

# TECHNICAL SUPPORT AND CAPACITY BUILDING FOR THE WILDLIFE CONSERVATION UNIT AND QUARANTINE AT KIRITIMATI, KIRIBATI, MAY-JUNE 2009



Ray Pierce<sup>1</sup> and Derek Brown<sup>2</sup>

With significant support from Ratita Bebe and staff of the Wildlife Conservation Unit, Kiritimati

1. Eco Oceania Pty Ltd, 165 Stoney Creek Road Speewah, Queensland, 4881, Australia
2. 102 Cullensville Rd, RD1, Picton 7281, New Zealand

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## EXECUIVE SUMMARY

Field support was provided to Government of Kiribati (GoK) staff at Kiritimati (Christmas Island) from 25 May to 9 June 2009 as part of a NZAID project focusing on biodiversity recovery and capacity building. Objectives focused on helping the Wildlife Conservation Unit (WCU) and Quarantine/Agriculture with their strategic work programmes, including Kiritimati and Phoenix Islands biosecurity, small motu biosecurity, rat eradication on small motu, black rat monitoring and general assistance with management planning.

A key outcome was assisting the WCU to plan and implement eradication of Pacific rats and cats on many motu in the central lagoons area. This effort resulted in 23 motu totaling more than 40 ha in area being targeted for rat eradication. If these eradications have succeeded, it will more than double the previous area of “safe” islets for nesting

seabirds and will greatly enhance the status of many sensitive and threatened seabirds on the island including petrels, storm-petrels, shearwaters, terns and noddies. After our departure WCU targeted rats on some additional motu.

Other outcomes included addressing the serious problem of rats and other pests being present on inter-island freighters, and the Quarantine Division of Agriculture has subsequently begun implementing rodent control on these ships. Biosecurity on the motu was also addressed and the tactical approach of WCU supported. General approaches to work plans were developed with WCU as well as a specific plan for monitoring *Rattus rattus* on the Kiritimati mainland.

Discussions were held with GoK staff and the Secretary of Ministry of Line and Phoenix Islands Development (MLPID) at Kiritimati about general and specific needs that would assist Agriculture and WCU in the effectiveness of their work and recommendations for the future are identified in this report. Related discussions were continued with MELAD staff and secretaries at Tarawa in July 2009 and are updated in this report.

## 1.0 INTRODUCTION

The current NZAID work at Kiritimati builds on previous work funded by Critical Ecosystem Partnership Fund (CEPF via CI), NZAID, Pacific Invasives initiative (PII) and Secretariat for the Pacific Regional Environment Programme (SPREP), aimed at biodiversity recovery in the Phoenix and Line Islands. These two island groups support globally important breeding colonies of many seabird species, including the Phoenix petrel (EN), white-throated storm-petrel (VU), and important populations of tropicbirds, frigatebirds, boobies, noddies and terns, as well as the Bokikokiko or Line Island's Warbler (VU) (Pierce et al 2006, 2007). In 2008 NZAID funded pest eradication training with Government of Kiribati (GoK) staff on Kiritimati (Brown and Pierce 2008) followed by pest eradications on two of the Phoenix Islands (Rawaki and McKean). Pest eradication on a third island (Birnie) was not attempted at this time and the unused bait was shipped on to Kiritimati (Pierce et al 2008).

The objectives of the work in May-June 2009 were to support the GoK in its biodiversity recovery work on Kiritimati and secondly to help build technical capacity among staff. The latter would have flow-on benefits for biota recovery not only at Kiritimati, but also the Phoenix Islands and elsewhere in the Line Islands. Key tasks were as follows:

1. Technical support for rat eradications on selected motu (islets) of the Kiritimati lagoon system using the unused bait from the Phoenix Islands;
2. Develop and implement a *Rattus rattus* monitoring plan;
3. Provide support to biosecurity approaches of motu of high biodiversity value;
4. Provide support to biosecurity approaches for Kiritimati and the Line-Phoenix Groups generally;
5. Provide other technical support to WCU and Agriculture as needed, e.g. scoping of general management and monitoring plans and data analysis.

