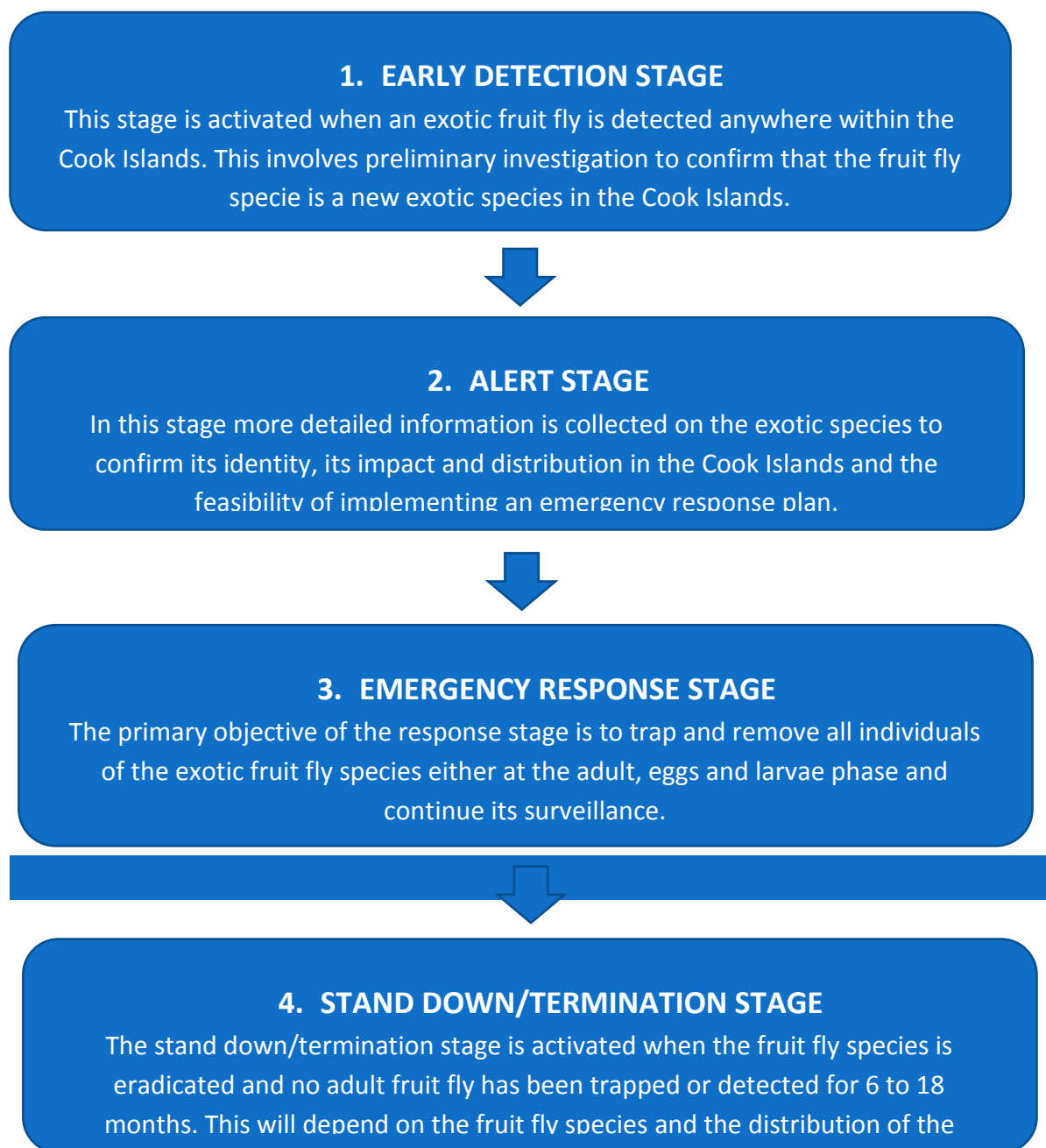
- Rapidly and effectively respond to exotic fruit fly species detected in the country
- Ensure measures are in place to carried out an exotic fruit fly response
- system in place to monitor exotic fruit fly species
- Clearly define the roles for relevant parties and individuals involved in the fruit fly emergency response
- Define the roles of agencies involved in the fruit fly emergency response
- Ensure effective and timely communication between national government ministries, regional organizations and members of the general public, in relation to exotic fruit fly species outbreaks.
- Ensure the public is effectively notified of response activities

## ACTIVATION PROCEDURE

This fruit fly emergency response plan has four key stages of action. These are;

- Step 1*            *Early Detection stage*
- Step 2*            *Alert stage*
- Step 3*            *Emergency Response stage*
- Step 4*            *Stand Down/Termination stage*

**Figure 1**    **Activation Stage Outline**



## FRUITFLY EMERGENCY RESPONSE STAGES

### 1. EARLY DETECTION STAGE

The early detection stage starts when an exotic fruit fly species is intercepted and reported in one of the fruit fly surveillance traps set-out around the island for the purpose of monitoring and detection of any new fruit fly species. This stage ensures the credibility of the report, that the fruit fly species is not *B. melanotus* and *Xanthodes*.

The initial detection steps:

**Field specimen:** If an adult exotic fruit fly is detected in a surveillance trap and confirmed as a fruit fly species other than *B.melanotus* and *B.xanthodes* then the next step is conducted.

**Specimen identification:** Once the fruit fly species is confirmed as species other than *B.melanotus* and *B.xanthodes* an entomologist and/or an officer with the skills or knowledge in species identification will carry-out a preliminary species identification to determine the fruit fly species. If the fruit fly species is confirmed as species other than *B.melanotus* and *B.xanthodes* and is an exotic species then the next step is conducted.

When an entomologist and/or an officer in the Cook Islands confirms the fruit fly species is an exotic species that is detrimental to the Cook Islands environment, the specimen is sent to an international reference entomologist. Photos of the specimen can be used for speedy initial identification and sent to the international reference entomologist for confirmation. The photograph must highlight key external characteristic lines on the thorax and abdomen of the fruit fly. A specimen is preserved and sent off as soon as possible for formal identification and DNA analysis. When a report is received confirming the fruit fly species is other than *B.melanotus* and *B.xanthodes* then the next steps are conducted.

