Biosecurity Guidelines for the Phoenix Islands, Kiribati

JANUARY 2011

BIODIVERSITY CONSERVATION LESSONS LEARNED TECHNICAL SERIES

8

CONSERVATION INTERNATIONAL
Pacific Islands

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Biosecurity Guidelines for the Phoenix Islands Protected Area, Kiribati

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Cover Photograph: the blue noddy, an indicator species.

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CONSERVATION INTERNATIONAL
Pacific Islands

CRITICAL ECOSYSTEM PARTNERSHIP FUND

ABOUT THE BIODIVERSITY CONSERVATION LESSONS LEARNED TECHNICAL SERIES

This document is part of a technical report series on conservation projects funded by the Critical Ecosystem Partnership Fund (CEPF) and the Conservation International Pacific Islands Program (CI-Pacific). The main purpose of this series is to disseminate project findings and successes to a broader audience of conservation professionals in the Pacific, along with interested members of the public and students. The reports are being prepared on an ad-hoc basis as projects are completed and written up.

In most cases the reports are composed of two parts, the first part is a detailed technical report on the project which gives details on the methodology used, the results and any recommendations. The second part is a brief project completion report written for the donor and focused on conservation impacts and lessons learned.

The CEPF fund in the Polynesia-Micronesia region was launched in September 2008 and will be active until 2013. It is being managed as a partnership between CI Pacific and CEPF. The purpose of the fund is to engage and build the capacity of non-governmental organizations to achieve terrestrial conservation. The total grant envelope is approximately US$6 million, and focuses on three main elements: the prevention, control and eradication of invasive species in key biodiversity areas (KBAs); strengthening the conservation status and management of a prioritized set of 60 KBAs and building the awareness and participation of local leaders and community members in the implementation of threatened species recovery plans.

Since the launch of the fund, a number of calls for proposals have been completed for 14 eligible Pacific Island Countries and Territories (Samoa, Tonga, Kiribati, Fiji, Niue, Cook Islands, Palau, FSM, Marshall Islands, French Polynesia, Wallis and Futuna, Eastern Island, Pitcairn and Tokelau). By late 2010 more than 35 projects in 9 countries and territories were being funded.

The Polynesia-Micronesia Biodiversity Hotspot is one of the most threatened of Earth's 34 biodiversity hotspots, with only 21 percent of the region's original vegetation remaining in pristine condition. The Hotspot faces a large number of severe threats including invasive species, alteration or destruction of native habitat and over exploitation of natural resources. The limited land area exacerbates these threats and to date there have been more recorded bird extinctions in this Hotspot than any other. In the future climate change is likely to become a major threat especially for low lying islands and atolls which could disappear completely.

For more information on the funding criteria and how to apply for a CEPF grant please visit:

- www.cepf.net/where_we_work/regions/asia_pacific/polynesia_micronesia/Pages/default.aspx
- www.cepf.net

For more information on Conservation International's work in the Pacific please visit:

- www.conservation.org/explore/asia-pacific/pacific_islands/pages/overview.aspx

or e-mail us at cipacific@conservation.org

CRITICAL ECOSYSTEM PARTNERSHIP FUND

CONSERVATION INTERNATIONAL Pacific Islands

Location of the project in the Polynesia-Micronesia Biodiversity Hotspot

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Lessons Learned

Project Design Process

Aspects of the project design that contributed to its success/shortcomings

The key lesson learned here was that it requires several meetings and workshops to obtain all the key data for risk assessments. Not all relevant data were obtained during the largest meetings which appeared to inhibit some information from being divulged. Smaller groups and individual contact was important. A second lesson was to allow more time in order to complete a project of this nature.

Project Implementation

Aspects of the project execution that contributed to its success/shortcomings

The design problem noted above was successfully countered by having multiple visits to Kiribati (in conjunction with other projects) which enabled better working relationships and for all key staff to contribute effectively, often on more than one occasion and this will need to be continued to some degree in implementing the recommendations on the ground. However, there was still a problem with timeframe for technical input from others.

Other lessons learned

relevant to the conservation community

Some generic pest management methods may not always work in each situation for physical, biological or cultural reasons.

Abbreviations and Acronyms

Ag	Agriculture Division of MELAD
Biota	Plants (flora) and animals (fauna)
Biosecurity	Actions undertaken to stop IAS from arriving (at PIPA), together with surveillance and emergency responses to deal with any arrivals
Biosecurity Committee	Group of technical staff and external advisers who can provide rapid technical advice in response to specific PIPA values, biosecurity issues and incidents
Brodifacoum	Anticoagulant rodenticide (toxicant) ideal for eradications on islands and for removing rodents from vessels – comes in pellet or wax block form
CEPF	Critical Ecosystem Partnership Fund
CI	Conservation International
Endangered	An IUCN threat category for a species intermediate between Critical (highest level of threat) and Vulnerable (lower level)
Eradication	Total removal of all invasives from an entire location, e.g. a PIPA island, as opposed to pest control which would be ineffective at the PIPA
Fly-on count	Evening count of sensitive birds returning to an island for the night
GOK	Government Of Kiribati
GPS	Global Positioning System
Home range	The area an animal ranges over, which can be a few square kilometres in cats, but potentially as small as 30–50 m^2 in mice
IAS	Invasive alien species, comprising invasive pest animals and pest plants
IBA	Important Bird Area, a key designation of BirdLife International
ID(s)	Identification(s)
Incursion	A term sometimes used for the initial stages of a potential invasion of an IAS
Indicator species	Species, e.g. blue noddy and grey-backed tern, whose numbers or productivity are useful in indicating the health of an ecosystem
Interspecific	Between species, e.g. interactions between the two myna species at Tarawa
Kanton	Kanton Island (Abariringa), the only inhabited island of the PIPA
Lantana	An orange-flowering invasive plant (see Section 9) common at Kanton and has been recorded at Orona
MELAD	Ministry of Environment, Lands and Agricultural Development
MHWS	Mean High Water Spring Tide
Monitoring	Here refers to measuring the native biota e.g. PIPA birds, plants
Neophobia	Of rodents – being afraid of approaching new objects, e.g. traps and bait stations,placed in their area – shyness can last for days
NZDOC IEAG	New Zealand Department of Conservation Island Eradication Advisory Group

PII	Pacific Invasives Initiative
PIPA	Phoenix Islands Protected Area
PIPAMC	PIPA Management Committee
PIPAMP	PIPA Management Plan
PIPA Biosecurity Committee	A group of technical experts from GOK and outside who advise on specific aspects of the biosecurity programme
Pluchea	An invasive shrub present at Kiritimati and beginning to invade the PIPA
Pre-border measures	Refers to measures undertaken at ports before the PIPA, i.e. Betio, Kiritimati and foreign ports
Rattus	A genus of rats that includes *Rattus exulans* (Pacific rat), *Rattus norvegicus* (Norway rat), *Rattus rattus* (black or ship rat) and *Rattus tanezumi* (an Asian rat).
Rodent	Rats (mainly *Rattus spp.*) and mice (*Mus musculus*)
SPC	Secretariat for the Pacific Community
Surveillance	Here refers to the search for sign of IAS following guidelines
Terrestrial	On land
Velcro	Sticky material of backpack straps, sandals, etc to which seeds can stick
WCU	Wildlife Conservation Unit, MELAD, Kiritimati

Executive Summary

The atolls of the PIPA support breeding colonies of 19 seabird species, many of them threatened or globally important. The GOK is currently restoring these bird populations and atoll ecosystems generally by eradicating mammalian pests. However, it is vital to prevent other these and other invasive alien species (IAS) from invading the islands, which would greatly undermine current restoration efforts. This document provides guidelines to the GOK to firstly strengthen biosecurity of the PIPA, secondly to undertake surveillance for any IAS that might arrive in breach of the biosecurity, and thirdly to implement emergency response procedures.

In order to strengthen biosecurity these guidelines (hereafter referred to as "the Guidelines") identify likely sources and pathways for IAS to get to the PIPA (primarily via fishing, freight and other vessels that enter PIPA waters) and outlines the most urgent biosecurity measures that need to be undertaken at the source ports and on the vessels themselves. Practical and inexpensive approaches are favoured to ensure the approach is financially sustainable. These include protocols for parties planning to land on the islands. In order to strengthen surveillance at the PIPA, the Guidelines identify protocols for patrol vessels and other visitors to undertake at the PIPA, including for landing parties. This is followed by rapid response measures if IAS are detected.

Support mechanisms are identified including a Biosecurity committee as well as sources of technical equipment and training and advocacy needs. A key need is to engender a social understanding and acceptance of the need for good quarantine amongst community and visitors. These guidelines should be updated as new and improved approaches are available as this will enable biosecurity tools and implementation to be increasingly more effective.

Acknowledgements

Many GOK staff assisted with developing these guidelines both in the field and in discussion. Issues were identified in the field with the help of Aata Binoka (Ag) and Fisheries staff at Tarawa, Nautonga Anterea (Ag), Katareti Taabu (WCU) and the Kanton community in the PIPA; Mamarau Kairirieta and Nautonga (Ag) and Ratita Bebe (WCU) and her staff at Kiritimati; and Alan Tye (SPREP) and Nacaniel Waqa (SPC) at Tarawa. Generic issues and broad protocols were further identified and developed with Tukabu Teroroko, John Mote (Maritime Police) and staff of Ag and ECD at meetings and via email and phone conversations. Further advice on the structure of these guidelines and technical content were provided by Souad Boudjelas and Bill Nagle (PII), Keith Broome and Island Eradication Advisory Group (NZDOC), Derek Brown, Sue Taei and James Atherton (CI), Alan Tye (SPREP), Nacaniel Waqa (SPC) and Graham Wragg (Pacific Expeditions Ltd). Spatial Conservation assisted with mapping. This work was funded by the CEPF of CI and we thank James Atherton and Leilani Duffy for their support throughout.

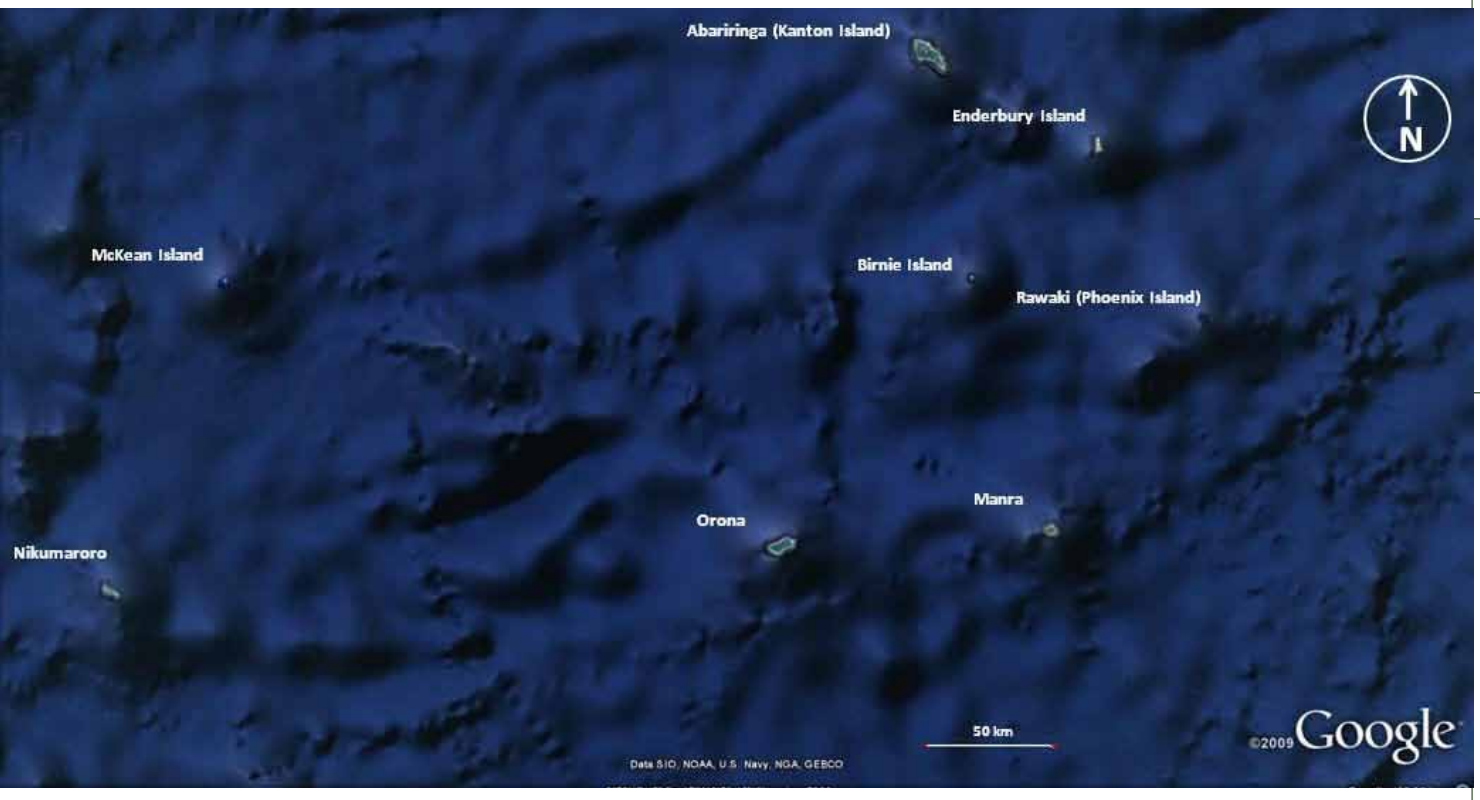
A

BACKGROUND AND STRATEGIC APPROACH

1 Purpose and Development of this Document

Purpose

This purpose of this document is to guide MELAD and the PIPA Management Committee of the Government of Kiribati in developing a sustainable biosecurity defence of the PIPA islands. The PIPA islands are currently being restored via pest eradication as part of the PIPA Management Plan (GOK 2010). The Guidelines support the PIPAMP and complement the imminent Biosecurity Act currently before the Government. The current Guidelines focus on a series of practical and sustainable tasks that are urgently needed and which should be implemented as soon as possible as a starting point for PIPA biosecurity. Additional biosecurity needs are identified and prioritised given that the GOK does not yet have the resources to enable 100% effective biosecurity protection of the PIPA and other island groups. It is intended that these guidelines be revised in the future as additional tasks are added or existing ones refined, and provide a basis for developing toolkits, procedures and awareness programmes.



Phoenix Islands group, Kiribati

Stages in Development of Guidelines

Several stages were used in the development of this document:

STAGE 1 – working with GOK field staff and specialists to identify existing process and needs.

STAGE 2 – review approaches to biosecurity elsewhere.

STAGE 3 – drafting of guidelines.

STAGE 4 – final reviews.

Stage one was critical to the process and included the following activities and staff input.