## 2.0 TIMETABLE

Timetabled activities were as follows:

Jan-May 09	Ongoing liaison an support to GoK, scoping work for the current trip
25-26 May	Fly to Hawaii where overnight with Eric VanderWerf and Lindsay Young
We 27 May	Fly to Kiritimati where met by Ratita Bebe of WCU, taken to accommodation
Th 28 May	Confirm timetable, staff rosters, inspect rat bait, meet MLPID secretary
Fr 29 May	Big Drum Island gridding and first baiting with Aobure and Katareti; check neighbouring motu for kimoa sign. Met with Ratita in evening.
Sa 30 May	Met Health doctor to discuss WCU's rat-baiting programme. Nimroona Lag survey, grid and first baiting with Katareti and Ngauea. Evening - official dinner of Hon Tawita Temoku and further discussions with MLPID Secretary.
Su 31 May	Met Fisheries Officers in Fisheries Tanguoua Closed Area, then surveyed and baited four motu in the Tonga-Fred Channel with Ratita and Aobure.
Mo 1 June	Surveyed and baited SE Nimarooka and E and N Drum with Katareti, Mamarau and temporary wardens.
Tu 2 June	Surveyed and/or baited motu in Ngaon te Taake, Turai Motu and East Manulu Lagoon with Ngauea and temporary wardens
We 3 June	Office day - discussed key management sites and priority species, scoped content of a WCU management plan with Ratita and Aobure. Discussed biosecurity issues and potential solutions with Mamarau and Nautonga
Th 4 June	Derek, Katareti and WCU rebaited Drum and Nimroona motu; Ray accompanied Mamarau to observe Quarantine process for purse-seiners
Fr 5 June	Surveyed and baited many motu in Isles Lagoon with Aobure and temps.
Sa 6 June	Surveyed and baited other motu in Isles, Koil Lagoons with Katareti and temps
Su 7 June	Surveyed and baited motu in Tibo and Ambo Channels and rebaited Tonga-Fred Channel motu with Katareti and Ratita
Mo 8 June	Am meet with WCU, Pm survey Motu Tabu and Cook with Bio and Katareti
Tu 9 June	Am sort remaining bait into WCU and Ag barrels; planned port visit with Ag (unsuccessful); pm discussions with WCU; evening dinner hosted by WCU and attended by Secretary for MLPID and Chief Lands Officer
We 10 June	Am - WCU; Ag – brief biosecurity discussions and plans for using bait in bait stations on boats; pm depart for Honolulu
11-12 June	Honolulu - purchase bait stations, battery chargers for freight to CXI

In addition to this RP visited Tarawa on 23-30 June 2009 to discuss management projects in relation to Phoenix Islands Protected Area (PIPA) restoration (biosecurity and pest management) and continuing support at Kiritimati.

### 3 RAT ERADICATION TRAINING

#### 3.1 Motu rat eradication

##### Planning

Prior to our arrival, Ratita Bebe and Aobure Teatata of the WCU had developed a plan for kimoa (Pacific rat: *Rattus exulans*) eradications. This included a targeted survey of islets in the lagoons in order to determine priority ones for rat eradication, and safety planning and community consultation. The top priority islands identified by WCU were:

- Drum Island and all other rat-infested motu in Drum Lagoon;
- All rat-infested motu in Nimroona Lagoon
- Three motu in Tonga-Fred Channel Area
- Several motu in Manulu Lagoon
- Several motu in Tibo Channel and Ambo Channel area
- Possibly Ngaon te Taake isles
- Turai motu in the Dojin Closed Area
- Isles Lagoon (refer Figs 1-2 for location map).

We supported the choice of most of the motu above based on the data presented by WCU, some prior knowledge from earlier survey results (Jones 2000, Pierce et al 2007), and considerable survey and discussion during this visit. Equipment was prepared on 28 May, including tape measures, compasses, GPS, string, pegs, flagging tape, scoops, masks, gloves, shirts, etc. Transport, including vehicles and dingy, were also arranged. Media coverage and signage was previously arranged by WCU. On 30 May a brief meeting was held with the chief health official on the island, Dr Kautu Tenaua, who endorsed the project.