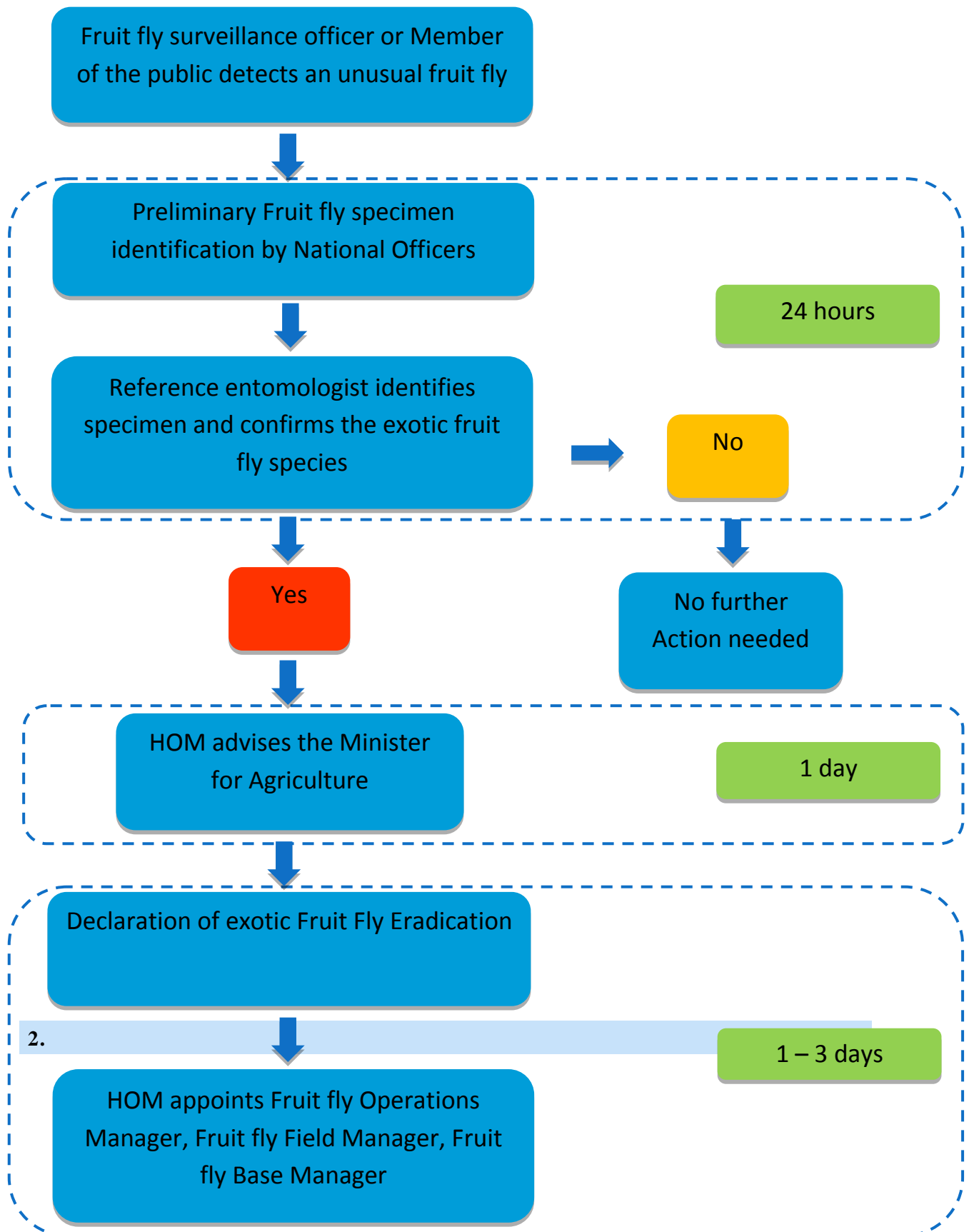
**Appointment of Fruit fly Operations Manager (FOM):** If the report received confirms the species is an exotic species then the secretary is advised. The Secretary then appoints a Fruit fly Operations Manager (FOM) who will conduct the fruit fly programme. *The FOM will be responsible in all the operations of the fruit fly eradication program and will report to the HOM on its operations and progress.*

**Appointment of Fruit fly Field Manager (FFM):** The Secretary will appoint a Fruit fly Field Manager (FFM) who will report to the FOM. *The FFM will be responsible in all field operations of the fruit fly eradication program such as the Surveillance Trapping and Eradication Application.*

**Appointment of Fruit fly Base Manager (FBM):** The Secretary will appoint a Fruit fly Base Manager (FBM) and will report to the FOM. *The FBM will be responsible for all fruit fly base operations such as preparation of materials for field operations and species identification/confirmation.*

**Figure 2**      **Flow Diagram of the Fruit fly Early Detection Stage**





## ALERT STAGE

The alert stage is triggered by the HOM when confirmation is received that the fruit fly species is a new pest to the Cook Islands and that further urgent action is required to control this new species. Detailed information on the species is collated and reported to the HOM to decide on a response and advise the Minister of Agriculture.

The following steps are followed in the Alert stage;

1. **Detailed information on the species:** More detailed information is collated on the species, site where detected, the impact it causes to agriculture crops and the environment, a list of its host plants in the Cook Islands. Countries where the fruit fly is found on, the biology of the species and possible pathway of entering the country.
2. **GIS Map Zoning:** A GIS map is produced to determine the hot spot area and other areas to be zoned in various meters from the first point of discovery, (300, 500, 1000 and so on). Once the hot spot area is determined the quarantine zone is set and the movement of any fruit and vegetables out of the area are banned.
3. **Quarantine Zone Surveillance traps:** An intense trapping in the quarantine zone is carried out. This intense trapping using Lynfield Traps are used to determine the distribution of the fruit fly. Distance from each trap in the quarantine zone is determined as well as the rest of the zones.
4. **Quarantine Zone host plant survey:** A survey is carried out to identify host fruit trees, vegetables, etc that are in season and plan for these to be removed from the trees.
5. **Assess feasibility of Emergency Response:** When information 1 to 4 above is collated by the FOM and reported to the HOM, the HOM will recommend a response and advise the Minister of Agriculture. Emergency Management Cook Islands (EMCI) should also be notified of the situation.
  - a. **Emergency Response Trigger:** The emergency response stage is triggered if the fruit fly is found to be an exotic fruit fly species that will cause social, financial and environmental loss and that it is at a stage where it has not widely distributed and can be managed.
6. **Public awareness:** A news article is released by the HOM to the public to announce the new species of fruit fly.
7. **Securing funding:** The HOM and FOM will seek financial assistance from government and/or regional agencies to assist with the fruit fly control program. A budget cannot be predetermined until an incursion happens for this is dependent on the distribution of the fruit fly in the country. The last fruit fly (*Bactrocera dorsalis*) eradication program cost the Cook Islands \$246,000NZD dollars.

### 3. EMERGENCY RESPONSE STAGE

The Emergency Response Stage is triggered once the HOM advises the Minister of Agriculture that eradication of the exotic fruit fly is the most appropriate response option thus initiating the eradication program. The eradication program includes trapping and removal of adult fruit flies and continues surveillance to monitor distribution and presence. The appointed managers in stage 1 commence with their key management functions. A media release is also made to announce the public of the new species and the requirements needed to maintain its spread.

The key steps of the emergency response stage include the following;

- **Eradication**
- **Surveillance**
- **Host fruit Collection**
- **Data Recording**
- **Education and Awareness**
- **Assess Feasibility of Stand down stage**

---

#### ERADICATION

There are two key processes when eradicating Fruit flies;

- **Male Annihilation Technique**
- **Protein Bait Spray**

These two techniques, Male Annihilation Technique and Protein Bait Spraying, traps and kills adult fruit fly species in the field. Male Annihilation Technique is also used to determine the distribution of fruit fly.

##### **Male Annihilation Technique**

Male annihilation technique involves the trapping of male fruit flies using trapping stations and block baits impregnated with male lure such as Methyl Eugenol (ME), Cue Lure and Trimedlure (Tl)/Capilure (Clr) that are effective attractants to various Fruit fly species. These male lures are mixed with rapid kill insecticides, Malathion and Fipronil.

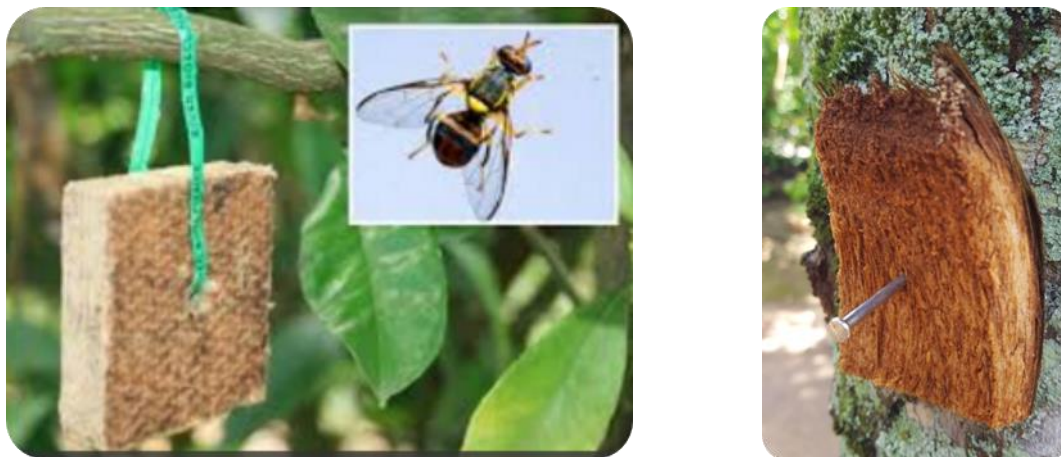
Surveillance Traps is a male annihilation technique used to determine the presence and distribution of fruit flies in an area. (See details below under surveillance)

Block bait is another male annihilation technique used where dry coconut husk/fiber are cut into blocks and impregnated with a male lure and a rapid kill insecticides to control male fruit fly population. This technique is called the Cocomat bait and the density of

blocks or traps is dependent upon the extent and geographic location of the outbreak. (see Resources for fruit fly emergency response program for materials and distribution)

A male annihilation technique is applied in unison with bait spraying to effectively eradicate the exotic fruit fly.