Date	Location	Activity	Key staff
July 2009	Kiritimati	Inspect port areas, inspect foreign fishing vessels, meetings with WCU and Ministry	Mamarau (Ag), Customs staff, Manukaoti (Secretary), Ratita Bebe (WCU)
23–24 July 2009	Tarawa	Workshop to scope risk assessments and solutions	Aata Binoka (Ag), Tukabu Teroroko (PIPA), Alan Tye (SPREP), Nacaniel Waqa (SPC)
25 July	Betio	Port inspection, container terminal	Tukabu, Alan, Nacaniel
27 July	Tarawa	Strategic discussions with MELAD, PIPA	Tererei, Nenenteiti, Tukabu
28 July	Tarawa	PIPAMC presentation and discussions	PIPAMC including staff from Police, Fisheries, MELAD, PIPA
3–10 Dec 2009	PIPA	Field workshop of improved biosecurity for specific islands including Kanton, Enderbury, Rawaki, Birnie and Orona	Nautonga, Katareti
4 Dec 2009	Kanton	Meeting with community elders to discuss PIPA management and Kanton biosecurity	Community leaders, Katareti Taabu, Nautonga Anterea
12 March 2010	Tarawa	PIPAMC meeting to discuss restoration and biosecurity work at PIPA	Full PIPAMC meeting
15–17 Mar	Tarawa	Follow-up meetings with Police, Ag and Fisheries to discuss biosecurity specifics	John Mote (Maritime Police), Kinaai (Director Ag), Tekirua Ringa and staff(Fisheries

Stages 2–3 were undertaken throughout and included ongoing discussions with key technical staff of GOK – Tukabu Teroroko, Aata Binoka, Nautonga Anterea and John Mote.

Reviews were provided by the above GOK staff plus outside specialists – Derek Brown, PII, NZ Biosecurity, NZDOC, SPC, SPREP.

2 PIPA Terrestrial Values and Threats

2.1 General

The Phoenix Islands Protected Area (PIPA) was established by Kiribati in 2006 and extended in area during 2008 to now cover 408 250 km^2. There are eight islands in the PIPA, all of them atolls, and each is well-removed from the other islands, typically 70–100 km apart. Unlike most other archipelagos in the Pacific, all except one of the islands are uninhabited and seldom visited. Only Kanton supports a small population (currently c.30) of caretaker families. In the past, the three southern islands were also inhabited for varying lengths of time (refer draft PIPAMP).

The islands are diverse in physical features including atoll size, lagoon size, vegetation type and ease of landing, all of which are summarised in Table 2.1.

TABLE 2.1 – Key physical and vegetation features of the island.

Island	Land area (ha)	Lagoon	Main vegetation types	Landing
Rawaki	c.50	Small, closed	Grass, low scrub	Difficult
McKean	c.30	Small, closed	Grass, low scrub	Difficult
Birnie	<50	Small, closed	Grass, low scrub	Difficult
Enderbury	500+	Many, closed	Grass, low scrub, trees	Moderate
Manra	c.500	Small, closed	Forest, scrub, coconuts	Difficult
Orona	c.600	Large, open	Forest, scrub, coconuts	Easy – excavated channel
Nikumaroro	c.400	Large, open	Forest, scrub, coconuts	Easy – excavated channel
Kanton	c.900	Large, open	Forest, scrub, coconuts	Easy – lagoon wharf

2.2 PIPA Fauna Values

The PIPA is a Key Biodiversity Area of Conservation International's Ecosystem Profile for the Polynesia/Micronesia Hotspot under the CEPF (Critical Ecosystem Partnership Fund) and is currently being nominated as an IBA (Important Bird Area, BirdLife) and a World Heritage site (IUCN). These existing and planned designations reflect the very high marine and terrestrial values present in the PIPA and the linkages between them. Terrestrial fauna values are dominated by seabirds with many globally important populations, including two threatened species (refer Appendix 1). These values will be enhanced as restoration progresses towards a pest-free PIPA (refer Table 2.2 for current pest status and eradication plans.

TABLE 2.2 – Pest mammal status and eradications in PIPA 2008–9

Green = confirmed pest-free 2009 Blue = eradication plans underway Plain = future eradications

Island	Pest status 2009	Comments
Rawaki	Rabbits eradicated 2008	Ecosystem and species recovering 2009
McKean	Asian rat eradicated 2008	Ecosystem and species recovering 2009
Birnie	Pacific rat	Planning for rat eradication underway
Enderbury	Pacific rat	Planning for rat eradication underway
Kanton	Cat, Rattus 2 spp.	Planning for rat/cat eradication underway
Orona	Cat, Pacific rat	Potential for multiple island restoration
Nikumaroro	Pacific rat	Potential for multiple island restoration
Manra	Unknown – rats/cats?	Survey then potential multiple island restoration

2.3 General threats to PIPA islands and their fauna

Current and future threats to the islands and their fauna are dominated by the impacts of invasive alien species (IAS) comprising pest plants and particularly pest animals. PIPA has been hard hit by invasive mammals which can change entire ecosystems and eliminate many species of birds and lizards. Examples of this can be seen at Rawaki and McKean. On Rawaki nearly all of the indigenous plant species had been eliminated or damaged by rabbits – up until 2008 storm-petrels, blue noddies, etc struggled to find suitable nest sites. But these seabirds still persisted on Rawaki simply because it is the only island in the PIPA never to have had rats or cats invade.

The seabird declines at PIPA will have had flow on impacts to the marine ecosystem, including reduced nutrient input to the coral reef and ocean.

WHY IS RAWAKI SO SPECIAL?

Rawaki is the only island in the PIPA to have avoided rat and/or cat invasion to date.

It provides the source of threatened and sensitive seabirds like Phoenix petrels (A), storm-petrels (B), blue noddies (C) and shearwaters to recolonise the other PIPA islands after they are restored.

A

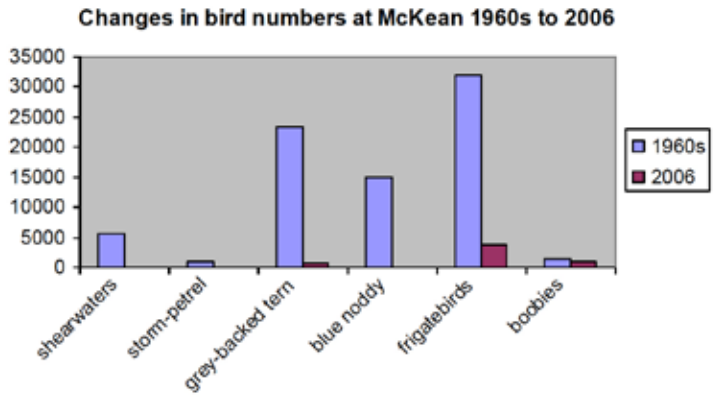
B

C

THE MCKEAN DISASTER – WHAT HAPPENED?

A fishing vessel was wrecked here in 2001–02 and allowed Asian rats (lower left) to invade and wipe out many seabirds.

Blue noddies, storm petrels and others declined from thousands of birds in the 1960s to very few in 2006 (see graph below).



CAN WE ERADICATE EXISTING INVASIVES?

Yes we can but it is expensive!

1. There are good protocols for eradicating pests, e.g. Cromarty et al 2002, Brown 2010 in prep.

2. In 2008 rats were eradicated from McKean by baiting (A) resulting in an immediate increase in bird productivity (no rat predation) and more shady plant cover.

3. In 2008 rabbits were eradicated from Rawaki which despite being dry resulted in rapid plant growth and after 18 months there were new nest sites for blue noddies, frigate birds (B) and other birds across the island.

4. Plans are being developed to eradicate IAS from other PIPA islands.

5. All islands depend on biosecurity being strengthened to prevent further invasions.

A

B

2.4 Strategic approach to restoring PIPA islands and fauna

General approach

The PIPAMP recommends a three-stage approach to restore the PIPA islands:

Legal Structure

The management of the PIPA islands is the responsibility of the GOK which implements the PIPA Management Plan administered by the PIPA Director as advised by the PIPAMC. The Minister of Line and Phoenix Islands Development (MLPID) based at Kiritimati also has a key role in overall governance and management of the PIPA. The biosecurity of the PIPA islands and the other Kiribati groups is the responsibility of the Agriculture division of MELAD. Kiribati Biosecurity is guided by the pending Biosecurity Act, which will provide officers with the necessary powers of enforcing biosecurity in Kiribati generally. Specific requirements for PIPA biosecurity are guided by the PIPAMC which also takes into account the PIPA Management Plan, the current guidelines and technical advice from a PIPA Biosecurity Technical Advice Committee (see below). Surveillance and emergency response are the responsibility of the PIPAMC, but these responses may also involve other MELAD staff (particularly those of Agriculture and ECD) and the Maritime Police.

Technical Advice

A PIPA Biosecurity Committee is being established to advise the PIPAMC on specific biosecurity approaches and one-off issues that might arise periodically. Technical advice will span matters of quarantine, surveillance and emergency response as needed, as well as developing awareness programmes. Suitable candidates who have indicated willingness to be on the committee are as follows, and others e.g. NZ Department of Conservation staff would be very helpful if needed:

TABLE 2.4 – Biosecurity Committee members (provisional list) A key requirement of the Biosecurity Committee members is to be contactable at all times in order to provide rapid advice to address incidents and issues as they arise. These members will need to be able to network more widely to obtain the most efficient and effective advice. When members are likely to be non-contactable for more than a day they should identify an alternative means of contact and/or details of a suitable back-up person to the group.

Name	Position	Role	Contact
Tukabu Teroroko	PIPA Director	Involved with all decision making	Ph 686–28762 tukabutravel@yahoo.com
Aata Binoka, Teaero Otiuea	Agriculture reps Tarawa	Key roles in advising on practical approaches of all biosecurity operations	b_aata@yahoo.com.au t_otiuea@yahoo.com
Nautonga Anterea, Mamarau Kairirieta	Agriculture reps Kiritimati	Key roles in advising on practical approaches of all biosecurity operations	anterea_n@yahoo.co.nz mamarau@gmail.com
Dr Ray Pierce	Eco Oceania Pty Ltd	PIPA strategic advice, ID sources of skills, equipment; networks to pest specialists e.g. Derek Brown, NZDOC	Ph 61–740930784 Mob 61–450418544 raypierce@bigpond.com
Dr Alan Tye	SPREP	Advising on Pacific strategic approaches – excellent skills in pest plant issues and general IAS	Ph 685–21929 alant@sprep.org
Derek Brown	Eradication contractor	Advising on rapid responses, derek.brown@xtra.co.nz	Ph 685–21929 alant@sprep.org
Nacaniel Waqa	SPC	Excellent biosecurity skills particularly for economic pests	NacanieliW@spc.int
Souad Boudjelas	PII Director	IAS toolkits; links with Pacific IAS specialists	Ph64–93737599 s.boudjelas@auckland.ac.nz

B

BIOSECURITY – THE IMPORTANCE OF QUARANTINE

3 Risk Assessment and Actions Needed

TABLE 3.1 on the following page summarises the main sites and pathways that key invasive species that could invade the PIPA, together with preventative measures that need to be implemented and by whom. It includes overall approaches, pre-border and at border sites and is based on findings of a workshop held at Tarawa on 23–24 July 2009.

A more detailed version of this table can be found in Appendix 9. Recent biosecurity breaches include the arrival of *Rattus tanezumi* via a fishing boat, *Rattus rattus* probably via cargo ships, and bull-headed ants by unknown means.

TABLE 3.1 – Summary of main pest risks and prevention measures for pre-border and at-border sites The following sections (4–6) address urgent actions needed to address the risks identified in the above risk assessment.

Site	Pathway	Main pests	Prevention measures needed	Responsibility
Pre-border				
Betio and Kiritimati	Cargo vessels and fishing vessels via illegal landings and wrecks at PIPA	Rats, mice, cats, ants, weeds	Port biosecurity Vessel biosecurity including loading procedures, inspection pre-departure and ongoing vessel pest management Observer on board	Ag Ag PIPA/ MELAD
Foreign ports	Fishing vessels as above	Rats, mice, cats, ants	Vessel biosecurity including loading procedures, inspection pre-departure and ongoing vessel pest management Observer or board	All Fisheries, withsupport from Agand foreign portauthorities
Multiple ports	Management, science, tourism expeditions	Rats, mice, ants, weeds	Update guidelines GOK observer/ participants	PIPA
At border				
Kanton	Seaport and potentially also the airport	Rats, mice, ants, weeds	Quarantine officer and facilities Risk assessments Surveillance Emergency response measures	MELAD/Ag/ PIPA
Other PIPA islands	Illegal and legal landings	Rats, mice, ants, weeds	"No landing" signage Remove coconuts Enderbury Biosecurity guidelines Surveillance Emergency response measures	All PIPA
Legislative and collaborative approaches				
All	All	All	Biosecurity Act Reinstate Biosecurity Cttee Biosecurity Guidelines Education/protocols throughout Pacific	MELAD/PIPA MELAD/PIPA MELAD/PIPA SPC/Agencies

4 Urgent Quarantine Actions Needed for Vessels

This section describes the urgent quarantine actions that are needed on all vessels proposing to visit PIPA waters. This includes vessels at Tarawa and Kiritimati and fishing vessels and other vessels departing foreign ports.

FIGURE 4.1 Inter-island freighter c.200 m offshore is ideally sited to prevent rodent access.

FIGURE 4.2 Wharf at Betio, Tarawa, offers potentially good trapping and bait station defence from rodents and other invasive species.

4.1 Preliminary requirements

When the GOK receives applications for permits to visit PIPA waters, it must make permitting and biosecurity requirements known to captains of those vessels to ensure that they comply. Currently these permit applications can come through any of Fisheries, PIPA or other MELAD offices and require a consistent response. A fundamental requirement for all vessels proposing to visit the PIPA is to have at least one GOK representative or delegate throughout the loading and voyage stages to ensure biosecurity protocols are followed.

A key issue at present is that internal GOK vessels understandably do not require customs and immigration attention, but they can also slip through the Quarantine inspection. Agriculture needs to include inspection of these GOK vessels arriving and departing at Tarawa and Kiritimati to ensure that they have effective at control and other IAS surveillance. Kanton needs to be added to the list of sites where a Quarantine officer is based.

4.2 IAS (by Agriculture or other GOK delegate)

OBJECTIVES: To detect and eliminate any IAS on vessels that leave Betio, Kiritimati, Kanton or foreign ports and are permitted to travel through the PIPA

Tasks for inspections are identified below. The key requirement is for the GOK representative or delegate to be present for all voyages and takes responsibility for biosecurity.