##### Methods

The team visited different motu over a 9 day period and kimoa were targeted on most of them (Appendix 1). Personnel on the project changed daily according to the WCU roster and the routine patrol work taking place at this time with 2-4 WCU or temporary staff being present on any one day and Mamarau Karirieta of Agriculture also took part on one day. Access to the motu within the lagoons was generally by aluminium dinghy with an 8 hp motor. Five islands were accessed by wading and two by swimming.

All motu targeted for rat eradications were treated with Pestoff 20R rat bait containing brodifacoum. The bait was hand-spread on all motu. On larger motu, a 25 m x 25 m grid was established prior to distributing the bait as per the 2008 training (Brown and Pierce 2008). On smaller islands, the bait-spreading was done 'by eye' with baiters sweeping across the island in a line, each no more than 25 m apart, stopping at 25 m intervals to distribute bait, until the entire island was covered. Plastic scoops that delivered 200 g of bait per scoop were used to measure delivery rate per baiting site and therefore per

hectare.

Whilst a single application of bait probably would have sufficed, we generally chose to follow current New Zealand 'best practice' of applying two separate applications of bait, the second ideally 7-10 days after the first, but the short duration of the trip meant a shorter time-span needed to be adopted for some of the key motu treated.

Many of the motu had not previously been visited before by RP or DB, so baiting rates were increased above standard best practice in acknowledgement of possible high density of kimoa on some islands due to the abundant birdlife, and the possible effect of manai (*Cardiosoma* land crabs) which were known to occur on some of the motu. We initially aimed for about 16 kg/ha on the first application and 8-10 kg/ha on the second.

In many cases the presence of kimoa had not been confirmed prior to our visit. However, it was generally remarkably easy to detect their presence. Within 15 minutes or so on most individual motu, team-members had either seen live rats (active during the day), found remains of dead kimoa, or found definitive feeding sign on birds' eggs.

We chose to adopt a rapid 'bait-as-we-go' strategy to maximize the limited time we had available. A bird, kimoa and habitat survey would occur first upon landing on the motu, while the precise size of the motu was calculated by walking its perimeter with a GPS (Garmin GPS60). Team members would confer, and if kimoa status was confirmed or suspected, a decision to bait or not was made on the spot, based on the motu's potential habitat for procellariiforms and ground-nesting terns and noddies.

## Results

The bait (c.1500 kg) held in storage on Kiritimati since December 2008 was generally in very good condition, reflecting the excellent storage conditions at firstly the wharf compound and secondly at Agriculture – the latter stored in a cool shaded environment, in original paper bags, inside pest-proof sealable 200 litre drums. Bait stored loose in drums fared worse, with many baits that had been in contact with bags of desiccant subsequently absorbing moisture and undergoing some decay.

A single drum of bait had been compromised by moisture, and the damp bait attacked by a host of a wax-moth type larvae, and we requested Agriculture to spray the insects and incinerate the bait as soon as possible.

At the end of our trip 37 bags of bait (370 kg) remained, and was available for scheduled rebaiting of approximately 13 motu (c.200 kg required), with some left to target a few other small motu (up to 8 ha total, based on standard rates used).

Approximately 250 kg of 'loose' bait, stored in two barrels can be used for rat control on main Kiritimati by Agriculture. While still in acceptable condition it has not survived in as good a condition as the bagged bait.

All of the groups of motu identified by WCU were visited during the trip, though time constraints did not permit us to visit all motu in some lagoons. Forty-two (42) motu were visited (sometimes twice, in order to rebait) during 9 days on this trip.

Of these 42 motu, only 8 were thought to be rat-free, and all of these were very small – all 0.7 ha or less, totaling just 2.8 ha (Appendix 1). Most of these were a considerable distance to the mainland or kimoa-inhabited motu, but in some instances the distances between ratted areas and rat-free islands was 50 m or less, supporting previous information from NZ that *R. exulans* are poor or reluctant swimmers.

Twenty three (23) motu were baited to eradicate kimoa, with 19 of these having kimoa confirmed as present. The largest were Big Nimroona (6.5ha) and Drum (6.1ha), while the rest ranged in size from 4.1 to 0.1 ha. The other 4 motu had presumed (probable) rat presence, but this could not be absolutely confirmed during our brief visit. They were therefore baited either as a precaution due to their proximity to other baited islands or in at least one case because of its relative potential value in relation to its size - it was worth the small amount of effort required to make sure it was rat-free. A total area of 42.6 ha was baited. This is a significant area when compared to the known current rat-free area of Christmas Island comprising c.20 ha Cook Is, 3-4 ha Motu Tabu and a handful of small motu less than 1 ha each.