**Photo 1: Block Bait (Left - chip board block and right - coconut husk block cocomat)**



**Photo 2: Cocomat Bait**



### **Protein Bait Spray**

The protein bait attracts females and acts as a food attractant and its effectiveness relies on the fact that immature females need a protein meal for developing mature eggs. The bait spray residue on the foliage is ingested by the flies and kills them. Because the bait spray relies on its attractant properties for its mode of action, overall coverage of the tree canopy is unnecessary and a 'spot spraying technique' is adequate.

Bait spraying is a mixture of protein and Malathion EC 50/Fipronil and is applied in unison with Male Annihilation. Bait sprays within the outbreak zone and outbreak area should continue to be applied for 2-3 generations (3month) after the last fly or larva has been detected. The baiting program may be expanded into the quarantine zone if results from the delimiting survey indicate this is required.

---

## SURVEILLANCE

Male Annihilation Traps or Surveillance Traps serve as a monitoring tool for the effectiveness of any eradication program. Surveillance traps monitor fruit fly population, distribution and presence of fruit fly within an area. Once an adult fruit fly is identified, the number of surveillance traps is increased within that area to capture the flies and remove them from the environment, even after an infestation is believed to be eradicated. The increased number of traps and their inspection interval remains high for several months before the area is officially declared eradicated.

Surveillance traps are placed, starting at 200 meters apart from the point of discovery in the Biosecurity Zone, followed by 300m within the next zone, 500m then 1km. Trap distance is dependent on the exotic species and number caught in the traps. The traps are checked every two days for two to three weeks to determine the distribution and population of the exotic fruit fly. This is reviewed depending on the distribution and population.

To determine the distribution of the exotic fruit fly in the Cook Islands Surveillance Traps are sent to the Pa Enuu.

Surveillance Trapping continues for 4 – 6months before it is reduced. Surveillance Traps made out of Chinese takeaway containers (Lynfield Trap) is used for surveillance trapping to determine the presence and distribution of fruit fly.

**Photo 3: Lynfield Surveillance Trap**





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## HOST FRUIT COLLECTION

Host fruit collection involves the removal of any host fruit and vegetable in the Biosecurity Zone. All host trees and plants are stripped of any fruit and vegetable including fallen fruits are removed. These fruits and vegetables are removed and destroyed within the Biosecurity Zone. Host plants in the surrounding buffer zone may also be removed to minimize the immigration of new adults into the area.



**Photo 4: collecting of fruits from the ground and taken to designated hole for burial**

A designated area preferable in the Biosecurity Zone is assigned for the burial of all fruits and vegetables. To ensure fruit flies do not emerge, the fruits are buried and covered with soil at a height of about 0.5 to 1 meter.



**Photo 5: covering of fruits with soil**

## DATA RECORDING

Accurate recording and reporting are essential for determining the progress of the program. Records of the program from the first sighting or phone call and all processes that follow, such as the trapping, baiting, fruit collections etc are to be kept safe. This information should be filed in such a way that any important records can be easily located later for assessment and to determine the status of the exotic fruit fly as well as assist with the write up of the final fruit fly Report.

The FOM will instruct the FFM and FBM to keep records of the operation for their reports.

Tables below are samples of record sheets carried out on Aitutaki.

**Table 1: Record sheet of surveillance trap in Aitutaki**

<b>OFF Surveillance Trap Locations on Aitutaki</b>								
<b>DATE</b>					<b>10.06.13</b>	<b>10.06.13</b>	<b>20.06.13</b>	<b>20.06.13</b>
<b>Island</b>	<b>District/Village</b>	<b>Locations/owner</b>	<b>GPS Position</b>	<b>Host tree</b>	<b><i>B. dorsalis</i></b>	<b><i>B. xanthodes</i></b>	<b><i>B. dorsalis</i></b>	<b><i>B. xanthodes</i></b>
Aitutaki	Amuri	Majorie Moerai	10	Guava	14	2	66	4
Aitutaki	Amuri	Toa Isamaera	11	Bread fruit	24		3	1
Aitutaki	Amuri	Pacific Resort	12	Chestnut	51	0	95	2
Aitutaki	Amuri	John Winchester	13	Chestnut	45	0	54	2
Aitutaki	Amuri	Nane Herman	14	Spondias	33	0	20	1
Aitutaki	Amuri	Teiti Teiti	15	Mango	28	0	14	0
Aitutaki	Amuri	Mokoenga Ratu	16	Carambola	42	0	15	0
Aitutaki	Airport	Spider	17	Ano	3	0	4	0
Aitutaki	Airport	End N/E Runway	18	Pandanus	0	0	0	0
Aitutaki	Airport	Vai O Mokora	19	Pandanus	0	0	0	0
Aitutaki	Airport	David Nicholls	20	Pandanus	1	0	0	0
Aitutaki	Airport	Tangi	21	Ano	11	0	0	0
Aitutaki	Airport	Inano Beach	22	Tauinu	25	0	0	0
Aitutaki	Airport	Moana Resort	23	Calophyllum	30	0	14	0
Aitutaki	Amuri	Black Rock	24	Chestnut	11	0	8	0
Aitutaki	Amuri	Terepoto	25	Paw paw	25	0	24	0