Inspection Tasks	Equipment needed
1. Pre-loading inspection of vessels: All vessels departing via the PIPA must be thoroughly inspected for IAS by GOK rep at least 2 days before departure and again on departure date (see Section 2 Inspections below). Certification or quarantine as appropriate. **Rodent surveillance searches**: rat and mouse droppings, gnawing – focus on areas that are dry and/or have food, including cargo holds, galley, food stores, dinghies, cabins, etc. establish sticky boards on the vessel to catch rats and mice – additional rodent surveillance should include rat trapping (optional given some captains may be unhappy to kill rats directly) – if captain wishes operate c.5 snap traps for 3+ nights prior to departure (checked daily including departure day and leave set on boat); the number of traps depend on size of vessel – typically 5–10 traps per ship; bait traps with coconut flesh. – collect any specimens for identification and if uncertain keep frozen for formal identification – establish bait stations permanently on all vessels, c.50 g bait per station – count the pellets placed in each stations (e.g. 25 pellets per station) and check daily for baits having been removed and check for and remove fresh rodent droppings. – complete data sheets (see Appendix 2–3). Interview passengers to verify "nil" returns for rat surveillance are correct.	Surgical gloves, specimen jars,pesticides, chew sticks, traps,sticky boards, bait stations,brodifacoum bait < 500 g per vessel, data forms (Appendix 2–3),pens, marker pens. First aid kit, toxin warningstickers, safety briefings
Ant/insect surveillance on board involves: • current fumigation certificate (methyl bromide) • ant surveys on vessel implemented at least 3 days prior to scheduled departure and on departure day following standard survey protocols (5–10 pairs of sweet and protein lures, refer Appendix 4) placed in galley and other areas where food and stores are kept, holds, covered storage areas, dinghies, etc • if IAS ants are detected follow quarantine procedures and complete eradication via fumigation and continue with inspections until clearance provided • maintain surveillance during voyage and if ants detected implement quarantine procedures • operating cockroach bombs as required • keep specimens for identification by Ag staff but treat all unidentified ants as potentially invasive and complete treatment.	Ant surveillance kit and methods (Appendix 4), ant fumigation equipment; Ripcord pesticide,cockroach bombs, data sheets, observer training in ant IDs.
Other IAS surveillance: search for and sweep out decks, store-rooms and holds where plant seeds may be present **In addition all cargo must be inspected as it is loaded (see below).** **If IAS are found the vessel must be quarantined and eradications completed.**	Brooms, containers, bags

2. Inspections during loading: All cargo to inspected by GOK rep on wharf or on vehicles on wharf before loading onto the vessel Rodents – inspect for rodents by visually inspecting all food boxes/bags, stores, equipment, etc for droppings and live rodents. Ants – inspect for ants and by washing foodstuffs in water, brushing gear, spraying with Permethrin any suspect cargo – collect and identify all ants found immediately – if IAS ants are identified, secure the area and undertake quarantine procedures to remove infestation – use Ripcord to eradicate any infestation. Seeds Inspect all goods for seeds – focus on boxes/bags and other containers, sweep out suspect areas, check for seeds on Velcro or other sticky substances. Other IAS – ensure no birds, cats and other potential IAS get on board – be aware of other potential IAS, e.g. mongooses, cane toads, birds, lizards, which can easily be transported in the Pacific. Provide cones (rodent-proof hoods) that captains can attach to mooring lines for blocking rat access.	Equipment as for surveillance in 1above .  *Cane toads are common Pacific stowaways*
3. Wharf area Ensure rodents and other IAS cannot get access to vessels while tied up at the wharf at e.g. Betio and Kiritimati, i.e. moor offshore at night, rodent control along wharf (see Port Compound below). Bird survey – brief captains on need to ensure no birds (mynas, bulbuls etc) accompany vessel on departure, taking particular during evening departures when birds can be going to roost. All other potential IAS, i.e. amphibians, reptiles, mammals, invertebrates to be captured and collected.	 *Avoid this IAS-friendly approach!*
4. Voyage surveillance – delegate voyage trapping and/or baiting of rodents, ants etc to captain and/or observer – operate bait stations and/or traps – maintain surveillance for IAS in stores, cargo etc while at sea – observer to alert captain and crew to report any IAS sightings – operate cockroach bombs – euthanize any live animals (don't throw overboard) – report details of other vessels in PIPA – immediately radio vessel name, registration, type, location, date, time and activity to PIPA office, backup = Fisheries office at Tarawa (PIPA) or Kanton Maritime Police – PIPA office decides on appropriate action – surveillance planes, patrol boat, etc.	As for 1 above
5.Transit ports/islands Note that if the vessel visits any other island in transit, assume that the island supports IAS (e.g. Kanton, southern PIPA islands) and repeat the "2 departure port procedures" above – at all islands including Kanton, moor the vessel well out from the wharf/landing. When departing the island, undertake searches 2–3 for IAS as before. Do not leave rubbish on islands and do not throw rubbish overboard in the PIPA.	As for 1 above
6. Reporting – data sheets and associated reporting to be held by PIPA office.	
7. Future improvements – work towards generic needs of Biosecurity Act, potentially including use of quarantine sheds at Betio, Kanton and Kiritimati, certified standards for packaging of produce etc, domestic animal standards, training or refine training for staff (Fisheries observers, Quarantine staff, captains, etc) in dealing with IAS identification, surveillance, quarantine, eradication. – agencies need to work towards trans-pacific agreements in improving biosecurity.	Quarantine shed, guidelines forpassengers and freight companies,education material on IAS
8. Advocacy – work towards improving knowledge and acceptance of quarantine by sea-going people. This could include making information stickers for vessels, brochures, posters etc, including adapting of the existing biosecurity poster (Appendix) for different target audiences. Some of the existing Pacific initiatives (e.g. Stop Rat) are worth using here.	

5 Actions Required by Parties Permitted to Land at the PIPA Islands

Minimise landing parties at the PIPA to a manageable level. On the most sensitive islands (McKean, Rawaki and other pest-free islands in the future), parties should be restricted to those undertaking essential management and research tasks, and be carefully briefed and monitored.

Landing parties actions (by PIPA or delegate)

Objectives: Ensure that no landing parties transport IAS or diseases ashore	
Tasks	Equipment needed
1. All actions described in 4.2 above plus:	See 5.1
2. Landing procedures – follow PIPA protocols and updates as directed by PIPA office – inspect dinghies for IAS – all camping equipment, supplies going ashore to be inspected for IAS (including seeds, invertebrates, paying particular attention to Velcro and cavities where seeds etc can collect) and repackaged and placed in pest-free containers (drums, dry-bags) which are sprayed and sealed at least 2 hours before going ashore – clothing, e.g. pockets, socks, inspected – all personal gear (cameras, binoculars, daypack etc) similarly inspected for IAS and placed in containers, sprayed and sealed at least two hours before going ashore – any additional items added within two hours of landing requires supplementary inspection and spraying – no poultry products (including eggs) to be taken ashore – no seeding fruit or vegetables, e.g. tomatoes, to be taken ashore – all human waste buried on the island and other waste removed to vessel	Dry-bags, drums/ barrels, Rip cord insecticide and Permithrin backup.
3. When returning to the vessel, repeat above procedures to ensure no biota are transported from the island to vessel.	As for 2 above

6 Port Compounds – Quarantine and IAS Management at Betio, Kiritimati and Kanton Port Compounds

(by Agriculture/Quarantine)

Objectives:

1. Confirm the species of IAS present at the port area (rodents, cats, ants, etc)

2. Manage these populations to low levels to ensure minimal chance of accessing vessels

3. Eradicate new invaders (e.g. mynas, invasive ants).

Tasks are identified below.

Task	Equipment needed
1.Review target IAS With Biosecurity Committee review the key threatening IAS present. Currently the IAS species known to be present at all three ports are *Rattus rattus, R. exulans* and cats while mice and two myna species are present at Betio; however there are few data on ants and weeds generally; Pluchea and several other weeds are present.	
2. Rodent identification and control Identification – Establish rodent trapping to confirm species of rat and mouse present and their distribution throughout inspection area (container terminal, warehouses, fish processing, buildings, wharves, recycle area) Control at Betio and Kiritimati: – subsequently maintain rodent bait stations and/or rodent trapping at c.50 m intervals to achieve sustained control to low levels to minimise their chances of reaching PIPA-bound vessels Control at Kanton: – use rat traps in the buildings of the wharf area to maintain very low rat numbers – don't use poison at Kanton (see explanation in "The Kanton situation" below) Data: – keep records of effort, captures, bait take etc (Appendix 3)	– rat traps (c.40) and coconut bait – bait stations and signage, authorisation – brodifacoum bait – data sheets Table4.2, Appendix 3) – map of trap and bait stations – safety signs, briefings of community re safety, no crab consumption
3. Ant surveillance Identification – Undertake annual ant survey stations as per protocol at the port (container terminal, wharves, warehouses) and identify IAS if present Control: – maintain ongoing surveillance of all incoming and outgoing PIPA/Line cargo to determine if IAS ants are accessing vessels – if IAS present, determine their distribution and feasibility to eradicate infestation and undertake eradications or containment as appropriate Data: – keep records of all annual survey results and surveillance results.	– as for freight vessels
4. Cats – Maintain cat-free area and recruit port staff to assist	Observations, cage traps

5. Birds – Evaluate the current myna population at Betio as below: • what is the distribution of the two species? How far are they already spread out from the port? • approximately how many individuals of each species are there? • where else do they nest? • where do they feed? • where do they roost at night? • other observations that may prove helpful, e.g. list of nest sites, interspecific behaviour etc. • additional information needed prior to attempting eradication includes public access and landowners, e.g. are they happy with eradicating the birds (once they have heard about their damaging impacts) and comfortable with using trapping, poisoning and/or shooting of mynas on their property? Are the target areas inaccessible to the public, i.e. can eradication be achieved on selected properties (such as the container port) without disturbance from people? (refer to more detail in Appendix 4) • also respond to and remove any other potential IAS birds, e.g. bulbuls, before they establish and become more difficult to eradicate.	Observations – preferably by student with help from
6. Invasive plants – Complete plant surveys of all the port compounds Map distribution and abundance of IAS Seek advice from Biosecurity committee on species to control/eradicate	Identification guides

The Kanton situation – moving towards a pest-free atoll

The IAS management at Kanton is likely to change in the near future – currently Kanton is infested with two rat species, cats, invasive plants and potentially other IAS, but it is planned to eradicate the rats and cats from the island in the near future. Currently there is little or no quarantine supervision at Kanton and the port area needs to be managed for IAS to stop them from accessing vessels that visit the wharf (and therefore they could be spread to other PIPA islands). Key IAS to manage to low levels are rats and cats (and invasive ants and plants if present). Rats need to be trapped rather than poisoned to avoid potential complications with the planned eradication work (note that if rats obtained sub-lethal doses during a poison control operation at Kanton they might avoid baits in future, placing future eradication in jeopardy).

It is essential for a quarantine position to be established on Kanton before eradications of IAS occur on this island and before there is an increase in tourism. Ways of doing this could involve sharing the tasks with WCU staff from Kiritimati, e.g. individuals being stationed on Kanton for a period of the year before being replaced.

Once the rats and cats are eradicated from Kanton, the IAS control will switch to surveillance but in reality the actions will stay much the same as the table above until the advice changes – this surveillance will include maintaining traps and probably bait stations for rodent detection, and regular surveys for other IAS including invasive ants and plants. The location of the port near the peninsula tip means that any invasion can (and must) be contained between the port area and the peninsula tip. There is a need for infrastructure investment at Kanton to manage restoration work (refer Section 10).

C

SURVEILLANCE AND RAPID RESPONSES

7 Pest Surveillance and Biota Monitoring at the PIPA

7.1 Why the need for surveillance?

The goal of the PIPA draft management plan is to have the islands free of invasive mammalian pests in the near future (GOK 2010). This will involve eradications of house cat, Pacific rat, Asian rat and black rat as well as enhancing the biosecurity. Given that nearly all of these IAS and some other invasives as well, occur elsewhere in Kiribati and on many vessels that visit the region, there is a need for a coordinated biosecurity effort to stop these IAS before they arrive at and invade the PIPA. The success of excluding IAS will depend on a raft of international agreements (refer Tye 2010), along with effective pre-border biosecurity and internal biosecurity to ensure that these IAS cannot invade the PIPA.

Quarantine effort is vital to preventing IAS getting to the PIPA (see Sections 3-6). However it is also important to regularly check for the most likely invasive IAS that could invade the PIPA and act to eliminate them before they become established. The most likely IAS invasion candidates are thought to be:

- **Rats** – several species, including black rat, Asian rat, Norway rat and Pacific rat occur or have occurred in the PIPA and/or other groups and some may be present on ocean-going vessels
- **House Mouse** – present at Tarawa and possibly elsewhere in Kiribati and on vessels
- **Cats** – present at Kanton, Orona and Manra and elsewhere in Kiribati and neighbours and potentially on vessels
- **Dogs** – present on some boats – potentially getting ashore with illegal landings and wrecks
- **Invasive ants** – many possibilities, including species of *Anoplolepis, Wasmannia* and *Solenopsis*
- **Other invertebrates** – spiders, beetles, mosquitoes, etc
- **Mynas** – two species currently present at Tarawa and 1–2 species in most neighbouring countries
- **Snakes, mongoose, cane toads, frogs** – tree snakes and amphibians have been found in many containers transported around the Pacific, while mongooses have been detected on some additional islands recently including at Samoa and New Caledonia.
- **Pest plants** – many species.

7.2 Which islands to survey, when and by whom?

All islands in the PIPA are vulnerable to illegal landings and shipwrecks therefore all need to be surveyed. Rawaki and McKean do warrant targeted surveillance given that they are pest free and have more to lose if pests invade them, as per the MV Chance shipwreck.

Kanton is currently the most likely PIPA atoll to be invaded by pests because it receives visits from a variety of freight, research, management, tourist and private vessels. Kiribati freight vessels are of particular concern at present because they have been carrying rodents and possibly other IAS. Kanton biosecurity including surveillance and emergency response is an Agriculture responsibility given that the risks are primarily from visiting vessels including Kiribati freight vessels from Tarawa and the Line Islands. There will be increased international responsibilities here in the future when the airfield is redeveloped as an international terminal.

The other islands are clearly PIPA responsibilities and the surveillance should be coordinated from the PIPA office. Observers will comprise trained GOK staff, required by permit to be present on all visiting research, management and tourism vessels in the PIPA. In many cases biologists on the boats can help with the surveillance tasks.

TABLE 7.2 provides a summary of recommended surveillance for each of the eight islands, timetables and who is responsible.

TABLE 7.2 – Pest surveillance in the PIPA: recommended islands, responsibilities, targets and timetables 7.3 Surveillance tasks for Police patrol boat, researchers and managers

Island(s)	Responsibility	Surveillance target and timetables					Comments
		Wrecks	Indicator Birds	Mammal sign	Pest plants	Others/ ants	
Rawaki, McKean	PIPA	<1 yr	<1 yr	<1 yr	5 yr	5 yr	If cannot land, do fly-on count blue noddies (indicator birds.) from boat (Appendix 6).Examine nests of terns for sign of predation. If apparent predation, survey for footprints and live animals (refer Section 8)
Enderbury / Birnie / rats	PIPA	<1 yr	–	–	5 yr	5 yr	Pacific rats currently present
Enderbury / Birnie post-rat	PIPA	<1 yr	<1 yr	<1yr	5 yr	5 yr	As for Rawaki/McKean but difficulty of landing at Birnie
Nikumaroro / Manra / Orona	PIPA	<1 yr	–	5 yr	5 yr	5 yr	Once cats and/or rats are eradicated, mammal surveillance needs to be increased to c.1–2 yr
Kanton	Ag	<1 yr	–	Cont.	Cont.	Cont.	Requires initial survey andongoing surveillance ofrodents, invertebrates, reptiles,birds and pest plants that couldarrive via vessels and aircraft.Coordinated by Ag andsupported by local residents;this pest monitoring should bereviewed as more informationon risks become available andwhen the island is cleared ofkey pests.

Note that <1 year refers to the ideal scenario of at least once a year. This annual checking should be achieved by the patrol boat, but every approved visitor should also undertake surveillance for wrecks at least.

Table 7.3 outlines a step-by-step process for surveillance tasks at each of the PIPA islands when visited by the Police patrol boat, researchers and pest managers. Specific IAS sign to look for in each task is provided in the next section (Section 8).