On two motu we could not find firm evidence of kimoa presence in the very brief time we spent on them. Both were of limited value for burrowing seabirds so we left them unbaited in order to preserve our limited bait stocks.

Another 9 motu were surveyed, and kimoa presence confirmed on them. However, for varying reasons they were not given priority for baiting and so left untreated. Reasons included poor or limited habitat for burrowing seabirds, relative risk of reinvasion by kimoa, high disturbance risk to the high-density of frigatebird nests (Turai Motu in Dojin Closed Area), or that they would need to be treated as part of a group of motu due to their proximity to each other and we either had not the bait or the time to do all of the group on the day.

Baiting rates varied considerably between motu. Partly this was due to the small size of many motu, and we generally chose to work in units of whole (10 kg) bags of bait (i.e. once a motu was treated, the remainder of bait in an open bag was used, rather than risk transporting it in the open boat to another motu). With such a number of different people involved (at least 9 local staff) it was also difficult to monitor the bait-spreading of individuals at all times, but it appeared in all cases that over-baiting rather than under-baiting occurred, and this was considered acceptable from a precautionary approach. A summary of information on the motu visited, including (where applicable) the baiting rates, can be found in Appendix 2.

Single feral cats were discovered on two small motu. In both cases they were able to be hunted down and killed. In one instance the cat had clearly preyed upon and virtually eliminated the local populations of all 5 procellariform species. It is apparent that the cats

will swim short distances to reach some motu – it is very unlikely given the motu concerned that they were placed there by humans.

Land crabs, while present on many islands, were not in high density. While they probably consumed some of the bait intended for rats their effect was probably less than anticipated. Assuming success in these rat eradications, the bait rates could in future acknowledge this, and be reduced slightly from the conservative (high) rates chosen for this project.

It is openly acknowledged that some of the treated motu have narrow water gaps and may therefore be reinvaded at some stage by rats. However, with monitoring and retreatment as necessary these can be managed in a generally rat-free status, allowing ‘pulses’ of successful breeding of vulnerable seabirds in rat-free years.

Some of the motu appear to be far more secure from natural reinvasion (e.g. Drum, North Drum, Big Tonga-Fred, and several motu in Isles Lagoon) and should (if eradication has been successful) add significantly to long-term ‘safe’ habitat for rat-vulnerable species

It will be important in future years to monitor the kimoa status of the treated islands – it is possible that kimoa will at some stage in the future recolonise some of those with smaller water gaps. There are a wide range of water distances and other factors (stepping stone islets, etc) so these motu may be a very interesting global test case for ability of *Rattus exulans* to recolonise across known ‘barriers’.

It is proposed that 13 motu that received a single application of bait during our visit should be rebaited by WCU staff between 16-18 June.

It is also recommended that further motu are surveyed to ascertain their current value to birdlife, their rat status and potential for eradication, and to gather information necessary to plan eradications (size, access, etc).

It is suggested that local WCU staff independently plan and carry out one or more further rat eradications on small motu, as the next step in building local capacity. This could be done using existing bait stocks, with motu in Isles Lagoon (motu #24, 28 and neighbouring islets), the big motu in Tibo channel, and Frigate Island in Koil lagoon being among the potential candidates. Other possible motu may be identified in future surveys (e.g. in Manulu Lagoon or Tenei Rababa)