**Table 2: Data sheet of surveillance trap in Aitutaki**

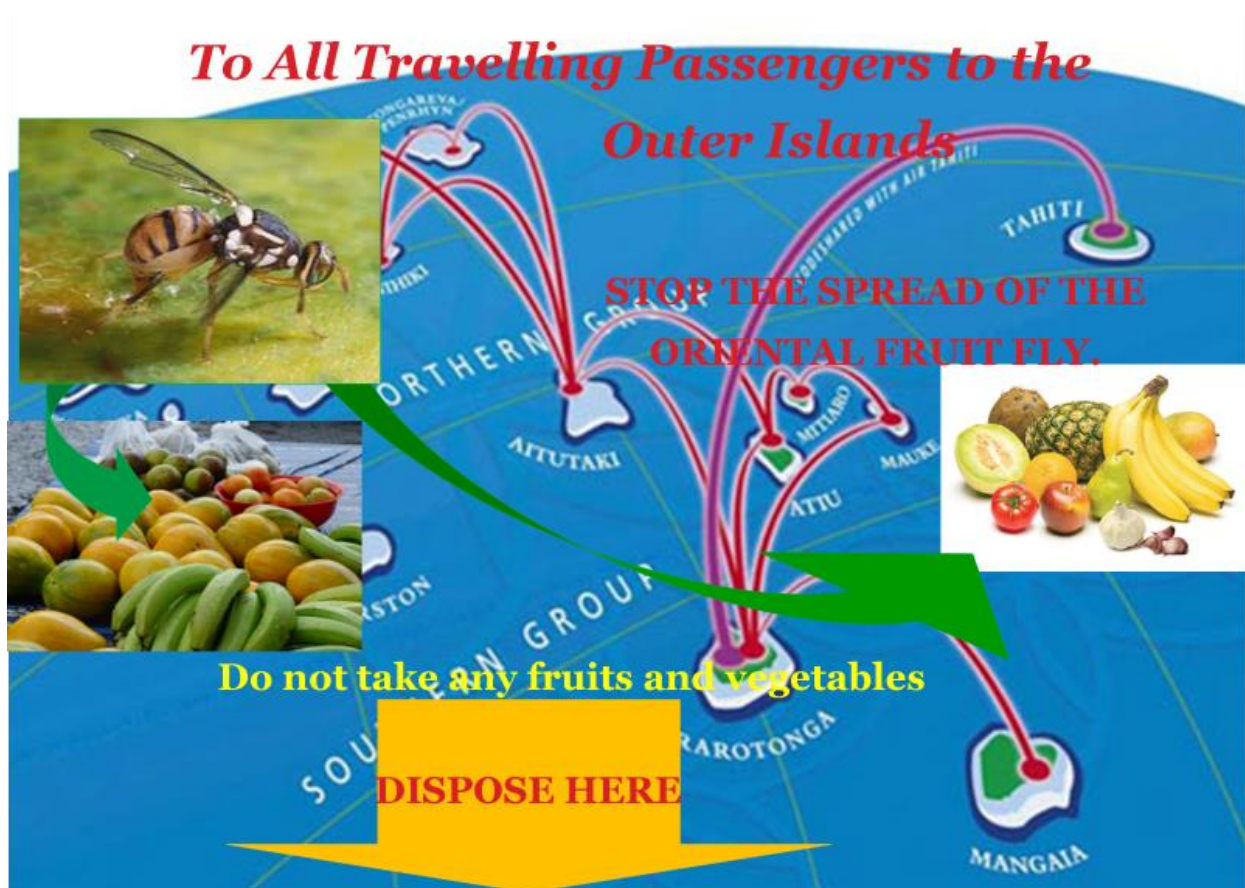
<b>Weeks in December 2013</b>	<b>Fruit Flies Trapped</b>	<b>Site (Hot Spot)</b>	<b>Follow up Action</b>	<b>Responsible Officer</b>
1	6	Vaipae	Protein Bait Spray & Fruit collecting	Junior, Pepe & Fred
2	4	Vaipae	Protein Bait Spray & Fruit destroying	Junior, Pepe & team
3	2	Vaipae	Protein Bait Spray & Fruit collecting	Junior, Fred, Pepe & team
4	0	Vaipae	Protein Bait Spray & Fruit collecting	Junior, Fred & team

## EDUCATION AND AWARENESS

Various social media tools should be applied to ensure the public is made aware of the eradication program. These public announcements should inform the public of the threats fruit fly can cause once established on the island. These announcements should also inform them about the eradication program, Biosecurity Zones and areas where fruits and vegetables are not to be taken out of the area.

Awareness should also be made in schools where students can be taught on the fruit fly life cycle and the threats it can cause to the Cook Islands agriculture, environment and economy. Trading partners and neighboring countries should also be officially contacted to notify them of the fruit fly outbreak.

*Awareness material produced by Ministry of Agriculture on Oriental Fruitfly*





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## ASSESS FEASIBILITY OF STAND DOWN STAGE

The stand down stage is triggered when no exotic fruit fly is found in the surveillance traps for 6 to 18 months. The collation of information and data from the surveillance program will determine when the appropriate time for the stand down stage is initiated.

### 4. STAND DOWN/TERMINATION STAGE

The stand down/termination stage come to effect when the eradication is successful and no exotic fruit fly has been found in the surveillance traps for 6 to 12months. A report of the exotic fruit fly eradication program with data evidence of no recording of exotic fruit fly shall be submitted to the HOM. The HOM will meet with the fruit fly advisors to determine the stand down/termination stage of the program. The HOM will inform the Minister of Agriculture and will also inform all agencies, trading partners and other relevant regional institutions.

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## REPORTING

The FOM will instruct the FFM and FBM to provide regular written report during the fruit fly operation and to also prepare a final report on the whole fruit fly operation within a week after the field operation is terminated. The FOM will provide a written report of the fruit fly operation to the HOM to consider a stand down/termination of the fruit fly emergency response program.

The report will include;

- Overview
- Operations procedures
- Discussion made
- Results
- Budget
- Challenges
- Recommendations

The HOM will discuss the written report with the FOM, FFM & FBM and finalize the report before submitting this to the fruit fly Advisory committee. The report will then be submitted to the Minister of Agriculture for endorsement. The HOM will also release a public notice in the newspaper and other media sources of the outcome of the fruit fly operation.

## RESOURCES FOR FRUITFLY EMERGENCY RESPONSE PROGRAM

It is noted that some of the resources required for the fruit fly program cannot be stored long term however resources required for continuous monitoring of fruit fly be purchased and stored at MOA. Resources required to carry-out a fruit fly emergency response program are highlighted below.

### CONTROL CENTERS

National Control Center	The Ministry of Agriculture main office will be the National Control Center for any fruit fly eradication program in the Cook Islands.
Island Administration	For an eradication program in any of the Pa Enua, the Island Administration will designate an appropriate site as the control center.

### HUMAN RESOURCES

Human resources are the key to carrying out a fruit fly control program. The fruit fly Operations Manager will be responsible in ensuring people are available to carry out the program. Annex IV lists key fruit fly personnel.

The Ministry of Agriculture Secretary will seek assistance from other Agencies such as Ministry of Health, National Environment Service and any other agency, to request for their assistance with the fruit fly control program. Volunteers may also be requested to assist with the program, in particular the Pa Enua.

The HOM of Agriculture may also form a fruit fly Advisory Committee to provide advice on the control of fruit fly in the Cook Islands. The advisory committee may be made of key stakeholders and experts on fruit fly control.

Request may also be made to SPC or any agency outside of the Cook Islands to assist with the fruit fly eradication program.



**Photo 6: Ministry of Agriculture staff stapling cocoMATs together**

### MAPS

Once the exotic fruit fly has been confirmed a GIS map is produced and hard copies printed. The Maps will;

- Highlight where fruit fly species are found
- Quarantine zone and a grid to determine distance or the area
- Location of Lynfield traps
- Flight pattern for aerial cocomat bait distribution



**Map 2: Map highlighting quarantine zone (red dashed line), area exotic fruit fly detected (yellow circle) and distribution of surveillance traps (i)**

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## MALE ANNIHILIATION TECHNIQUE

### Surveillance traps

### Lynfield Traps Materials





- Chinese Food containers
- Soldering iron (make holes in the Chinese containers)
- Surplus of dental wicks for traps
- Steel wires
- Long nose plier
- Methyl Eugenol (lures)
- Malathion (Insecticide)
- Surveillance recording sheet

#### **Surveillance Trap mix for Cue lure and Methyl eugenol lure**

**Photo 7: Lynflied trap on tree**

- Ratio 1:20
- 10ml malathion and 200ml lure in 1L water

#### **Lynfield Trap preparations**

- Holes of size of 5cm are made on the sides of Chinese container using soldering iron
- Two cotton wicks are twisted around steel wires
- Steel wire are threaded through the Chinese container lids
- Cotton wicks are dipped into the lure
- NOTE: Ensure when dipping wicks in the lure that the lure does not drip in or around the container

#### **Lynfield Trap Distribution**

- Location of traps from each other – starts at 200 meters apart from the 1st point of discovery or circle, then 300 within the next circle, 500m then 1 km.
- Remain deployed for 3 months or 3 generation to the Fruit Fly life cycle
- Recharge the traps with Methyl Eugenol (ME) every Month and collect flies every 2 days period for the next month then weekly thereafter.
- Best to hang traps on host trees, 1.5 or 2 meters above ground in amongst the leaves and fruits.