TABLE 7.3 – Surveillance tasks and incident response procedures for individual PIPA islands

1. Rawaki, McKean – Inaccessible, pest-free islands teeming with birds			
Step	Task	Subsequent response, i.e. next step to go to	Things needed
1	Circumnavigate the island to check for wrecks, rubbish, sign of landing.	If no wrecks etc just go to step 2. If evidence of wreck etc, skip 2 and try to land (steps 3–6)	Binoculars, camera, 2 hand-held radios
2	Bird count/Fly-on: If dangerous to land and/ or there are concerns about your own vessel's quarantine, just do fly-on count in one evening (5.00 pm to 6.45 pm) from anchored boat at safe site out from "the landing". Count the small sensitive birds (blue noddy, shearwaters and storm-petrels) flying to shore and within 100 m of your boat, i.e. a 200 m wide corridor. During this count have separate observer(s) scan the foreshore and high tide mark for any sign of landings and IAS movement, e.g. rodents, cats, rabbits.	If indicator bird fly-on counts are high, nothing further is required except to complete surveillance form. If fly-on counts of blue noddies at Rawaki are low (< 50) and/or shearwaters < 50 at either island, wait for safe landing conditions (step 3).	Binoculars, surveillance form, instructions for counting, species ID forms (Van der Werf and Young 2008)
3	Land for day survey: If you have a landing permit and it is physically safe to land follow biosecurity landing protocols and go ashore to search for IAS and their sign particularly focussing on: tern/noddy colonies – are there any rat-eaten egg-shells or bird remains – what species, how many? If there is a wreck or debris fix its position by GPS. If it is safely accessible, check on board for sign of IAS (detailed approach in Section 7.4), i.e. rodent gnaw marks on food containers and plastic, presence of droppings, ant infestations, etc, and photograph and collect examples of all of these. Immediately contact PIPA office and provide details and await advice from Biosecurity Committee (Tukabu Teroroko ph +686 29762, mobile +686 94571).	If IAS sign is found go to step 4	Landing permission,safe landing gear, hand-held GPS, radios, strong head lamps, batteries,vials, ruler, 25–50 m tape measure, surveillance form, map of island, survey methodology (Section 8). Police boat carries Brodifacoum rodent bait (c.10 kg) and gun and ammunition available for cats) if needed.
4	Night survey: From late afternoon continue search for rodents and other vertebrate IAS on the island throughout the early part of the night, catch rodent specimens by running them down (easy to do during the late afternoon) and estimate numbers seen.	Go to step 5	As for 3

5	In morning update the PIPA office. Meanwhile complete surveys for other IAS, e.g. cats, ants, invasive plants (refer section 8)	Surveillance boat should remain near island (in case more information is needed) until cleared by PIPA office to leave	Satellite phone on boat and communication with shore party possible (radios)
6	PIPA office liaises between PIPA team and PIPA Biosecurity Committee the latter of which advises if additional information is needed at the island and the subsequent course of action.	Rapid responses planning begins	Good communications between surveillance boats (sat phones), PIPA office (phone, email, skype) and Biosecurity Committee (phone, email, skype)

Note that Birnie and Enderbury will be added to this surveillance grouping once rats are removed. Currently the only surveillance warranted at Birnie is circumnavigation to check for wrecks and illegal landings, but see below for Enderbury.

Enderbury = accessible island with Pacific rats but soon to be free of IAS			
1	Circumnavigate the island to check for wrecks.	If wreck sighted complete all steps 2–4; no wrecks go to step 3	Binoculars, camera
2	If there is a new wreck fix its position by GPS. If it is safely accessible, check on board for sign of IAS (detailed approach in Section 7.4), i.e. rodent gnaw marks on food containers and plastic, presence of droppings, ant infestations, etc, and photograph and collect examples of all of these.	Steps 3–4	GPS, map
3	Currently not ideal for counting bird fly-on due to Pacific rats still being present in 2010. If you have a permit to land, follow steps 3–4 above for Rawaki and McKean, i.e. search for other IAS and their sign.	If IAS confirmed, go to step 4	As for Rawaki 3–4
4	Complete surveys for other IAS (ants, cats, weeds) and complete surveillance form. If Wreck and/or IAS detected, immediately alert PIPA office (Tukabu Teroroko) by telephone and provide details. PIPA office responds as per Rawaki/McKean 6 above.	Surveillance boat remains near island in case more information is needed and until it is cleared to leave.	As for Rawaki 5
Orona, Nikumaroro, Manra = accessible islands currently with IAS(refer Table 2.4 for details)			
1	Circumnavigate the island to check for wrecks.	If wreck sighted complete steps 2; no wrecks go to step 3	Binoculars, camera
2	GPS position of new wreck and access it if safe to do so and complete survey of IAS sign and baiting as per Rawaki 3 above	Step 3–4	As for Rawaki 3
3	Record details of IAS detected on the island focussing on vertebrates especially rodents (species if possible), cats.	Step 4	As for Rawaki 3

4	Complete surveillance form and phone details to PIPA office if there is a wreck and/or new IAS, or forward details later if there is no wreck and no new IAS.	Surveillance boat stays until cleared to leave.	As for Rawaki 5
Kanton = inhabited island also currently supporting many pests			
1	Kanton officer maintains surveillance of island for wrecks and other incidents, supported by Police patrol boat when it visits.	If wreck detected go to 2	Set-up needs include office, generator, motor-bike, trailer, battery charger, camera, binoculars, GPS, maps, quarantine sheds, storage facility for bait, tools
2	Kanton officer reports wreck to Tarawa Police/ PIPA office. If wreck is safely accessible carry out inspection for IAS and lay bait as per Rawaki 3 above.	Advice from Biosecurity Committee	As for Rawaki 3
3	Kanton Biosecurity Officer or delegate completes full biosecurity and quarantine inspection of incoming and outgoing vessels (and any future aircraft) for rodents and other mammals, ants, other invertebrates, mynas, reptiles, plants and seeds	Refer Section 8 for IAS containment and eradication	Biosecurity inspection kit; pest-proof shed for inspections and containment (at wharf and airport); up to 200kg of Pestoff bait for emergency responses and local Kanton use, replaced every 2nd year
4	Ant survey at wharf, adjacent storage buildings and in representative parts of the village, followed by regular surveillance of wharf and environs	Refer Section 8	Education material,identification sheets, vials, lures, data sheets, maps, GPS
5	Pest plant survey of Kanton and plan for management of pest plants and ongoing surveillance.	Refer Section 8	Education material, identification sheets, maps, ziplock bags, camera, GPS,
6	Miscellaneous pest surveillance, e.g. mynas, reptiles	Refer Section 8	Education material, maps
7	Adapt Kanton biosecurity as plans for restoration evolve, e.g. if mammalian pests are removed from the island, maintain ongoing surveillance in wharf area and village by local residents.	Refer Section 8	Traps, rodenticide, pest-proof containers and room for processing cargo

Copies of surveillance reports and data sheets will be held at the PIPA office and will be copied to PIPAMC and Biosecurity Committee members.

8 Surveillance Methods for IAS at PIPA

This section describes surveillance methods for detecting IAS on the PIPA islands.

8.1 Rodents

Methods of detecting rats and mice on tropical atolls like the PIPA can be difficult because of the low frequency of surveillance visits and the often prolific birdlife present. Any IAS invaders could easily escape detection until they are well-established in numbers and range across the islands. For example an invasion at Rawaki or McKean Island would result in rats being spread throughout the islands and causing severe population impacts on birds within a few months. For these reasons the emphasis must be on preventing invasion at the source (Section 5) and on vessels (Section 6), but also early detection on the islands (Section 7 and this section).

Key methods for detecting rats on rat-free islands in the PIPA are:

Seabird egg predation

- Focus on colonies of small seabirds that are common and breeding throughout the year (e.g. terns, noddies)
- Search through colony for abandoned or failed eggs – rat-eaten eggs have many jagged edges (Figure 8.1), larger rats (e.g. Norway rat) can prey on larger eggs while smaller eggs are often smashed into small pieces. On islands lacking rats and other predators, the failed/abandoned eggs are generally intact or broken open without characteristic rat-gnawed edges
- Don't check large eggs of frigatebirds and boobies as these birds can defend their eggs against rats.

A B C D

FIGURE 8.1 Examples of predation on tern eggs by different predators:

- A: *Rattus exulans* – note entirely jagged edge of shell
- B: bristle-thighed curlew (incomplete, note combinations of jagged and torn entrance)

- C, D: *Coenobita* crabs (note combinations of jagged and torn shell on both eggs).

Seeing rats and mice

- Rats and mice become quite active after about 4 pm – search for them and catch specimens to confirm identity (it is much easier to run them down during the day than at night)
- If no sign is found during the day continue searching at night using a strong headlamp or spotlight.

Footprints

- Check for footprints in damp sand or mud. Make a point of walking the perimeter of the muddy lagoons of Rawaki, McKean, Enderbury, etc where footprints of IAS if present, are conspicuous.

Coconuts

- Look for rat gnaw marks on coconuts and other fruits
- Coconut flesh could be used as natural lures in the same crab-deficient area – look for gnaw marks.

Other remains

- Check bones of dead seabirds and fish for gnaw marks.

Traps, sticky boards, racking tunnels and chew sticks

- If you are fortunate enough to find an area with few crabs and birds, consider setting out tracking tunnels and coconut-baited rat traps in those areas, e.g. Victor rat traps with strong spring (to prevent large rats escaping) although some rats need several days of trapping to overcome their neophobia. Set the traps reasonably finely so that small rats (e.g. Rattus exulans) and mice will set them off. Artificial chew sticks can be useful in areas where there are few crabs and examined the next day(s) for tooth marks of rodents. Don't rely on these areas however, because if they are devoid of birds etc then rats will not be so active there.

8.2 Cats and dogs

Key methods for detecting cats and dogs ashore on the PIPA islands are:

- Search for bodies of adult seabirds (especially terns, noddies, shearwaters) – cats often eat the head or tear open body of seabird for internal organs. There can be many dead birds in a very small area
- Look for footprints in sand – most islands have extensive sandy beaches on the lee of the island
- Look for droppings at the same time as searching for footprints etc – on a rodent-free island, droppings of cats and dogs will have remains of feathers, sometimes with bones in the middle of the droppings.
- Day and night searches – at night look for the characteristic bright eye-shine of cats and dogs in spotlight – particularly useful on open islands like Enderbury, Rawaki, McKean and Birnie.
- Lures – stake out a clean sandy area with fish tied to pole (unable to be accessed by crabs).

8.3 Ants

If a shipwreck or illegal landing of a party and supplies has occurred follow protocols for sampling ants (Appendix) which in summary comprises:

- Lures – sugar and protein-based lures set out in a series of 10 pairs of containers in likely invasion site, e.g. camp site, immediately above landing site (and GPS these areas)
- Operate traps for c.30 minutes or until lures are starting to dry out and collect and preserve ants in formalin or alcohol
- Label specimen jars with location, date, observer, sample type and number.

FIGURE 8.3 Yellow Crazy Ant worker. Photo courtesy Paul Zborowsky

FIGURE 8.2 *Left*: cat and kitten footprints in sand at Orona; *Right*:Sooty tern with skull chewed by cat (generally deep canine incisions can be seen on closer inspection); sometimes it is possible to see rat gnawing on bones of dead birds.

8.4 Mynas and other animals

Use your ears and eyes to detect mynas or other perching birds – check, buildings, holes in banks and tree holes for possible nests, and check large trees for night-time roosts. Respond to any unusual sightings, e.g. investigate sightings of toads/frogs, all mammals, colourful reptiles, etc, and collect as much information on identity (photograph, specimen ideal) and location as possible.

8.5 Pest plants

Several pest plants are already present at the PIPA, including lantana and *Pluchea* which are present on Kanton and both have been recorded on other islands. Key needs of the PIPA MC are to:

- With local community complete a survey of Kanton to determine the extent of lantana, *Pluchea* and any other IAS plants. The Port-Village area looks to be the weed hotspot, but this is unconfirmed. Once the survey information is known, seek advice from Biosecurity Committee on priorities for further work.
- Meanwhile provide Pest plant identification manuals for visitors to PIPA islands highlighting key likely IAS plants that could invade.

- All visitors to PIPA islands are to GPS any sites of IAS plants that they find and take action on invasions as identified in Section 9.

FIGURE 8.5 – orange-flowering lantana lining the main street of Kanton

8.6 Surveillance kits

Surveillance kits should be based at each of the following offices:

- PIPA office Tarawa (and available for PIPA staff and research trips)
- Police Tarawa (and available for the Police patrols)
- Agriculture Tarawa and/or Kiritimati (and available for Ag staff visits to the PIPA).

A generic surveillance kit for all visitors to the PIPA islands is identified on the next page. This kit should be checked at the end of each visit to the PIPA and gear cleaned and/or oiled as necessary. It should be checked again two months in advance of a trip to enable replacements to be purchased as necessary, while some items (ant lures) need replacing close to departure date.

Item	Number	Use
Maps of each of the 8 islands	2	Marking sites of IAS issues in relation to landmarks
Biosecurity Guidelines	1	General and specific guidance
Pest Identification manuals	1	For ID of plants, ants
Kiribati Bird ID manual	1	For ID of birds
GPS unit	1	Marking sites of issues and pests, e.g. weed removed
Binoculars	2	Surveillance, bird fly-ons
Digital camera	1	Photographing wrecks, pest plants, mammal sign, etc
Tape measure 25–50 m	1	Marking bait grid if needed
Compass (sighting)	1	Marking bait grid if needed
Day bag	1	Carrying gear
Dry bag	1	Keep gear dry
Ruler	1	Measure rodent etc footprints, animal and tail lengths
Ziplock bags	50	Specimen bags
Ant bait stations (jars)	20	Bait stations for ants – can improvise on these
Plastic vials	20	Specimen jars (ants)
Preservative	1	Ethanol or formalin
Ant lures	x	Peanut butter, soya oil, sugar
Felt pens	3	Marking bags and vials
Data sheets	10	Surveillance, pest and bird data
Note books	2	Incidental notes
Pens/pencils	10	For data sheets notebooks
2 way radios	3	Island to vessel communication
Satellite phone	1	Phoning from vessel to Tarawa
Strong headlamps/ battery set	2	Night surveillance if needed
Pestoff 20 P bait	10 kg	IAS emergency
Flagging tape (pink and blue)	1 roll ea	Marking IAS sites e.g. pest plants, also grid lines
Rat traps and a coconut	10	Emergency response
Rodent bait stations	5	Contingency for other vessels encountered
Chew sticks and sticky boards	20	Contingency for islands
Ripcord and Permethrin	1 ea	Vessel; spray gear and equipment before island landings
First Aid kit	1	Comprehensive
Plastic surgical gloves	10 p	Handling bait, traps and potentially rodents
Bait scoops	5	Bait hand-spreading
Firearms and ammunition	x	Police patrol boat only
Camping gear	2 people	In case personnel need to stay ashore overnight

9 Rapid Responses

This section describes rapid responses following reconnaissance work identified in the previous surveillance section (8). The key message is to react appropriately to whatever situation arises and gather as much information about the incursion or invasion as possible and convey findings by phone to the Biosecurity Committee via the PIPA office immediately. The Biosecurity Committee will consider on available information whether it is possible for the team to complete an eradication of the threat immediately, i.e. while they are still on the island.