Update -10August 2009: Ratita Bebe noted that the additional islands in Isles lagoon had been baited, but heavy rain then the return of the curlews and other waders precluded further baiting – details to come.
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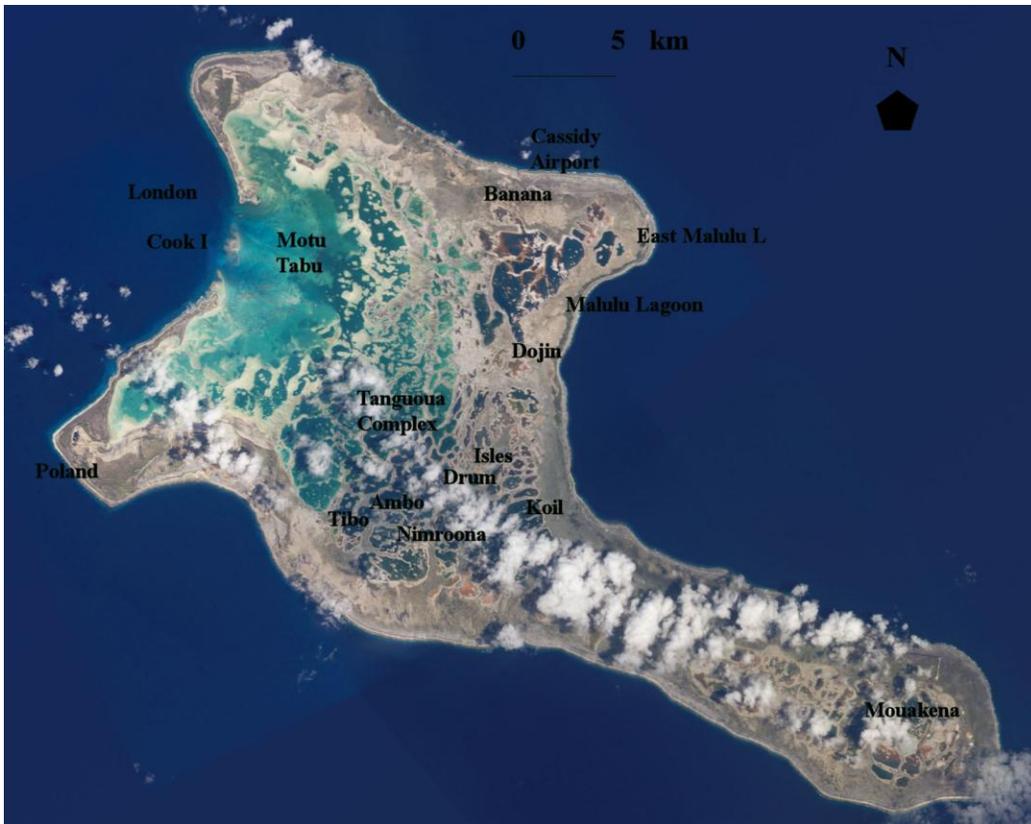