## **Block Baiting**

### **Block Materials**

- sheet of Fiber board
- Coconut husk
- Methyl eugenol (Me)
- Malathion (preferred insecticide)
- Fipronil (alternative insecticide)
- Wide trays/bins with lids for dipping
- Hammers
- Cordillidos (used to connect 2 cocomat for aerial drops)
- Nails 2.5 inch
- Bush knives
- Tie-wires
- Gloves
- Pliers
- Buckets
- Face mask
- Overalls
- Safety boots
- Safety glasses



**Photo 8: CocoMat nailed to a tree**

### **Male Lures**

Cue lure (Cl)

Methyl eugenol (Me)

### **Block Mix**

- Mix ratio: 80% Methyl Eugenol + 20% Malathion (~70%ME + 30% Fipronil)
- 1,000 blocks = 14,000mls of mixture (14 litres)
- 11.2L of ME + 2.8L of Malathion 50EC = 14L mixture solution
- Impregnate 14ml of male annihilation lure (ME) + insecticide with Block materials

### **Block Preparation**

- Fibreboard blocks size - 50mm x 50mm x 5mm (commercially prepared)
- Coconut husk blocks (CocoMATs) Size - 50mm x 50mm x 5mm

### **Soaking of Blocks**

- Treat 500 blocks at a time (inside 7L mixture solution) in a soaking bin/open square wide flat plastic bin/drum.
- Soak blocks in bin/drum for 2 hour and stir to make sure all side of the block come into contact with mixture solution
- Remove blocks from soaking bin/drum and drain excess and place them in a dry bin/drum overnight
- Pre-nailing blocks (with 2.5 inch nail) and put them in small buckets ready to be distributed in the field

### **Block Distribution**

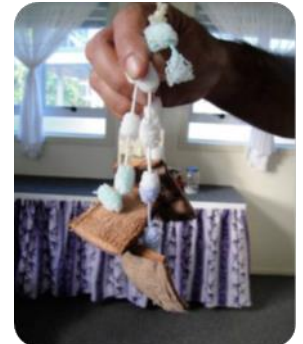
- Obtain daily plan from Operation Manager/Team Leader
- Walk in straight line in direction agreed by Team Leader
- Nail Blocks at 50m (100 normal walking pace) intervals to fruit trees
- Nail blocks 2m above ground, above your head
- Nail blocks in shady places out of sun
- Make sure your blocking line is separated from your 2 neighbours by 50m
- Regroup regularly at an agreed place for updates (eg. on roads for coordination)
- Work out ways of getting blocks to difficult to reach areas

The density of blocks or baits will be dependent upon the extent and geographic location of the outbreak. Suggested densities are as follows:-

- Not less than 400 blocks per km<sup>2</sup> in the field 50m x 50m
- Not less than 1,600 blocks per km<sup>2</sup> in residential areas, 25m x 25m
- Not less than 2,500 blocks per km<sup>2</sup> in rural areas, 20m x 20m
- 1 block minimum per urban backyard,
- 1 block per 25 trees in managed orchards, and
- 1 block per 4 trees in derelict orchards

#### **Aerial Block Preparation**

- Cocomats are dipped in Fipronil insecticide then dried overnight
- Cocomats are then sprayed with 5.5 ml Methyl Eugenol (70 cocomats are sprayed for 25 to 30 seconds)
- Two cocomat blocks are joined together by a cordillidos to ensure the blocks tangles on tree branched when dropped from a light plane during distribution over the hills.



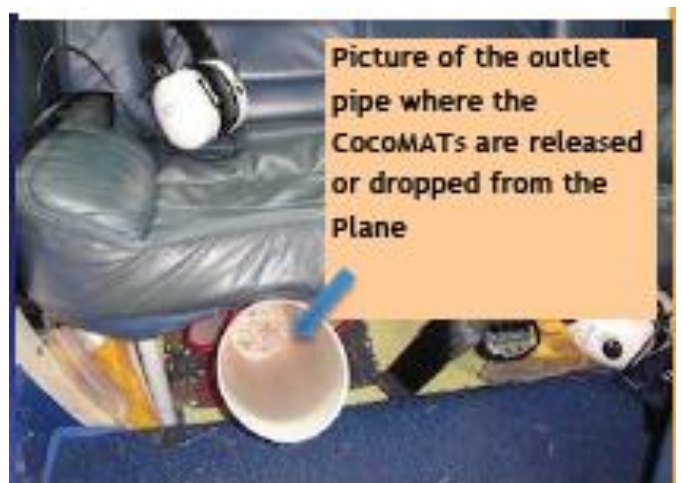
**Photo 9: Cocomats connected by cordillidos for aerial**

#### **Aerial Block Distribution**

- Flight path is determined approximately 50m apart (see photo below)
- Each block is dropped thru a tube, every two seconds to get an approximate distribution of 50 to 70 meters apart based on an average flight speed of 70km/hr.



**Photo 10: Flight path for aerial distribution**



**Photo 11: Outlet for cocomat aerial distribution**

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## PROTEIN BAIT

### Materials

- Sprayers / nap sacks (5L)
- Protein Bait
- Malathion (preferred insecticide)
- Fipronil (alternative insecticide)

### Protein Bait Mix

To make 1 litre mix solution

- Protein – 50ml
- Malathion – 4ml (7ml for Fipronil)
- Water - 946ml

### Protein Bait Field Application

- Protein bait should be applied in 100 ml dose spots at 100 spots per hectare
- in urban areas 6-8 spots per household property should be applied
- Baiting at a once weekly interval must also be conducted within the 1.5 km outbreak area.
- Bait sprays within the outbreak zone and outbreak area should continue to be applied for 2-3 generations (3month) after the last fly or larva has been detected.
- The baiting program may be expanded into the quarantine zone if results from the delimiting survey indicate this is required,