9.1 Key steps

Key steps are:

1. Carry out surveillance for specific pests as in Section 8
2. If an IAS is suspected focus search effort on that species or sign
3. If an IAS is confirmed telephone details to PIPA office while the team is still on the island
4. PIPA office liaises with Biosecurity Committee who convey immediate advice for any follow-up work that may be needed and the island team responds to that advice (some examples follow in 9.1 and 9.2)
5. If the team do not have the resources and/or time to undertake an eradication, PIPA and ECD will collaborate in developing an eradication plan using past and current eradication plans for PIPA, Kiritimati and generic work as guides (e.g. Brown 2010) and seeking advice from Biosecurity Committee as needed.
6. Meanwhile transfer all relevant observations from notebooks to a data sheet including for nil returns (Appendix 10). If invasives are present all relevant information should be compiled in a report at the trip's end.

Some hypothetical (but unfortunately still quite likely) invasion scenarios are provided in Appendix 12.

9.2 Invasive ants – prevention is better than a cure!

There are many species of native ants on the PIPA islands, but we need to ensure that no invasive species arrive. Invasive ants are proving to be almost impossible to eradicate from islands or mainland sites where they invade. For example, despite millions of dollars of control operations the yellow crazy ant is still a problem at Christmas Island, Australia. The key message here is that the effort put into keeping ants off vessels going to the PIPA is currently the only feasible approach. So the effort going in at Kanton, Betio and Kiritimati to determine if invasive ants are present is important, just as it is in the vicinity of vessels departing from other ports like Apia, Lautoka and Suva. If invasive ants are present at any of these ports as they are at Apia, it is important that captains work with port authorities at containing/limiting the extent of the infestations and remove them from loading areas, e.g. constantly control them at Apia wharf and marina. Meanwhile, biosecurity officers need to quarantine vessels that have ant infestations until satisfied that the infestations do not pose a risk and/or they have been eradicated from the vessel.

If invasive ants are detected in the PIPA, the first step is to determine the extent of the invasion. Key steps at PIPA are:

- Kanton – survey the port and village area (results are still pending from wharf survey December 2009, once these are known proceed with next steps, more widespread survey at Kanton)
- Orona – bull-headed ants were found at Orona in Nov-Dec 2009 (identification not yet confirmed). Once this is confirmed planning should be made for the next steps, beginning with more extensive survey to define the extent of the infestation.

We are not at a stage where responding to ants is needed, but if this happens then advice on current protocols should be sought via the Biosecurity Committee.

9.3 Other animals and plants

Other animals are also very difficult to eradicate and effective quarantine is the best approach.

Mynas and other birds

A single myna might not be a problem by itself, but the risk is that if another arrives during its lifetime then there is a 50% chance of a fertile pair forming and a population starting. Therefore, if a single myna arrives at e.g. Kanton it should be studied and if possible fed with food scraps to encourage tameness. Meanwhile the Biosecurity Committee would be informed to discuss and agree on the best eradication method.

If multiple mynas arrive, then they should also be studied (refer Appendix 5) and further advice sought from the Biosecurity Committee on how to proceed with eradications. The same advice applies to other invading birds, e.g. bulbuls.

Cane toads, other mammals, amphibians, non-native reptiles

These should all be killed immediately they are found and specimens preserved in preservative for formal identification by MELAD staff. If no preservative is available, photograph, then dispose remains at sea.

Pest plants

- Remove *Pluchea* from Enderbury and from any other uninhabited islands that it is found on. Dig them out taking care to remove all the roots from the ground, and leave with roots exposed to the air (anchoring in place with coral)
- If plants are seeding, it may be necessary to collect the whole plant in plastic bags for later incineration. If only a few seeds are on the plant it may be possible to break off the seeding parts and carefully bag these (in sealable plastic bag) for incineration, leaving the dead plants as above. Always take care that there are no seeds left at the site.
- GPS and photograph sites from which invasives such as Pluchea are found
- To assist people in re-locating the incursion spot, mark with flagging tape and a coral mound.
- Record and report on all details.
- Report should alert the need for subsequent parties to return to this incursion site as frequently as possible in order to remove any further seedlings. If in doubt of seedling identity, remove it.

D

SUPPLEMENTARY INFORMATION

10 Equipment and Training for the Future

Equipment

The short-term equipment needs have been itemised in the tasks described for Tarawa, Kiritimati, and fishing and other vessels in Sections 4–7. Most of these set-up items needed at Kiritimati and Tarawa are currently available to Kiribati staff or have been recently ordered, while equipment needs for research and recreational vessels are the responsibility of those expeditions.

Equipment that is still needed includes many set-up items and ongoing costs, including rodent bait and pesticides that require replacement every 1–2 years needs (including consumables). Key needs and costs include a biosecurity officer being based at Kanton with associated infrastructural costs, quarantine sheds at arrival points (Kanton wharf and later the Kanton airport) and pre-border departure points (Tarawa and Kiritimati) and ongoing equipment and consumables. These are summarised in Table 10.1.

TABLE 10.1 – Estimated costs for improved PIPA biosecurity

Item	Where used/ stored	Estimated set-up cost AU$	Ongoing Cost/ annum
Biosecurity officer and infrastructure – building, incinerator, office, motorbike, trailer, generator, satellite phone, etc	Kanton/Ag	$100,000	Salary + $10,000
Quarantine sheds	Betio, Kanton (2), Kiritimati (2)	$60,000	$1000
Patrol boat and infrastructure based at Kanton	PIPA	Already budgeted for future PIPA work	
Bait stations	Vessels, ports/Ag	$5000	$100
Rodent bait	Vessels, ports/Ag	–	$2000
Rodent traps	Vessels, ports/Ag	$500	$100
Fumigants	Vessels, ports/Ag	$2000	$1000
Ripcord, etc	Vessels, ports/Ag	$1000	$500
Tracking tunnels, sticky boards	Vessels, posts/Ag	$500	$100
Ant kits	Vessels, ports/Ag	$1000	$200

Item	Where used/ stored	Estimated set-up cost AU$	Ongoing Cost/ annum
Safety gear	Vessels/ports/Ag	$2000	$1000
GPS hand-held	Kanton (1), Police vessel (1), spare (1)	$1000	–
Binoculars + camera	Kanton (1), Police vessel (1) spare (1)	$1000	$100
Head lamps, battery chargers, rechargeable batteries	Kanton (2), Police vessel (2), spare (2)	$1000	$200
Pink and blue flagging tape, 25–50 m tape measure, marking pens, pens, notebooks, compass	Ports, vessels/Ag	$300	$100
Over-night camping gear for islands	Police vessel, later Kanton when vessel based there	$1000	$100
First-aid kits	Kanton, ports, vessels	$500	$100

Some potential sources of materials are identified in Appendix 7.

Training and collaboration

The GOK already has a healthy relationship with outside agencies in the training of its staff in many fields involving SPC, SPREP, USP and international agencies and consultants. This relationship clearly needs to continue. The relationship should also focus increasingly on specific goals such as the restoration and biosecurity goals for the PIPA and Line Islands. Specific capacity building and advocacy needs for sustaining a pest-free PIPA are summarised in the table below.

Objectives:

1. Raise the level of awareness and training among staff of relevant agencies etc (Port Authority,Police, sea-captains, Fisheries staff, port services, airport staff) – include IAS identification, IAS impacts, and the need to immediately report sightings of IAS in threatening situations (in container terminal, in containers, in wharf area, on boats, near ports, etc)

2. Raise the level of awareness of the public generally about IAS, including how people should react to specific events

3. Safety issues for staff and community re IAS work – toxins, crabs eat bait, shorebirds can eat bait

Tasks	Equipment/training needed
Staff awareness/training at Tarawa and Kiritimati – education kits on IAS – specific training for identifying IAS, especially rodents, mynas, ants – training in control methods, safety	– international kits and other interpretive material from e.g. PII(invasives toolkit), SPREP, SPC – targeted training from SPREP, SPC, PII et al for Fisheries and other staff on IAS identification,surveillance and control
Community awareness at Tarawa/Betio, Kanton, Kiritimati – school material relevant for different age groups spanning conservation values, pest impacts and management, safety – radio items – newspaper/bulletin articles	– existing international material;translations needed – existing local material e.g. CXI posters and booklets – new locally targeted material relevant to Kiribati (PIPA and Line Islands) e.g. biosecurity poster (see Appendix 8 – translations and refinements can be made for targeted audiences)

The future integrity of the PIPA depends on effective biosecurity being maintained at all times. To achieve this requires ongoing collaboration between the GOK and outside specialists. Currently the combined focus is on improving measures at obvious weak points such as on freighters, fishing boats and seaports, but as this is corrected, increased effort should be placed into other weak points, notably international ports and vessels, and potentially Kanton airport. An obvious issue for the Pacific community and conservation agencies is the increased use of the Pacific by seafarers generally many of whom still have little or no understanding of biosecurity and ship hygiene.

Some biosecurity references

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GOK 2010. Draft PIPA Management Plan. Government of Kiribati.

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Pierce R.J. et al 2008: Operational work undertaken to eradicate mammalian pests in the Phoenix Islands, Kiribati, May-June 2008. *Eco Oceania Ltd* report for Government of Kiribati and NZAID.

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Stop Rats! Fish and Wildlife Service brochure. www.stoprats.org

Thorsen, M.; Pierce, R.; Broome, K. 2008. Operational Plan for the Eradication of Three Exotic Mammal Species from Three Islands in the Phoenix Group, Kiribati. Unpublished report to PII.

Tye A (compiler) 2009. Guidelines for invasive species management in the Pacific. SPC, SPREP.

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Appendix 1

Seabirds of the PIPA

Estimated seabird breeding populations at the PIPA islands in 2006–09

Note: all figures represent estimated total pairs

Kiribati name	English name	Estimated total pairs	Islands[1]
Te ruru	Phoenix petrel	<100	R K
–	Bulwer's petrel	<50	R
Te tangiuoua	Wedge-tailed shearwater	500+	R E
Te tinebu	Christmas Is shearwater	500+	R
Te nna	Audubon's shearwater	1000+	R E Mc
Te bwebwe ni marawa	White-throated storm-petrel	100+	R
Te take	Red-tailed tropicbird	1000+	All
Te gnutu	White-tailed tropicbird	<10	N
Te mouakena	Masked booby	2000+	All
Te kibwi	Brown booby	250+	All
Te koota	Red-footed booby	2000+	All
Te eitei are e bubura	Great frigatebird	1000+	R E Mc
Te eitei are e aki rangi ni bubura	Lesser frigatebird	20000+	Most
Te tarangongo	Grey-backed tern	5000+	R E K Mc
Te keeu	Sooty tern	1,000,000	R E Mc O
Te io	Brown noddy	10000+	Most
Te mangikiri	Black noddy	10000+	Most
Te raurau	Blue-grey noddy	2500+	R
Te matawa	White tern	1000+	All

Note 1: R = Rawaki, E = Enderbury, K = Kanton, Mc = McKean, O = Orona

Appendix 2

Datasheets for IAS inspections on vessels at Betio and Kiritimati and fishing vessels.

Clean IAS inspection data sheet

Invasive Alien Species (IAS) Inspections Freighters						
Vessel name:		**Registration:**			**Captain:**	
Vessel itinerary (all ports):						
Port of inspection: Kiritimati		**Officer:**			**Date:**	
Captain's observations and comments on IAS:						
Officer inspection: potential IAS recorded and where (which site)						
Potential IAS	**Rodent**	**Ant**	**Cockroach**	**Plant material**	**Other**	**Other**
Bait stations						
Galley						
Galley store room						
Hold 1(food containers)						
Hold 2 (food containers)						
Hold 3 (furniture, vehicle parts)						
Hold 4 (cement)						
Life boats/covers						
Lockers for life jackets etc						
Other:						
Comments on IAS found and actions taken:						

Example IAS inspection data sheet

Invasive Alien Species (IAS) Vessel Inspections		
Vessel name: Kiribati A	**Registration**: Tarawa	**Captain**: J Kirk
Vessel itinerary (all ports): Betio, Kanton, Kiritimati, scheduled for Fanning		
Port of inspection: Kiritimati	**Officer**: A Inspector	**Date**: 3/3/10
Captain's observations and comments on IAS: Ag had trapped for rodents on board at Betio prior to departure (one black rat caught); anchored off Kiritimati and supplies landed by dinghy. No bait take from rat bait stations in voyage from Betio and no rats etc reported by crew or passengers; Ants observed and collected 12/3/10 in freight addressed to ABC – freight sprayed with Ripcord daily for 3 days – no ant sightings since, but needs inspection. Cockroaches present in holds.		

Officer inspection: potential IAS recorded and where (which site)						
Potential IAS	**Rodent**	**Ant**	**Cockroach**	**Plant material**	**Other**	**Other**
Bait stations	N	N	Y	N		
Galley	N	N	N	N		
Galley store room	N	N	Y	N		
Hold 1(food containers)	Y old sign	Y	Y	Y		
Hold 2 (food containers)	N	Y	Y	N		
Hold 3 (furniture, vehicle parts)	N	N	Y	Y		
Hold 4 (cement)	N	N	N	N		
Life boats/covers	N	N	N	N		
Lockers for life jackets etc	N	Y	Y	N		
Equipment being loaded A	etc					
Equipment being loaded B						
Equipment being loaded C						
Equipment being loaded D						

Comments on IAS and actions taken: *Rodents* – two large (c.10 mm long) droppings found in food container – old. No sign of live rodents. Bait untouched by rodents and smells and looks OK for ongoing voyage. 5 traps set on board for duration at Kiritimati to be checked daily by captain. *Ants* – infestations of ants in two hold containing foodstuffs – attracted to sweet foods, dark coloured small antsc.3–4 mm in length, collected for ID. Main infestation area sprayed in situ 20/3/10 and to be re-inspected 21/3and sprayed again if necessary. *Cockroaches* – widespread and common on the vessel. No current capacity to deal with this issue at Kiritimati;interim fumigation needed on return to Betio. *Plants* – seeds found in one food container and in furniture. Collected for Ag identification then incineration.
Vessel anchored off Kiritimati 3 nights, unloaded from KPA wharf.

Appendix 3

Clean data sheet for recording rodent trapping and baiting information.

Rodent trapping and/or baiting on vessels									
Vessel name:				Registration:				Captain:	
Vessel itinerary (all ports):									
Port trapping/baiting started: Betio				Established by:				Date:	
Operated by:									
Traps and bait stations:									
Trap	1	2	3	4	5	Bait Stn 1	Bait Stn 2	Bait Stn 3	comment
Date									
Comments:									
Note: RR = *Rattus rattus*, RU = *Rattus* unknown species; N = no change (trap set, bait OK); N= trap set, baitgone; Sp= sprung, bait gone, Sp+ = sprung bait OK.									

Example data sheet for recording rodent trapping and baiting information.