Fig 3.1 – Approximate locations of some key sites at Kiritimati

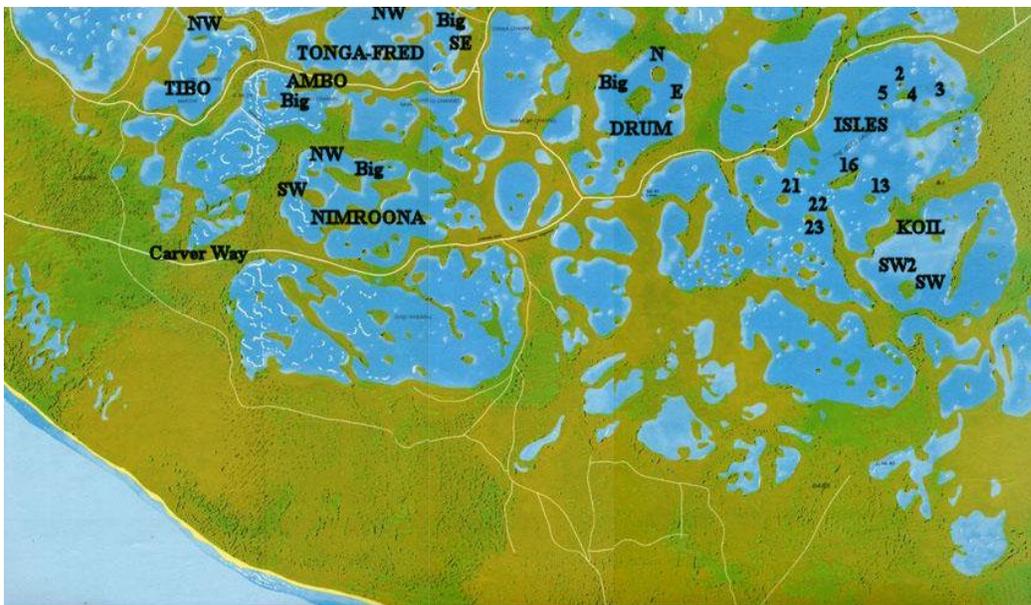


Fig 3.2 – Locations of 22 de-ratted islands in central lagoons area May-June 2009. Individual lagoons are Tibo, Tonga-Fred, Nimroona, Drum, Isles and Koil Lagoons. Abbreviations for motu within the lagoons are Big (e.g. Big Drum, Big Tonga/Fred), N, E, NW, SW, etc = North, East, etc (e.g. North Drum, South West Nimroona). Motu in Isles Lagoon are numbered. One additional motu was targeted at East Manulu Lagoon.

### 3.2 Motu biosecurity

Motu biosecurity has been set-up by the WCU aimed at preventing invasive species (particularly cats and rats) getting to the pest-free Motu Tabu and Cook Island. Scheduled patrols via dingy have been increased and are intended to help in intercepting illegal landings. We participated with WCU staff on visits to Motu Tabu and Cook Island to check for pest-sign, including follow-up to a reported cat sighting on Cook Island. Searches by four people revealed no sign of cats or rats on either island. The 'No Landing' signage has been upgraded on Cook Island and the same is planned for Motu Tabu. WCU staff are aware of the need to keep boats free of rats. There are no reports of rats on hotel boats (Simon, WCU Temporary and former Hotel angling guide). A new boat (outrigger modeled on CHH type) is currently being constructed for the WCU. Overall, this is a major step forward in the effectiveness of motu biosecurity.

We recommend that staff continue the routine checks for rats on their own boats and for sign of rats and cats on the two most important motu – Motu Tabu and Cook. Data should be recorded after each day's patrol on the island data sheets covering the following.

- Island (Motu Tabu or Cook)
- Date and observers
- Sign of rats - eggs shell showing small jagged edges, rat sightings – if rat sign is found, carry out follow up visit for confirmation and seek advice for implementing urgent eradication.
- Sign of cats - partly eaten medium sized birds (petrels, shearwaters, noddies, terns), and footprints – if cats are found, remove those individuals urgently.
- Sign of people having landed, poaching etc – footprints, dead birds, etc – if sign found step up patrols.

The more important of the now de-ratted motu should now be added to this list for increased biosecurity (rat/cat/poaching) surveillance and reporting. These motu are:

Drum Lagoon motu – especially Big Drum and North Drum  
Nimroona Lagoon motu – especially Big and SW Nimroona  
Tonga-Fred Lagoon motu – especially Big, SE and NW Tonga/Fred  
Isles Lagoon motu - especially Motu # 16.

### 3.3 Kiritimati biosecurity

Island biosecurity is the responsibility of the Quarantine Section of Agriculture. During this visit two brief meetings and two field inspections were held with Mamarau Karirieta and Nautonga Anterea. The meetings identified generic problems with quarantine procedures for both incoming and outgoing vessels and aircraft, and field inspections confirmed this. Thus inspection of a Spanish fleet of purse-seiners moored off London on 3 June revealed that the ships were operated at high levels of hygiene and biosecurity. However, the captains' efforts were potentially being undone by the servicing of these

vessels by the MV Betiraoi, a Kiribati vessel which is known to contain black rats (Sam Tekiree, Customs, pers. comm.). This vessel had previously been seen with its ramp open on land in 2007 (Pierce et al 2007) and the same example was used at the 2008 PIPA workshop at Kiritimati (Brown and Pierce 2008) in order to highlight the need for de-ratting boats and operating more effective biosecurity. Shortly after the 2008 workshop, one of the participants noticed a large rat walking along a mooring line from a recently docked ship from Tarawa (Ereti Takabaia pers. comm.).