Photo 12: Bait Spray: Spraying of Protein Bait on the under leaf of a pawpaw

## TRAINING

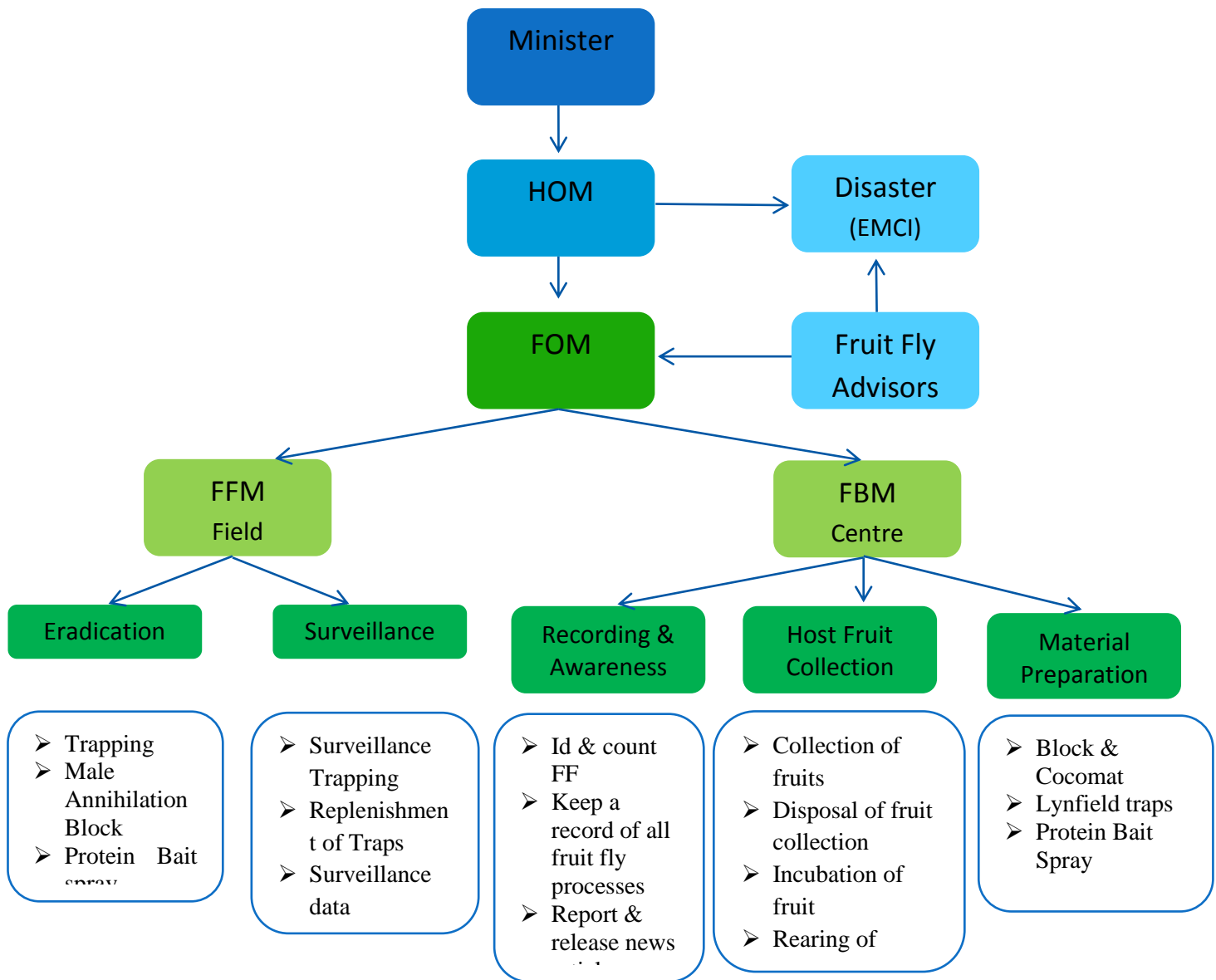
All key staff involved in the operational elements of the fruit fly control program need training to perform their functions properly. Key training needs are

- Ensure staffs level of understanding of the impact exotic fruit fly species can cause to the Cook Islands are made.
- Raise the level of understanding of the team of the command and control structure and decision making processes.
- Train staff on application of baits
- Train staff on handling of traps and use of chemical attractants to ensure no cross contamination.
- Personnel trained on safe handling of chemical

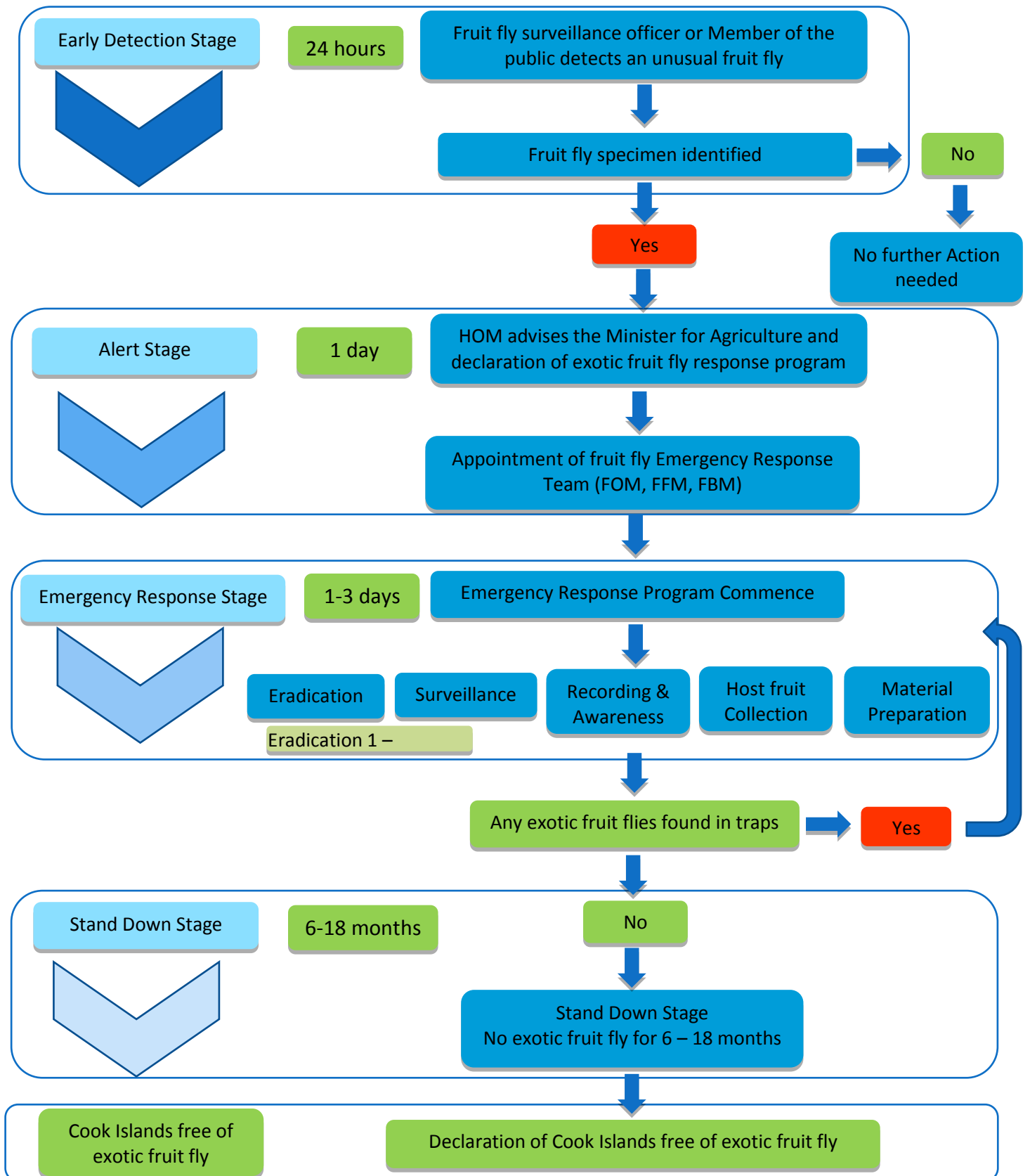
Training objective	Audience for Training	Outcomes
Staff fully trained on application of bait traps	All staff taking part in dispersing bait trap	Bait traps successfully applied and exotic fruit flies reduced
Safe handling of chemical	Staff responsible for mixing of insecticides Personnel handling the block baits	insecticide handled safely No cross contamination of chemicals
Staff understand Fruit fly life cycle	All staff	Understand fruit fly cycle and able to determine when flies are at a mature stage
Data recording	Staff carrying out surveillance trapping	Clear data of surveillance traps recorded



## FRUITFLY EMERGENCY RESPONSE STRUCTURE



## FRUITFLY EMERGENCY RESPONSE FLOW CHART



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## APPENDIX I FRUIT FLY LIFE CYCLE

stages:

- Egg
- Larva (caterpillar)
- Pupa
- Adult (fly).

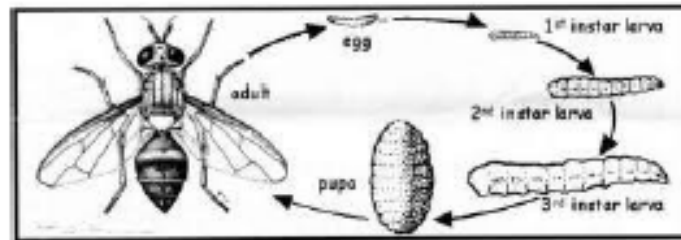


Figure 1: General fruit fly life cycle (Chris Lambkin)

Plant Health Australia describes the life cycle in the fruit fly handbook based on many studies of Queensland Fruit fly. This is consistent with a US study of 53 species of *Bactrocera* fruit flies.