Rodent trapping and/or baiting on vessels									
Vessel name: Kiribati A			Registration: Tarawa				Captain: J Kirk		
Vessel itinerary (all ports): Betio, Kanton, Kiritimati									
Port trapping/baiting started: Betio			Established by: A Inspector				Date: 3/3/10		
Operated by: A Inspector 3-4/3/10 and crewman ABC 3-18/3/10									
Traps: 5 Victor rat traps baited with coconut checked daily Bait stations: 3 Aegis bait stations each loaded originally with 25 baits checked daily and baits topped up to 25 again									
Trap	1	2	3	4	5	Bait Stn 1	Bait Stn 2	Bait Stn 3	comment
Date									
3/3/10	RR	Sp	N	N	N	25	14	18	
4/3/10	N	Sp+	RR	N	N	19	16	11	
5/3/10	N	N	RR	N	N	17	7	0	Depart Betio
6/3/10	N	N	N	RU	N	19	17	0	Unknown rat species
7/3/10	N	N	N	N	N	11	19	11	
8/3/10	N	N	N	N	N	25	25	17	
9/3/10	N	N	N	N	Sp+	25	25	19	
10/3/10	N	N	N	N	N	25	25	25	
11/3/10	N	N	N	N	N	25	25	25	At Kanton
12/3/10	N	N	N	N	N	25	25	25	
13/3/10	N	N	N	N	N	25	25	25	Nibbles bait: insect?
14/3/10	N	N	N	N	N	25	25	24	No rat droppings
15/3/10	N	N	N	N	N	25	25	25	
16/3/10	N	N	N	N	Sp+	25	25	25	
17/3/10	N	N	N	N	N	25	25	25	
18/3/10	N	N	N	N	N	25	25	25	
Comments: Sprung traps possibly caused by rats early on. Sprung traps on 9 and 16 March had no sign ofrodent teeth – possibly sprung by cockroaches. All except one rat had long tail and long ears; one smaller unidentified rat had small ears, tail slightly shorterthan rest of rat.									

Note: RR = Rattus rattus, RU = Rattus unknown species; N = no change (trap set, bait OK); N= trap set, baitgone; Sp= sprung, bait gone, Sp+ = sprung bait OK.

Appendix 4

Ant surveillance on vessels, at ports and at the PIPA

Adapted from material presented at Kiritimati workshop (Brown and Pierce 2008) and applied in the PIPA and at Kiritimati.

Background

Invasive ants can impact on other insects, birds and plants etc. We need to determine whether any invasive species of ant are present on vessels and at source areas (mainly Betio and Kiritimati and all visiting vessels) at the PIPA. If they are present then they need to be eliminated (vessels) and either eliminated or contained at the source areas.

Objectives

Determine what ant species are present on vessels and at source areas at Betio and Kiritimati, and if IAS are present then eliminate (from vessels) or contain and if possible eliminate them (land).

Equipment and Methods

- Ashore at PIPA focus on landing sites, camps, storage areas, etc, GPS the site; at source areas (Betio, Kiritimati) focus on wharves, adjacent sheds and storage areas; on vessels focus on areas with foodstuffs (galley, storage, holds)
- For each site (shore, vessel) set up at least 5 paired ant bait stations (small jars) on the ground – at Betio and Kiritimati many more stations will be needed to cover potential threatening sites.
- Each pair of stations has a protein lure (one jar) and a sugar lure (other jar)
- Protein is a mix of peanut butter and soya bean oil
- Sugar is a plug of cotton wool soaked in 20% sugar solution (1 part sugar, 4 parts water)
- Operate for a few hours, preferably in shade, possibly as little as half an hour if it is hot or crabs attack the lure
- If there are any obvious ant colonies, collect ants from these too
- Preserve in ethanol/alcohol – put all the sugar samples in one container and all the peanut butter samples in a separate container; no live ants transported
- Label with location, date, GPS coordinates and your name and address as below
- Have them analysed by Agriculture (e.g. Aata Binoka or other staff) or NZ specialists.
- Respond accordingly, e.g. eradication from vessel, tighter biosecurity if a departure point. If in doubt eliminate the infestation.

Equipment needed to do ant sampling and identification per site

- Peanut butter and soya oil; sugar and cotton wool
- 20+ vials to be used as stations
- 2+ vials to store specimens in
- Identification sheet for preliminary identification
- Syringe/tweezers for handling specimens
- Ethanol or formalin for preserving specimens
- Felt tip pen for writing on specimen vials
- Pens and data sheets as above
- GPS.

Example of datasheet for recording ant data in field

Location: e.g. Vessel name	**GPS cords if island**: E, S	**Date**:	**Observers**:
Cargo (vessel) or **Habitat** (give plant and terrain details of island, e.g. wood and coral debris at landing)			
Stations: 10 pairs comprising: A: protein lure – peanut butter and soya oil B: sugar solution – 20% sugar and water on cotton wool			
Samples sent to:			
Results received: details, e.g. see next table			
Action required, e.g. containment, eradication, and by whom			

The table below provides preliminary data on ant species found on seven PIPA islands in May–June 2006 (Pierce et al 2006).

Species	Rawaki	Birnie	Enderbury	Kanton	McKean	Orona	Nikumaroro
Carnud	P						P
Mondes	P		P	P	P		P
Monflo			P		P		P
Parlon			P		P	P	P
Parvag						P	P
Phemeg						P	P
Tapmel			P				
Tetsim		P			P		

Species key: Carnud = *Cardiocondyla nuda*, Mondes = *Monomorium destructor*, Monflo = *Monomorium floricole*, Parlon = *Paratrechina longicornis*; Parvag = *Paratrechina vaga*; Phemeg = *Pheidole megacephala*, Tapmel = *Tapinoma melanocephalum*; Tetsim = *Tetramorium simillimum*.

Appendix 5

Mynas at Betio, Tarawa – Phase One Study Needs Prior to their Eradication

Background

Mynas are native to Asia, but in the Pacific and elsewhere they are environmental and agricultural pests with impacts on hole-nesting vertebrate species and fruit species (Pierce 2006). Mynas of two species (Common Myna *Acridotheres tristis* and Jungle myna *A fuscus*) have arrived at Betio in recent times. The actual arrival dates are unclear but there seem to have been sightings back to the early 2000 period (Teaeriki 2003) and then again in 2007 (A Tye pers comm.).

On 25 July 2009 a small number of individuals of both species were present at Betio c.1 km from the Port complex (R. Pierce, A. Tye pers obs). During a short period of observation key aspects were: there were at least 3-4 individuals of each species present vacated nests were seen in an open shed in the container port the caretaker at the Container terminal mentioned seeing mynas (sp) in the compound including nesting in the same building and roosting on a tall light of the compound both species appeared to have 1-2 active nests under the eaves of a building in a small fenced compound beside Kiribati Institute of Technology, site also subsequently observed by Tukabu Teroroko same day and Aata Binoka on a later date both species were feeding on the grass within the compound and in trees in neighbouring properties a single common myna was seen in a coconut tree c.100 m to the SW of the site a single common myna flew the c.1 km to the Betio Container Compound. no mynas were seen in a wider search of streets in the immediate area of Betio (this was very limited) mynas were reported to have been seen around the copra factory on the opposite side of the old port from the container terminal (Tukabu)

Key research questions

These birds need to be eradicated before they invade the entire island and subsequently spread to other islands in the Gilbert. Their presence in the port poses a risk of spread to other island groups in Kiribati, as the birds readily travel on ships.

- Before eradication can be considered however key information needs are:
- What is the distribution of the two species?
- How far are they already spread out from the port?
- Approximately how many individuals of each species are there? Where else do they nest?
- Where do they feed? Where do they roost at night?
- Other observations that may prove helpful, e.g. list of nest sites, interspecific behaviour etc.

Additional information needed prior to attempting eradication includes:

- Landowners – are they happy with eradicating the birds (once they have heard about their damaging impacts)
- Landowners - would they be comfortable with using trapping, poisoning and/or shooting of mynas on their property? It may be possible to kill most of the birds using poisoned bait, and any survivors trapped or shot at the end.
- Are the target areas inaccessible to the public, i.e. can eradication be done on selected properties (such as the container port) without disturbance from people?

A study approach

To address the above questions there is a need for a MELAD staff person to coordinate this work. Ideally, a suitably qualified student (max 2) could observe the birds and collect the above necessary information about mynas and their distribution, nesting, feeding and roosting sites.

The person(s) would need to have skills in the observation of birds which would include careful observation without disturbing the birds, be prepared to observe the birds at all times of the day, including the evening when they go to roost for the night, and complete data sheets. They would need to have a good rapport with landowners in the Betio area in order to determine distribution etc.

Information sheets (pics etc) and data sheets can be provided as necessary.

Appendix 6

Fly-ons - indexing abundance of sensitive birds on islands

You will need binoculars and notebook and pencil View from the boat anchored opposite landing site on lee of island Two observers on deck, first observer looking out one side and second covering other side, both out to c.100 m from boat (i.e. max distance of safe species ID) If only one observer cover both 100 m corridors, i.e. 200 m width Count during the last 90 minutes of light 1700-1845 h Count the sensitive birds only (bold in table below) flying on to the islands in evening Subtract those (few) individuals returning to sea – in the note book, mark each sighting as e.g. 1, 5, 1, -1 etc, and add total at end (see below). Record all other species coming in, but no need to count them. Transfer totals and other count details to a data sheet that evening If counts are low at Rawaki, repeat another night to test inter-night variability.

Example of Fly-on page from notebook

Site: Rawaki SE side	Observer ABX	Date/time: 29-5-08; 1700-1845 h	
Kiribati name	Species	Running score	Total
Te ruru	Ph Petrel	1 1 1 -1 2	4
Bulwer's petrel	Bu Petrel		0
Te tangiuoua	Wedge-t SW	5 4 1 5 3	18
Te tinebu	CX SW	1 3 3	7
Te nna	Audubon's SW	3 4 5 1 1 1	15
Te bwebwe ni marawa	WTStorm-petrel	1 1 1	3
Te raurau	Blue noddy	1 1 1 1 1 3 4 5 2	19
Te taake	RT Tropicbird		P
Te mouakena	Masked BO		P
Te kibwi	Brown BO		P
Te koota	Red-footed FBO		0
Te eitei are e bubura	Great FR		0
Te eitei are e aki rangi ni bubura	Lesser FR		P
Te tarangongo	Grey-backed TE		P
Te keeu	Sooty TE		P
Te io	Brown NO		P
Te mangikiri	Black NO		0
Te matawa	White TE		P
Notes: Light SE wind, clear. P = present			

Appendix 7

Sources and approximate costs of some materials

Item	Some potential sources	Approximate unit costs $AU
	Note: PII are preparing additional information in their Island toolkit	
Binoculars	Many	<$100
Brodifacoum/Pestoff	Animal Control Products – ideally waxed blocks for bait stations, pellets for handspread	check
Camera	Many	$50
Chew sticks and sticky boards	Pest Management Services NZ	cheap
Compass (sighting)	Outdoor shops	$20
Dry bag	Marine shops	$50
GPS	www.myshopping.com.au	$400
Headlamps	Many options in Australia for e.g. LED Lenser	<100
Methyl bromide and Fipronil	Hazardous chemical suppliers	–
Myna traps and toxins	Australian Nest Box Co (for nest traps); Tidemann traps (for cage traps) see their websites; Starlicide poison Pest Management Services, NZ	$50-200
Preservative	Ethanol or formalin available from most pharmacies	$10
Permithrin	Most hardware stores	$5
Quarantine sheds	Various sources NZ, AU	c.$10,000 ea
Radios – hand-held	Electronic outlets NZ, Australia	$150
Rat bait stations – Aegis	Crop Protection Services, Honolulu	$12
Rat bait stations – Protecta	Bell Laboratories reps internationally, Pest Management Services NZ	$9-12
Tracking cards and tunnels	Black Trakka from Pest Management Services, NZ	$30 for 20
Victor traps	E.g. Pest Management Services NZ	$5-7

Appendix 8 PIPA Biosecurity Poster

ENHANCING BIOSECURITY AT THE PHOENIX ISLANDS PROTECTED AREA (PIPA), KIRIBATI

Ray Pierce[1*] & Tukabu Teroroko[2]

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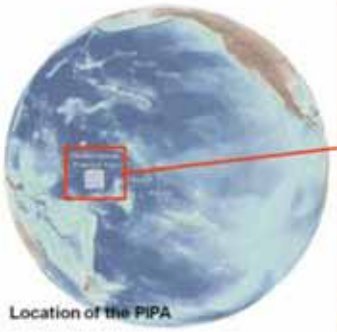
2. Government of Kiribati, Director of PIPA Office, MELAD, Tarawa, Kiribati

1. Biodiversity values of the PIPA

The PIPA is the largest marine protected area in the world. Its eight atolls provide fairly secure breeding grounds for 19 seabirds, including Phoenix petrel (EN) and White-throated storm-petrel (VU). Many of PIPA's populations of boobies, frigatebirds and terns are also globally important. Seabird presence is inextricably linked with the marine resources of the PIPA. The islands also provide important habitat for migrant birds (e.g. bristle-thighed curlew), lizards and invertebrates.

PIPA is important for seabird breeding

A shipwreck bought Asian rats to McKean



Location of the PIPA

Islands of the PIPA

2. Invasive species threat to the PIPA

Seabirds and other biota have been depleted by the impacts of invasive species, particularly rats (3 spp.), cats, pigs and European rabbits. The only rat-free atoll (Rawaki) has supported rabbits for >100 years. Rabbits have had serious impacts on vegetation and competed with petrels, shearwaters, storm-petrels, noddies and terns for little remaining nesting cover. Large rats have recently arrived on at least two islands: *Rattus tanezumi* on McKean (via shipwreck) and *Rattus rattus* on Kanton (unknown means).

Table 1 – Pest mammal status in the PIPA

Island	Pest status 2009	Comments
Rawaki	Nil	Rabbits eradicated 2008
Birnie	Pacific rat	Operational planning underway
McKean	Nil	Asian rats eradicated 2008
Enderbury	Pacific rat	Operational planning underway
Orona	Cat, Pacific rat	
Nikumaroro	Pacific rat	
Manra	?	Cats, rats and pigs reported
Kanton	Cat, Pacific rat, *Rattus rattus*	Inhabited island

3. Vision for restoring the PIPA

Removing invasives is a key need for PIPA atoll restoration. In 2008, a first step was implemented: rabbits were removed from Rawaki and *Rattus tanezumi* from McKean island. Positive responses can now be seen through increased vegetation diversity and extent, and increases in seabird productivity.

Planning is currently underway to restore other atolls, initially Enderbury and Birnie islands. As well as local benefits, recovering seabird populations potentially provide colonists for other islands in the central Pacific. Increasing biosecurity measures at and beyond PIPA is critical to ongoing success.

5. Current approaches to enhance biosecurity

Recent steps to improve PIPA biosecurity include:

- Imminent approval of Kiribati Biosecurity Act
- Development of PIPA biosecurity guidelines
- Rodent baiting on Kiribati domestic freighters
- GoK observers/radios on legal fishing vessels
- Plans to prohibit all but essential island landings
- All legal visitors monitored for permit compliance

Freighter ashore at Kiribati

Rat-eaten eggs

6. Surveillance and response

GoK observers will patrol key islands for pest (re)invasion. Protocols are being developed for monitoring sensitive indicator species (e.g. blue noddy) and searching for invasive sign (e.g. direct observation, gnaw marks on eggs and bird bones). Invasion response protocols include forming a response team to:

- Confirm identity of invasive species
- Implement site- and pest-specific response procedures for invasives
- Ensure bait is available and appropriately stored and transported
- Time response to minimize impacts on curlews and other non-targets.