However, there appears to have been no significant change in biosecurity management at Kiritimati and perhaps Kiribati generally. In May 2009 Quarantine staff (Mamarau and Nautonga) identified five Kiribati vessels that visit the Line Islands, all of which are thought to have rats on board:

- MV Matangare - operates Tarawa-Kanton-Line (Kiritimati-Fanning-Washington)
- MV Moomi - was rat-infested in 2008
- MV Mataburo - 1-2 visits to Kiritimati annually - infested
- MV Betiraoi - from Tarawa, stays in N Line Is now
- MV Moamoa - had rats in 2008 - given baits in July 2008 (N Anterea pers. Comm)

It is totally unacceptable that rats are present on these boats. It not only places Kiritimati at increased risk of being invaded by other pest species, but it adds severe risk to more pristine islands in the Phoenix and Line Groups and jeopardizes the recent gains made with pest eradications at the Phoenix Islands.

Actions needed immediately are:

At Kiritimati (Agriculture to action urgently)

- Work with the captain to eradicate rats from the local MV Betiraoi and maintain 1-2 bait stations on board after this.
- Work with captains to place bait stations and traps on each of the other Kiribati vessels arriving at port and provide sufficient bait for sustaining rodent-free vessels (bait stations will be brought down from Honolulu by GoK staff).
- Ensure that rodents cannot get on or off boats (i.e. ensure rat-proof hoods are on the mooring lines, boats must anchor offshore not beside the shore, inspections of arriving and departing boats are very thorough - look for rodent sign in store rooms).
- Consider the raft of other alien species that could arrive via supply ships and planes from Hawaii (scores of potential invasive species spanning birds (e.g. mynas, bulbuls), reptiles (various species), invertebrates (invasive ants), mammals (Norway rat, mongoose) and from other sources, and ensure that appropriate biosecurity searches and precautions are implemented at the source, en route and at arrival.

At Tarawa (Agriculture/PIPA to action urgently)

- Ensure all arriving and departing ships at Betio have rodent bait stations that are being maintained.
- Ensure all ports of call in the Gilbert, Phoenix and Line Islands have procedures in place to prevent rodents and other invasive species from getting on or off the ships.
- Ensure that there is adequate bait and traps supplied to the ships' captains annually.

- Ensure no illegal landings occur at the PIPA.
- Formalise biosecurity legislation and biosecurity plans for Kiribati, the latter with clear action plans, responsibilities and reporting. Note that a proposed Biosecurity Act will be before the Government late this year or early 2010 (T. Teroroko pers. comm.). Meanwhile the biosecurity guidelines currently being prepared in support of the Phoenix Islands (Pierce/CEPF-funded) will assist in developing formal protocols in support of the Act. Although the guidelines naturally focus on the Phoenix Islands they will subsequently be extended to the Line Islands during other work funded by SPREP/CEPF).
- Note that two species of myna (*Acridotheres tristis* and *A. fuscus*) are currently present and breeding at Betio, Tarawa (R. Pierce and A. Tye pers. obs. 25 July 2009) and there is a need to collect baseline information on their distribution, numbers, night roosts, nest sites and feeding areas prior to developing a plan for their eradication.

Update 1 - 27 June 2009: Nautonga Anterea reported that the MV Matangare was in Kiritimati port and the MV Moamoa was expected to arrive soon.

Update 2 - 5 August 2009: Nautonga reported that eradication measures were completed for MV Matangare and Moamoa during the last week of July and captains had been provided with ongoing instructions for rat eradication.

Update 3: 28 July 2009 - During RP's July 2009 visit to Tarawa members of the PIPA Management Committee and Agriculture noted that **people from these same rat-infested boats sometimes landed (illegally) at the uninhabited PIPA islands, placing the PIPA islands at extreme risk of rat and other pest invasions.** It was recommended that biosecurity be strengthened at each end (Betio and Line Islands) including pest eradication on Kiribati freighters at Tarawa, initially using some of the spare bait at Kiritimati.

#### 4. TECHNICAL SUPPORT

##### 4.1 Monitoring plan for black rats (*Rattus rattus*)

Black (ship) rats have been present on Kiritimati for at least 10 years. Curiously however, they have been reported mainly from a small part of the island - villages and buildings between London and Banana – and have been trapped in stands of te ren and te mao along some isolated beaches, e.g. Crystal Beach (Pierce et al 2007). However, this information is still inadequate to interpret patterns of colonization and impact of the rats so a work plan for monitoring black rats was designed with WCU on 3 June. The plan is as follows.