The general life cycle is described as follows:

- Adults mate, usually in the foliage of plants surrounding or near the host but not necessarily on the host.
- Eggs are deposited (using an ovipositor) just under (3mm) the flesh of the favoured host fruit for the species. They are generally white, banana shaped and approximately 1mm in length. Infested fruit may show 'sting' marks on the skin and may be stung more than once by several females.
- In a short period of time, usually a few days, larvae hatch and begin to consume the fruit in which they find themselves. To the naked eye, the larvae resemble blowfly maggots. They are creamy white, legless, blunt-ended at the rear and tapered towards the front where black mouth hooks are often visible.
- The larvae develop through three larval stages to become about 9 mm long and pale yellow when fully grown.
- After an additional number of days ranging between 4 and 12, the larvae drop from the fruit and become pupae in the soil. The mature larvae can 'jump' by curling into a 'U'-shape and then rapidly straightening.
- Adult flies emerge 7-10 days later (although this can extend to several weeks in cooler conditions) from their pupal cases in the soil and burrow towards the surface where they inflate their wings and fly away.
- The adult flies congregate on foliage and fruit to feed on bacterial colonies for about a week before sexually maturing and mating. Adults may live for many weeks with females continuing to lay eggs throughout their lifecycle.

(Margosian *et al* 2007)



## APPENDIX II FRUITFLY FACT SHEETS



### Fact Sheet: Oriental Fruit Fly (*Bactrocera dorsalis*)

*Bactrocera dorsalis* is a major economic pest and utilises a wide range of commercial, edible and rainforest fruits. Found mainly in Asia it's mainly restricted to the tropical and sub-tropical regions. Eggs won't hatch below 13°C so is restricted largely to the northern, summer climate in New Zealand.

#### Assessment of risk

Establishment in NZ	Economic impact	Market Access
Entry pathway	Host range (incl. kiwifruit)	?
Ease of establishment	Plant health	Area freedom required
Ease of detection	Crop productivity	Movement control
Ease of eradication	Crop protection	Quarantine requirements

Key: ■ High risk ■ Moderate/unknown risk(?) ■ Low risk

#### Description & Life cycle

The adult, is noticeably larger than a house fly, has a body length of about 8.0 mm and wing length about 7.3 mm. The colour of the fly is very variable, but there are prominent yellow and dark brown/black markings on the thorax.



The ovipositor is very slender and sharply pointed. Eggs are laid below the skin of the host fruit. These hatch within a day (although delayed up to 20 days in cool conditions). The egg is white, elongate and elliptical measuring about 1.2 mm.



The third instar, which is a typical maggot in appearance, is about 10 mm in length and creamy white. The larvae feed for another 6-35 days, depending on seasonal temperatures, before dropping to the soil to form a tan to dark brown puparium about 5 mm in length. Adults emerge after 1-2 weeks.



#### Distribution

Found mainly in Asia, OFF is widespread throughout much of Pakistan, India, Sri Lanka, Myanmar, Indonesia, Malaya, Thailand, Cambodia, Laos, Vietnam, southern China,

Taiwan, Philippine Islands, Ryukyu Islands (including Okinawa), Micronesia, Mariana Islands (Guam, Rota, Saipan, Tinian), Bonin Islands, and Hawaiian Islands.

It has been introduced to Palau, Hawaii, Nauru and Tahiti, and has been eradicated from southern Japan (Ryukyu Is) and Mauritius.

#### Host & Climatic Range

The oriental fruit fly has been recorded from more than 150 fruit and vegetables, including citrus, guava, mango, papaya, avocado, banana, loquat, tomato, surinam cherry, rose-apple, passion fruit, persimmon, pineapple, peach, pear, apricot, fig, and coffee. Avocado, mango, and papaya are the most commonly attacked.

Is a high priority pest identified for: Apple/Pears, Avocado, Banana, Citrus, Summerfruit, Tropical fruit and Vegetables

OFF is mainly found in warmer, tropical areas. Eggs will not develop at temperatures below 13°C, although the adult fly may be able to cope with colder temperatures.

#### Impacts

The damage to crops caused by OFF result from, oviposition in fruit and soft tissues of vegetative parts of certain plants, feeding by the larvae, and decomposition of plant tissue by invading secondary microorganisms. Larval feeding damage in fruits is the most damaging.

In addition to physical damage OFF inflicts economic damage due to costs associated with quarantine and monitoring programmes, limits on exports from fruit fly infested areas and quarantine treatments of fruits from fruit fly infested areas.

Dispersal ability	Ease of detection	Ease of Eradication
<p>Adult flies can disperse over long distances through flight. There is evidence that OFF adults can fly at least 50 - 100 km.</p> <p>The transport of larvae in infested fruit can result in global movement, giving these flies an extreme risk rating.</p>	<p>OFF can be monitored by traps baited with male lures. Males are attracted to Methyl eugenol (O-methyl eugenol) at a range of up to 1 km</p>	<p>Ripe host fruits need to be destroyed.</p> <p>A cover and bait spray combination can be used.</p> <p>OFF was eradicated from northern Japan using Methyl eugenol bait/kill traps.</p> <p>Sterile insect release can work to control population growth.</p>

NOTE: There are a number of other flies in the Bactrocera family that are very similar in appearance, but differ in their ranges and specificity around host plants.

[Bactrocera correctae](#), guava fruit fly

[Bactrocera invadens](#)

[Bactrocera cucurbitae](#), melon fly



## Fact Sheet: Queensland Fruit Fly (*Bactrocera tryoni*)



QFF is a very serious pest of a wide variety of fruits and some vegetables and is a particular threat to the northern parts of NZ. Damage levels can be up to 100% of unprotected fruit and being indigenous to Australia the trade is in a similar crop maturity time zone to New Zealand.

### Assessment of risk

Establishment in NZ	Economic impact	Market Access
Entry pathway	Host range (incl. kiwifruit)	Treatment required
Ease of establishment	Plant health	Area freedom required
Ease of detection	Crop productivity	Movement control
Ease of eradication	Crop protection	Quarantine requirements

Key: ■ High risk

■ Moderate/unknown risk(?)

■ Low risk

### Description & Life cycle

The adult female is approximately 6-8 mm long, has a wing expanse of 10 to 12 mm, and has mostly transparent wings marked with brown. The fly is reddish brown with yellow markings.



The abdomen is constricted at the base, flared in the middle, and broadly rounded at the tip excluding the ovipositor in females. Adults can live for many weeks. Female flies usually mate once or twice. Male flies mate multiple times.



QFF lay eggs in maturing and ripe fruit on trees and sometimes in fallen fruit. Females can lay several hundred eggs during her lifetime. Eggs are small (< 1 mm long), white in colour and banana shaped.



When fully grown larvae are about 6 to 8 mm long and pale yellow. Larvae feed for 10 - 31 days on the host fruit, before dropping to the soil to pupate.



QFF numbers tend to increase in spring when temperatures are warm and there is ready availability of suitable host fruit. Under favourable conditions one generation takes about four weeks.

### Distribution

QFF is indigenous only to Australia, but like other *Bactrocera* spp. is known by experience to have the potential to establish adventive populations in various other tropical areas. It is the major fruit fly pest species in eastern Australia and is the target of major control and quarantine programmes.

It occurs in large populations throughout eastern Australia from Cape York (Queensland) to East Gippsland (Victoria). It is also established in New Caledonia and the Austral Islands.

### Host & Climatic Range

QFF can attack a wide range of fruit, fruiting vegetables and native fruiting plants. The main hosts are mostly tree fruits: avocados, plums, mangoes, peaches, citrus, passionfruit.