Table 2. Example of a risk assessment profile and actions needed for PIPA biosecurity

High Risk Pathway	Source	Main risks	Prevention measures and other actions needed	Who responsible
Illegal landings from people on cargo boats that pass through the PIPA, and their potential shipwrecks	Tarawa, Kiritimati, and other northern Line Islands Cargo vessels are MVs Matangar Moorri Mataburo Betinea Moamoa	rat spp. mice cats birds ants dogs lizards	Government observer to be present on these boats to ensure non-landing compliance	PIPA/GoK
			Provide bait stations, rodenticide and rat traps for permanent use by all captains	Agriculture
			Inspect boats pre departure and on arrival at each of Betio (Tarawa), Kanton and Kiritimati and provide certification or quarantine as appropriate	Agriculture
			Reinstate Quarantine/Biosecurity Committee to coordinate above measures and implement new regulations. Improve boat hygiene for accidental pests and monitor permitted/prohibited goods, plus risk analysis under new Biosecurity Act. Improve cargo regulations (prohibited/ permitted product lists), cover packing materials and standards for fresh produce (fruit/veg), etc. Regulations for male cats (& dogs) and restricted to inhabited islands of Lines & Phoenix.	GoK/PIPA
			Port surveillance and control - currently focused on agricultural pests. Needs improving and broadening to cover rats, ants, cats etc. Get details of what currently done and plan improvements.	Agriculture
			Need inter-island regulations to be included under planned Biosecurity/Quarantine Act.	Agriculture GoK
			Decide who is responsible for drawing up regulations.	PIPA
			"No landing" signage	PIPA
			Remove Enderbury coconut trees	PIPA

Appendix 9

Biosecurity Risk Assessment and Actions Needed

The Table below provides more detail on invasive species and their pathways and sources that threaten the PIPA, together with preventative measures that need to be implemented and by whom. The level of risk (extreme, high, moderate etc) refers to the perceived likelihood of an invasion occurring. No differentiation is made between impacts of different invasive species as they are all impacting and full implications are still unknown for some, e.g. different ant species.

9.1 Pest risks and prevention measures for pre-border and at-border sites

Very High Risk				
Pathway	Source	Main pests	Prevention measures and other actions needed	Responsibility
Illegal landings from people on Kiribati cargo boats that pass through the PIPA, and potential ship-wrecks of the same vessels	Tarawa, Kiritimati, and other northern Line Is Cargo vessels are MV Matangare, Moomi, Mataburo, Betiraoi, Moamoa	Rats (several spp), mice, cats, dog, birds, ants, lizards	Government observer to be present on these boats to ensure non-landing compliance Provide bait stations, rodenticide and rat traps for permanent use by all captains Inspect boats pre departure and on arrival at each of Betio (Tarawa), Kanton and Kiritimati and provide certification or quarantine as appropriate Reinstate Quarantine/Biosecurity Committee to coordinate above measures and implement new regulations. Improve boat hygiene for accidental pests and monitor permitted/ prohibited goods plus risk analysis under new Biosecurity Act. Improve cargo regulations (prohibited/ permitted product lists), cover packing materials and standards for fresh produce (fruit/veg), etc. Regulations for male cats and dogs and restricted to inhabited islands of Lines and Phoenix. Port surveillance and control - currently focused on agricultural pests. Needs reviewing, improving and broadening to cover rats, ants, cats etc. Need inter-island regulations to be included under planned Biosecurity/ Quarantine Act. Decide who is responsible for drawing up regulations. No landing signage Remove Enderbury coconut trees	PIPA/MELAD Agriculture Agriculture MELAD/PIPA Agriculture Agriculture MELAD PIPA PIPA PIPA
Legal fish boats (illegal landings, wrecks)	US mainland PL, LL, PS	Rats, mice, cats, ants, birds, reptiles (snakes)	International agreements for boat hygiene - none exists? Inspection at home ports by home country quarantine services? Inspection by Kiribati/observers – moving towards 100% coverage. Kiribati regulations - need developing to cover pests on board, powers of inspectors etc. Education & awareness in fisheries. Probably needs doing in home countries.	International agencies International agencies Fisheries &PIPA Cttee. Fisheries Act. MELAD (&PIPA Cttee). SPC? Issues ofhow to get at fishing community
	Korea PS LL			
	Taiwan PS, LL			
	Japan PS, LL, PL			
	EU (Spain) PS			
	Ecuador (Spain boats)			
	NZ			
	China PS			
	Am Samoa offloading catch			
	Betio offloading			
	Kiritimati offloading			
	Pacific island transit ports (many)	Snakes? Unknown	Identify ports used. Then above measures apply.	Fisheries

Illegal fish boats (illegal landings, wrecks)	IUU and others	Rats, mice, cats, ants	Observers on legal boats report these. Patrol boat and aircraft (Aust/NZ Orion). Get additional boat based in Kanton.	Fisheries GOKMaritime Command PIPA, CEPF.
Passenger/ cargo & other planes (e.g. medical, surveillance) to Kanton	Australia, Hawaii, Kiritimati, Nadi, Tahiti	Rats, mice, snakes, lizards, mosquitoes, ants and other insects, frogs, toads, weeds	Form Tech Committee for Risk analysis. Include specific pests, permitted/ prohibited product lists, packing standards, standards for fresh produce (fruit/ veg) etc, domestic animals, on-board treatments (residual insecticides etc). Draft pre-border agreements (different for each source country?) and seek pre-border agreements. Draw up regulations for airlines under planned Biosecurity Act. Implement regulations. Design improved quarantine procedures (including Surveillance at airports for selected range of pests) and incorporate into regulations under planned Quarantine Act. Establish/improve quarantine (procedures including surveillance, facilities, officers) at Kanton & Kiritimati airports (and other airports in Kiribati).	Agriculture, SPC, SPREP,PIPA Cttee;ECD; outsideinput to riskanalysis Agriculture (Quarantine), SPC, SPREP, PIPA Cttee; ECD. Agriculture; input fromECD, PIPACttee, SPREP, SPC. Ag - Quarantine Input neededfrom PIPACttee, ECD,SPREP, SPC. Ag (Quarantine)
Moderate Risk				
PIPA Patrol boat	Tarawa, Kiritimati, Penrhyn	Rats, mice, ants	Maintain rodent bait station, inspect boat on departure (Tarawa, Kiritimati) and arrival (Kanton)	Agriculture
Yachts (legal & illegal landings, wrecks) - < 50 applications per year.	Tahiti, Marquesas, Cooks	rats, mice, birds, dogs, cats, lizards, ants, weeds	Permit conditions need reviewing and possibly improving. Improve inspection (procedures and training) in entry ports. Implement inspections in ports of entry (Kiritimati, Tarawa, Kanton, Fanning)	PIPA, ECD, SPREP. Ag (Quarantine). Ag (Quarantine).
	Hawaii			
	Kiritimati			
Live-aboard tour boats (legal landings, wrecks)	Cooks	rats, mice, ants, geckos, insects, weeds	Update permit guidelines Implement guidelines on permit. Inspections - observers on boats.	EcoOceania, SPREP, SPC. Currently relyon Captains. PIPA, Fisheries
	Fiji			
Research & management boats (Naia, etc) (legal landings, wrecks)	Hawaii	Rodents, ants, snakes, lizards, mosquitoes, other insects, frogs, weeds	Provide permit guidelines	PIPA
	Samoa Rarotonga	rats, mice, ants, birds, weeds, surveillance needed	Update permit guidelines Implement guidelines on permit. Inspections – observers on boats.	Technical input requiredas above Currently relyon Captains. PIPA, Fisheries.

Appendix 10

Clean data sheet for island surveillance and rapid response

Island:	**Vessel:**	
Date:	**Observers:**	
Time of day and total time ashore:		
Area covered:		
IAS searches	**Methods**	**Results**
Rodents		
Ants		
Plants		
Others		
Comments:		
Recommendations:		

Example of data sheet for island surveillance and emergency response

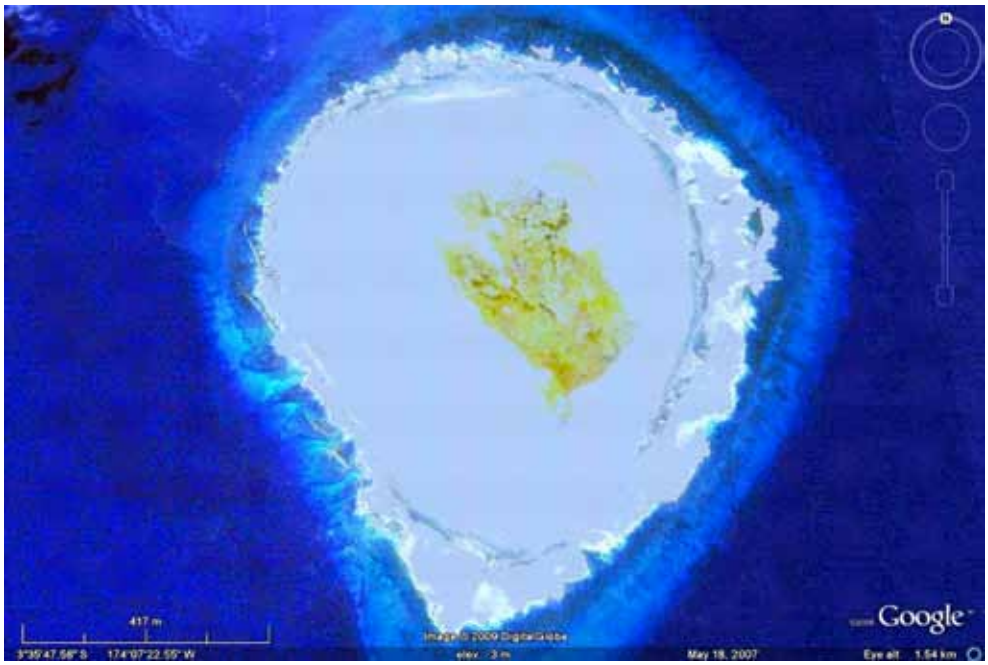
Island: Rawaki	**Vessel**: Police patrol	
Date: 13/6/10	**Observers**: John Mohe, N Anterea, et al	
Time of day and total time ashore: 0815-1215 (4 h)		
Area covered: island perimeter and edge of lagoon and 5 random transects between		
IAS searches	**Methods**	**Results**
Rodents	c.500 sooty tern and grey-backed eggs checked, checked for mammal footprints in lagoon mud	No mammal sign; severaltorn eggs shells looked likecrab predation –photographed
Ants	-–	-–
Plants	Searched for lantana and Pluchea	Nil
Others	General observations	No sign of mammals, nosign of freshly killed birds
Comments: No sign of human landings Did bird fly-on previous night – plenty of noddies and petrels – see separate data sheet		
Recommendations: Email pictures of egg predation to Biosecurity Cttee for comment. Next year, plan to do ant survey at landing as well as rodent and island-wide invasive plantsurveys		

Appendix 11

Maps of individual PIPA atolls

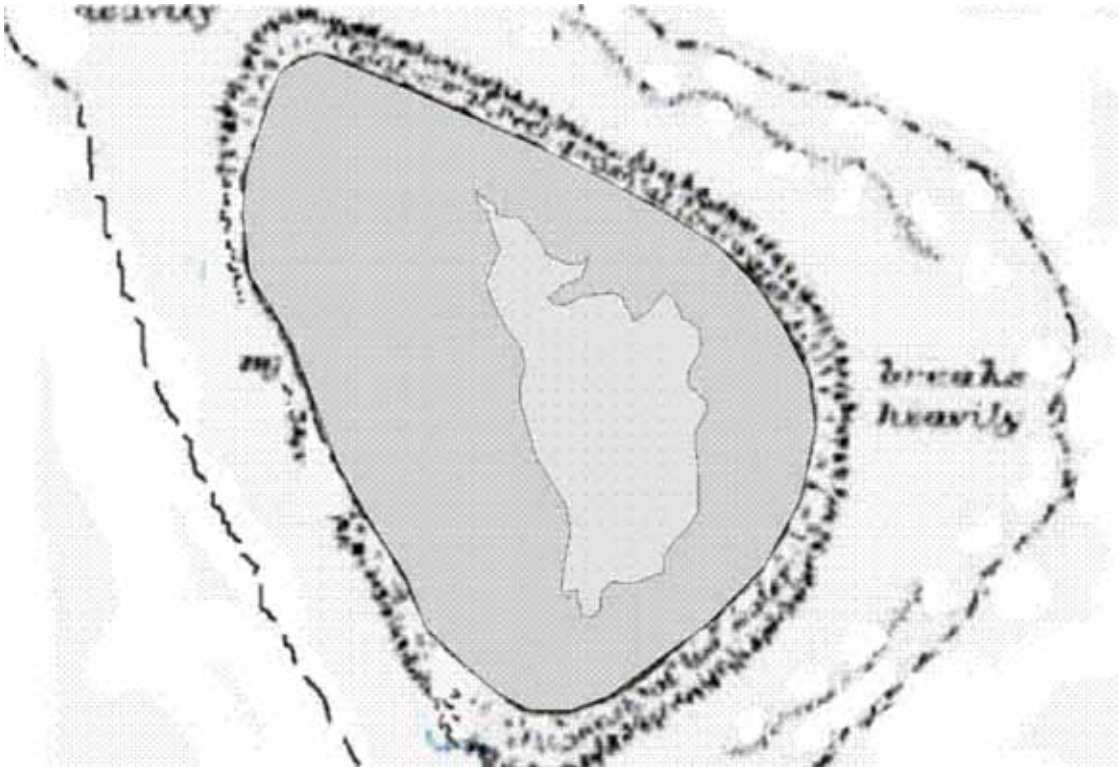
Maps courtesy Google Earth, Vince Kerr, Spatial Conservation.

Kanton



McKean

Enderbury



Rawaki


Sydney Island
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2009 Europa Technologies
Image © 2009 DigitalGlobe
Image NASA
1284 m
4°27'14.86" S 171°14'33.19" W
elev 0 m
Oct 9, 2006
Eye alt 4.59 km
Google

Manra


Hull Island
Arariki
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2009 Europa Technologies
Image © 2009 DigitalGlobe
2667 m
4°30'53.58" S 172°10'47.08" W
elev 0 m
Dec 25, 2006
Eye alt 9.23 km
Google

Orona

Nikumaroro

Birnie

Appendix 12

Hypothetical examples of responding to invasion of rats and cats

1. Rodents

In June 2010, the Police patrol boat captained by John Mote was carrying out surveillance work in the PIPA. Nautonga Anterea (Ag) was on board to carry out surveillance training of the crew before returning to Kiritimati. Late in the day of 15 June the team was circumnavigating Rawaki (c.50 ha) to check for sign of landing when the crew spotted rubbish on the beach of the rugged eastern shore of the island. The rubbish had not been present on the previous pest management expedition in December 2009, and John's team suspected that a vessel may have grounded here recently.

Because it was too late in the day for anyone to land, John anchored the patrol boat off the western landing and notified Tukabu at PIPA office by satellite phone of the details. John and Tukabu agreed to follow standard protocols and complete a fly-on count of sensitive birds that evening, and if safe, land on the island the next day to investigate the rubbish and also to check for IAS sign. Meanwhile, Tukabu emailed the Biosecurity committee members requesting them to be on stand-by for advice.

The evening fly-on count produced about 70 blue noddies and several storm-petrels, shearwaters and petrels flying on to the island, indicating that if pests had invaded they had not yet decimated the bird populations. No sign of people or pests were seen during these observations. Meanwhile a landing kit of surveillance gear was double-checked to ensure that all of the ant and rodent surveillance gear was present.

The next day revealed that landing was feasible and a team of four people went ashore and carried out the following tasks:

- The rubbish comprised heavy boxes and other containers and the site was fixed by GPS and these details were recorded in a note book
- An intensive search was made of the rubbish for IAS sign with the team searching for live insects, seeds and rodent droppings, gnawing, etc on food items, plastic. Worryingly, some rodent sign was found in the form of rat droppings which were collected in a vial and labelled.
- The next step was to follow protocols identified in section 8 and search the bird colonies and walk the edge of the muddy lagoon for sign of rats. The timing was ideal as there were 3 large colonies of sooty terns and 5 colonies of grey-backed terns.
- All tern colonies were thoroughly checked for broken eggs. Seven of the colonies showed no evidence of rat damage, but the sooty tern colony nearest the rubbish had many eggs that looked like rat-predation (jagged edges to shells, contents cleaned out). Many of these were photographed.
- In addition clear footprints of a large rat were found at the edge of the lagoon adjacent to this tern colony; the footprints were measured (pad length and width).
- This information was radioed to John on the patrol boat who then phoned Tukabu with details who subsequently phoned Ray. Ray's mobile-phoned pest advisers Keith Broome and Derek Brown to discuss possibilities of the team using the 10 kg of Pestoff on the boat to spread through the area with rat sign and adjacent areas of lagoon edge and cover (beach debris and Sesuvium).

In the end the advice given to Tukabu and John was for the team to use all the10 kg bait on a 25 m grid through the entire area of rat-predation and lagoon edge sign, plus the surrounding undergrowth at about 2 kg/ha, and to return from Kanton in a week's time with more bait.

- Nautonga and team completed this bait-spread work later in the day, by walking in a parallel line each about 25 m from the next person and stopping every 25 m to spread 0.25 kg of bait as evenly as possible – four small (50 g) scoops at each of N, S, E. W and one at the spot.
- Meanwhile 10 pairs of ant bait stations were established in and around the rubbish and closest vegetation above the high tide mark and collected 0.5 hours later (because crabs were attacking the lure). Unidentified ants were found in most of the stations and these were collected in vials containing formalin and the label was completed – Rawaki rubbish site 15/6/10. All details were recorded on an ant data sheet. Initial examination with a hand-lens by Nautonga suggested they were not an IAS but he would send the samples back to his Tarawa colleagues for confirmation.
- The team left the island that afternoon and completed writing a report on their findings and actions.
- The plan was to return in about one week's time with extra bait that had been stored at Kanton and repeat the exercise of initially checking for rat sign, then baiting. If no rat sign was found all the bait would be spread in the area where rat sign had originally been seen, plus further afield along the lagoon edge.
- Depending on further advice from the Biosecurity team, the next scheduled visitors to the island (a team of marine scientists due to arrive in 3 months) would repeat the exercise.

But what if?

If the rat sign had been more widespread and rats clearly well-established on Rawaki, John and Nautonga's team would have been advised not to lay poison simply because they did not have enough bait to adequately cover the island. Instead an island-wide approach would need to be taken involving more detailed planning. The plan would need to consider:

- How much bait – c.10 kg/ha in crab areas, x two spreads, 50 ha = <1000 kg.
- Timing – middle of year months are ideal to avoid peak curlew (non-target), etc, presence
- Availability of bait – generally manufactured early in calendar year
- Availability of transport – ideally work in with a scheduled visit to PIPA, bait can be readily sent to Apia or Suva etc.
- If no scheduled trip, then consider a repeat trip for the patrol boat
- ...and many other factors (see Brown 2010 in prep for guidance).
- While present on Rawaki the team should map approximately the areas of high and low hermit crab density as this would have some bearing on bait requirements.

Dealing with rats reinvading at Kanton:

Another potential scenario for rodent reinvasion is at Kanton. Once rats are removed from Kanton any rodent sightings will need to be responded to swiftly. The most likely pathway for reinvasion there is via vessels mooring at Kanton wharf itself where biosecurity will be tightened (Section 5). In addition to intensive vessel and cargo surveillance, precautionary bait stations should be permanently serviced at Kanton wharf at c.50 m intervals throughout the area of buildings and

into the surrounding scrub and shoreline for c.200 m. The bait stations should be crab-proof to enable the baits to remain useful for long periods (see Figure 9.1), i.e. base of hole should be c.20 cm off the ground. The stations should be monitored weekly and data recorded as per vessel data sheets. If bait disappears, check for rat or crab sign in the form of droppings. Ideally have a back-up method for detecting and/or intercepting rodents, i.e. tracking tunnels, chew sticks, trapping. This is an untested approach but the stakes are high and it is likely that rats could be intercepted by this approach. The important thing is to keep good surveillance and data collection so that we learn from the methodology and adopt it more widely or revise it as appropriate. Human safety is a major issue here and this will need to be worked through with health officials and the local community – signage, briefings re toxins given the potential for crab consumption of bait.

FIGURE 12.1 – rats can leap into these plastic stations but crabs struggle to get access.

And what about mice?

Mice can be very difficult to eradicate, so like other IAS, it's vital to stop them from arriving at the PIPA in the first place. If a mouse invasion is detected, the emergency response is similar to that for rats, i.e. spend effort to define the area infested (which could for instance just be the port area at Kanton or an entire island if a ship was wrecked at a smaller island) and develop plans for their eradication. Although a mouse plan would be similar to the hand-spread approach for rats, it would still be complex and require careful planning with external help.

2. Cats

Cat incursions or invasions can often be dealt with very quickly. What if John and Nautonga found that the Rawaki incident had the following scenario?

On searching the rubbish site Nautonga found large droppings that looked suspiciously cat-like and the team suspected that one or more cats might have invaded the island. They searched the island systematically, walking in a parallel line c.25 m apart. Soon they began to see many terns and shearwaters missing their heads and the body cavity torn open, characteristic signs of cat predation. Two of the crew returned to the boat to fetch the Patrol boat's shotgun and ammunition and the best shooter took charge. On their second circuit of Rawaki a cat was flushed from an area of shearwater burrows near the lagoon's edge and ran c.100 m to an area of dense vegetation along the lagoon edge. Once the shooter was confident of the safety of his companions, he advanced to where the cat was hiding beneath some kaura (Sida) and shot it. The dead animal was disposed of at sea to ensure no further chance of disease establishing. Further circuits were made of the island to ensure that no other cats were present and two staff remained on the island at night and completed three spotlight circuits of the island looking for cats-eyes in the torchlight. If no gun was available, Nautonga might have recalled the WCU's ability to run down cats on some motu at Kiritimati.

CEPF Small Grant Final Project Completion Report

Biosecurity Guidelines for the Phoenix Islands, Kiribati

Organization Legal Name

Eco Oceania Pty Ltd

Project Title

Biosecurity Guidelines for the Phoenix Islands, Kiribati

Date of Report

June 2010

Report Author and Contact Information

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CEPF Region

Polynesia-Micronesia Hotspot

Strategic Direction

1. Prevent, control, and eradicate invasive species in key biodiversity areas

Grant Amount

$16,000

Project Dates

June 2009–June 2010

Implementation Partners for this Project

Please explain the level of involvement for each partner

- Government of Kiribati – significant input from PIPA director and MELAD staff (Agriculture, Environment), Police and Fisheries staff at Tarawa over two x one week periods in 2009 and 2010,
- significant input by WCU (Wildlife/Environment) and Agriculture staff at Kiritimati over a 2 week period in July 2009
- significant input at Phoenix Islands by one WCU and one Agriculture rep over a two week period in December 2009
- SPREP – contribution of documents, planning at Tarawa in one week during July 2009 and ongoing reviews (A Tye)
- SPC – planning at Tarawa in one week in July 2009 (N Waqa) and ongoing reviewing
- PEL – comments on draft plan (G Wragg pers. comm.)
- NZDOC – discussion with Island Eradication Advisory Group in February 2010 and ongoing reviews (Keith Broome et al)
- PII – initial guidance and ongoing comments including report format and ongoing review (S Boudjelas)
- NZ Biosecurity – provision of information and pending review (C Reed pers. comm.)

Conservation Impacts

Please explain/describe how your project has contributed to the implementation of the CEPF ecosystem profile

The project has provided guidelines for implementing effective biosecurity for the Phoenix Islands. These guidelines will be gradually implemented by Kiribati staff assisted by other projects (NZAID advice, PIPA restoration, SPREP advice) and revised as more effective measures and resources become available to Kiribati.

There have been some urgent biosecurity measures that have been put in place already via this project, particularly the de-ratting of Kiribati cargo vessels that pass through the PIPA. Whilst immediate actions were not the first need of the project, it did become apparent during the project that there were some very serious risks occurring that needed rectifying immediately.

Please summarize the overall results/impact of your project against the expected results detailed in the approved proposal

It is too soon to gauge impact. However, the desire by Kiribati to implement the urgent rat eradications on vessels and to implement other significant biosecurity actions (fishing vessels, management at source ports, etc) is encouraging. The key to ensure effective biosecurity is maintained at the PIPA is to provide ongoing technical advice (and quickly) to ensure that the tasks are kept as simple and effective as possible. This advice would span subjects such as pesticides, traps, surveillance methods, education, etc.

Please provide the following information where relevant

- *Hectares Protected*: The Phoenix Islands Protected Area includes 8 islands, totaling 3000 ha of land
- *Species Conserved*: 19 species of seabird breed in the PIPA.
- *Corridors created:* Links with Kiritimati (Line is) and Tarawa (Gilbert Group).

Describe the success or challenges of the project toward achieving its short-term and long-term impact objectives

Successful aspects include the willingness of Kiribati staff and managers to achieve good outcomes for the PIPA. This is also a feature of the agencies in support of the project. Challenges include the obstacles presented by the geographic isolation of the PIPA and also the location of key staff at long distances from the PIPA and with often poor communications.

Were there any unexpected impacts (positive or negative)?

None

Lessons Learned

Describe any lessons learned during the design and implementation of the project, as well as any related to organizational development and capacity building. Consider lessons that would inform projects designed or implemented by your organization or others, as well as lessons that might be considered by the global conservation community.

Project Design Process: (aspects of the project design that contributed to its success/ shortcomings)

The key lesson learned here was that it requires several meetings and workshops to obtain all the key data for risk assessments. Not all relevant data were obtained during the largest meetings which appeared to inhibit some information from being divulged. Smaller groups and individual contact was important. A second lesson was to allow more time in order to complete a project of this nature.

Project Implementation: (aspects of the project execution that contributed to its success/ shortcomings)

The design problem noted above was successfully countered by having multiple visits to Kiribati (in conjunction with other projects) which enabled better working relationships and for all key staff to contribute effectively, often on more than one occasion and this will need to be continued to some degree in implementing the recommendations on the ground. However, there was still a problem with timeframe for technical input from others.

Other lessons learned relevant to conservation community:

Some generic pest management methods may not always work in each situation for physical, biological or cultural reasons.

Additional Funding

Provide details of any additional donors who supported this project and any funding secured for the project as a result of the CEPF grant or success of the project.

Donor	Type of funding*	Amount	Notes
CEPF	CEPF-PIPA Pests	NA	The November-December 2009 visit to PIPA enable effective biosecurity workshopping with two GOK staff and the Kanton community
CEPF	CEPF-PIPA pests	AU$3378	Covers some travel and accommodation expenses to Tarawa March 2010 for biosecurity and PIPA pest planning; plus bait station costs
NZAID	B	NZ$15000	This is an advisory project starting July 2010 and will provide direct and indirect support to the PIPA

**Additional funding should be reported using the following categories:*

A Project co-financing (Other donors contribute to the direct costs of this CEPF project)

B Grantee and Partner leveraging (Other donors contribute to your organization or a partner organization as a direct result of successes with this CEPF project.)

C Regional/Portfolio leveraging (Other donors make large investments in a region because of CEPF investment or successes related to this project.)

Sustainability/Replicability

Summarize the success or challenge in achieving planned sustainability or replicability of project components or results.

Clearly the test for this project is whether biosecurity can be sustained into the future. The most urgent biosecurity needs (de-ratting, surveillance on vessels) are also simple tasks that we can be confident will be sustained into the future by Kiribati staff (Agriculture and Fisheries). The captains of the vessels also want to maintain their vessels as "clean" vessels; it just needs the process to be simple and the cost negligible. Meanwhile the observers on the fisheries vessels are being paid by the industry which, if the industry is sustainable, will provide for viable surveillance of legal and illegal vessels into the medium and long term. The requirement for government staff to be on all vessels visiting the PIPA is sustainable because the user pays.

A potential problem for all biosecurity projects in the Pacific is that of the illegal operator who in this case might land or become wrecked at a PIPA island as happened at McKean in c.2002. Fortunately the PIPA are a long distance from other ports and problem vessels, but this also works against the efficacy of surveillance. There is a need for all agencies to continue to address this issue in different ways, particularly via remote surveillance, education and assisting at problematic source ports.

Summarize any unplanned sustainability or replicability achieved.

By the nature of this work there was significant generic coverage, however, the work-shopping of these issues together was arguably necessary for better staff "ownership" of them.

Safeguard Policy Assessment

Provide a summary of the implementation of any required action toward the environmental and social safeguard policies within the project.

Biosecurity tasks do include some actions that have a bearing on environmental and community safety (e.g. use of toxins) and these have been clearly raised in the document. For example, where toxins might be considered for use in areas with waders, crabs and people, safety requirements need to be of paramount concern.

Performance Tracking Report Addendum

CEPF Global Targets (June 2009 – June 2010)

Provide a numerical amount and brief description of the results achieved by your grant. Please respond to only those questions that are relevant to your project.

PROJECT RESULTS	Provide your numerical response for results achieved during the annual period.	Provide your numerical response for project from inception of CEPF support to date.	Describe the principal results achieved from 1 July 2009–30 June 2010. (Attach annexes if necessary)
1. *Did your project strengthen management of a protected area guided by a sustainable management plan? Please indicate number of hectares improved.*	N/A	N/A	Involves strengthening biosecurity of the Phoenix Islands Protected Area of which there are 8 islands (total area over 3000 ha) and of which two have now had pests removed by a NZAID project.
2. *How many hectares of new and/or expanded protected areas did your project help establish through a legal declaration or community agreement?*	N/A	N/A	
3. *Did your project strengthen biodiversity conservation and/or natural resources management inside a key biodiversity area identified in the CEPF ecosystem profile? If so, please indicate how many hectares.*	N/A	N/A	Involves strengthening biosecurity of the Phoenix Islands Protected Area of which there are 8 islands (total area over 3000 ha) and of which two have now had pests removed by a NZAID project.
4. *Did your project effectively introduce or strengthen biodiversity conservation in management practices outside protected areas? If so, please indicate how many hectares.*	N/A	N/A	
5. *If your project promotes the sustainable use of natural resources, how many local communities accrued tangible socioeconomic benefits?*	N/A	N/A	

Additional Comments/Recommendations

This project will be supported into the future particularly via a NZAID-funded project (and potentially also by CEPF-funded work at the PIPA) by working alongside and advising Kiribati staff on conservation management at Kiritimati, Tarawa and possibly at Kanton. It is recommended that the Guidelines be revised and/or adapted as needed during that process.

Information Sharing and CEPF Policy

CEPF is committed to transparent operations and to helping civil society groups share experiences, lessons learned, and results. Final project completion reports are made available on our website, www.cepf.net, and publicized in our newsletter and other communications.

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CONSERVATION INTERNATIONAL

Pacific Islands

BIODIVERSITY CONSERVATION LESSONS LEARNED TECHNICAL SERIES

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