QFF is found in warmer areas of Australia, but has been found in Tasmania (similar climate to NZ). The adult fly may be able to cope with colder temperatures. QFF are most active in warm humid conditions and after rain. QFF might be seen walking on the undersides of leaves or on maturing fruit. They readily take flight if disturbed.

### Impacts

Large numbers commonly occur in Australia in March and April at a similar time that many fruit crops are maturing in New Zealand.

The damage to crops caused by QFF result from, oviposition in fruit and soft tissues of vegetative parts of certain plants, feeding by the larvae, and decomposition of plant tissue by

invading secondary microorganisms. Larval feeding damage in fruits is the most damaging.

In addition to physical damage OFF inflicts economic damage due to costs associated with quarantine and monitoring programmes, limits on exports from fruit fly infested areas and quarantine treatments of fruits from fruit fly infested areas.

Dispersal ability	Ease of detection	Ease of Eradication
<p>There is evidence that Queensland Fruitfly adults can fly at least 50 - 100 km.</p> <p>Dispersal of larvae also occurs in (usually ripe) host fruit.</p>	<p>QFF can be monitored by traps baited with male lures. Males are attracted to Cue lure (4-(p-acetoxyphenyl)-2-butanone) or a mixture of methyl eugenol and cue lure are effective at a range of up to 1 km</p> <p>QFF is also attracted to wet food lures such as protein and citrus juice although these lures are less effective.</p>	<p>Ripe host fruits need to be destroyed.</p> <p>A cover and bait spray combination can be used.</p>





SPC  
Secretariat  
of the Pacific  
Community

Plant Health  
Land Resources Division

**PEST Alert**

No.47

ISSN: 1727-8473

July 2013

## Oriental Fruit Fly invasion in the Cook Islands



Oriental fruit fly (OFF) was first noticed in Rarotonga on 9<sup>th</sup> of May 2013 when 22 male adult flies were intercepted at one of the male annihilation Methyl Eugenol (ME) lure traps installed on 27<sup>th</sup> April 2013 around Rarotonga. The suspected exotic fruit fly was collected and then referred to Dr. Maja Poeschko, Entomologist, Ministry of Agriculture (MOA) who viewed the flies under a stereo microscope and based on morphological characteristics identified the flies as the Oriental fruit fly species, *Bactrocera (dorsalis) dorsalis* (Hendel).

Subsequently, five males of the discovered fruit fly were sent to New Zealand Ministry of Primary Industry, Plant Health Entomology Laboratory (PHEL) on 20<sup>th</sup> May 2013 for further taxonomic analysis and confirmation. The NZ MPI PHEL referred the specimens to Dr. Richard Drew at Griffith University for morphological and molecular analysis. The results of taxonomic analysis from NZ MPI PHEL and Dr. Drew were relayed back to the Cook Islands government on 28<sup>th</sup> May 2013 confirming the exotic fruit fly to be indeed the Oriental Fruit Fly, *B. (dorsalis) dorsalis* (Hendel).

OFF is very destructive pest of fruit and vegetables with a host range of over 117 plant species. The pest is native to the Asian continent and prevalent in many Asian countries. Apart from its incursion into the Cook Islands, OFF is also present in Hawaii and French Polynesia. The pest was found in Guam in 1948 and Commonwealth of Northern Mariana Islands in 1936 but was subsequently eradicated from both these territories in 1965. The pest was eradicated from Nauru in 1999.

Immediately after intercepting OFF in Rarotonga, MOA intensified fruit fly trapping throughout the island group to determine the full extent of the pest occurrence and population

density. About 10 traps were sent to each of the other islands.

In Rarotonga traps were installed about every half a km around the coast. Results of weekly trap clearances confirmed OFF presence in four coastal locations. At these 'hotspots' a systems approach of intensified trapping was initiated. Sixteen traps were placed within 250 meter radius and another set within a 500 meter radius as buffer zone.

Trap catch cleared on 28<sup>th</sup> May 2013 from Aitutaki recorded a high population of OFF from traps placed a week earlier. As of 7<sup>th</sup> June, the results of trap surveillance clearances from all the islands of Cook Islands confirmed that OFF was only present in Rarotonga and Aitutaki.

Three methods of eradication for OFF have started for Rarotonga - crop hygiene and sanitation, male annihilation blocks and protein bait spraying. A similar eradication campaign for Aitutaki will soon start pending arrival of supplies.



For further information, contact Dr. Maja Poeschko, Entomologist, Ministry of Agriculture, P.O. Box 96, Rarotonga, Cook Islands. Phone: (682) 26720; Fax: (682) 21881; Email: [maja240961@yahoo.co.nz](mailto:maja240961@yahoo.co.nz) or Maclean Vagalo, Entomologist, Land Resources Division, Secretariat of the Pacific Community, Private Mail Bag, Suva, Fiji Islands, Phone: (+679) 3379431(d)/3370733 ext 431, Mobile: (+679) 9393355 Fax: (679) 3370021/3386326, website: [www.spc.int/inf](http://www.spc.int/inf)

## APPENDIX IV KEY PERSONNEL FOR FRUITFLY PROGRAMME

Below is a list of key personnel responsible for the fruit fly monitoring program in the Cook Islands. The following list is to be regularly updated by MOA.

Island	Personnel Address
<b>Rarotonga</b>	<p><b>HOM</b> Ministry of Agriculture Rarotonga Ph: +682 28711/28710</p> <p><b>Dr Maja Poeschko</b> Senior Research Officer Ministry of Agriculture Ph: +682 28711/25403</p> <p><b>Maru Nganu</b> Biosecurity Officer Ministry of Agriculture Ph: +682 28711/28710</p> <p><b>Biosecurity Office</b> Ph: +682 28711/28710</p>
<b>Aitutaki</b>	<p><b>Pepe Raela</b> Agriculture/Biosecurity officer Island Administration Ph: +682 31700 Mobile + 682 57513</p>
<b>Mauke</b>	<p><b>Vaine Keu</b> Agriculture/Biosecurity officer Island Administration Ph: +682 35141</p>
<b>Mitiaro</b>	<p><b>Tokai Ngaiorae</b> Agriculture/Biosecurity officer Islands Administration Ph: +682 36108</p>
<b>Atiu</b>	<p><b>Bob Teata</b> Agriculture/Biosecurity officer Island Administration Ph: +682 33269</p>
<b>Mangaia</b>	<p><b>Nuku Koroa</b> Agriculture/Biosecurity officer Islands Administration</p>

	Ph: +682 34289
<b>Pehnryn</b>	<b>Tutavake Andrew</b> Agriculture/Biosecurity officer Ph: +682 42100
<b>Palmerston</b>	<b>Taepae Masters</b> Agriculture/Biosecurity officer Island Administration Ph: +682 37620
<b>Pukapuka</b>	<b>Neiao Topetai</b> Agriculture/Biosecurity officer Island Administration Ph: +682 41712
<b>Nassau</b>	<b>Course Topetai</b> Agriculture/Biosecurity officer Island Administration Ph: +682 41712
<b>Manihiki</b>	<b>Moto Finiasi</b> Agriculture/Biosecurity officer Island Administration Ph: +682 43103
<b>Rakahanga</b>	<b>Agriculture/Biosecurity officer</b> Island Administration Ph: +682 44036
<b>Regional Key Personnel</b>	
<b>SPC</b>	<b>Mr Mclean Vaqalo</b> Entomologist SPC Campus, Nabua, Fiji Tel: (+679) 3370733 Ext: 35431 E-mail: McleanV@spc.int  <b>Mr Lesio Saurara,</b> Biosecurity Officer, Plant Protection Service, SPC Campus, Nabua, Fiji Tel: (+679) 3370733 Ext: 35223 E-mail: LesioS@spc.int



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**UNEP**



**GEF**