##### 4.1.1 Objectives - why monitor black rats at all?

There are three important reasons to monitor this invasive species at Kiritimati:

- a) To determine whether they are accessing important mainland locations, particularly

habitat for Bokikokiko.

b) To determine whether they are invading or threaten to invade critically important seabird-nesting islands, e.g. Motu Tabu and islets in the Central Lagoons.

c) To better understand the patterns of spread of black rats around Kiritimati. This will help in decision making of how to deal with them on the island. Potential management responses on Kiritimati include translocation of Bokikokiko to rat-free islands outside Kiritimati and/or sustained rat control on important seabird motu and adjacent mainland. The monitoring will also provide insights for other tropical islands that this species might invade in the future.

#### 4.1.2 Where to monitor black rats?

Sites that are strategically important for monitoring black rats are:

a) Villages and houses east and south of Banana - these are isolated houses between Cassidy Airport and Manulu Lagoon, and the village of Poland.

b) Important Bokikokiko habitat, e.g. the monitoring lines at Crystal Beach-Main Camp, Manulu Lagoon and Boating Lagoon road.

c) Likely rat dispersal pathways on the mainland which are adjacent to important motu e.g. Bathing Lagoon area (potential rat pathways to the critically important Motu Tabu) and Carver way (adjacent to important islands in central lagoons, many of them now kimoa-free).

#### 4.1.3 How to monitor black rats?

Two methods are available:

a) Consult with villagers - ask the community and schools to report any black rats outside of London, Tabwakea and Banana villages and record details of date, location and observer on data sheet.

b) Trap rats in the Bokikokiko habitat and near important seabird areas (see sites mentioned in 2.2 and 2.3 above). At each site use the following methods:

- A line of 10 traps - each trap about 100 m apart
- Select each trap site on basis of being good for black rats - beside rubbish, old building, on sloping coconut tree, te ren, etc
- Tie trap to branch or tree trunk above crab height
- In Bokikokiko areas, cover the trap with tunnel to prevent Bokikokiko getting caught
- Bait the traps with a piece of cooked coconut flesh
- Trap for 3 nights to give a total of 30 trap nights (=10 traps x 3 nights). If one night is wet, do another night of trapping.
- Record results on a data sheet (see Appendix)

#### 4.1.4 Timetable to monitor black rats?

Any time of year is OK to monitor Kiritimati rats. After the wet season and after the busy season for patrols, etc is ideal, e.g. July-October.

In 2009 aim to cover the following sites:

- a) July - Villages/houses beyond Banana. Ask people if they have seen black rats and enter results on survey form
- b) July - North-east Point area. Trap along edge of the coconut plantation on south side of road.
- c) August - Carver way corner (Bay of Wrecks) - coconut plantation and extend 3 or 4 traps across the road to the te ren/te mao at top of beach.
- d) September - Bathing Lagoon road (coconuts) and along edge of the lagoon in car park area.

Send copies of the results (data sheets) to Ray who will discuss the next steps with other ecologists and the WCU. Depending on where black rats are caught or reported from, the next steps could involve more site-specific surveillance, stepping up of motu surveillance and/or direct rat control or eradication in the most critical habitats.

Update - 10 August 2009: Ratita indicated that she was revising the black rat monitoring plan with Aobure with a view towards implementing the first monitoring soon.

#### 4.2 Seabird poaching

Surveys by WCU and supplemented by observations in 2007 and 2009 indicate two levels of poaching on seabirds:

1. Taking of sooty tern eggs mainly from the large mainland colonies
2. Taking of adults, juveniles and nestlings of tropicbirds, boobies, frigatebirds and other seabirds.

The first is low impact poaching given that only eggs (not adults) are taken, and it occurs in areas where there are high predation levels on nests). Little poaching occurs at the highly productive predator-free tern colonies on Motu Tabu and Cook Island.

However, the taking of tropicbirds, boobies and frigatebirds, etc is high impact given:

- a) It removes adults from the populations, c.f. eggs of sooty terns, which requires high breeding investment to replace.
- b) It can be devastating to entire colonies of frigatebirds and boobies and, to a lesser extent, to tropicbirds.
- c) There is likely to be selective hunting pressure on the largest birds, i.e. masked boobies, brown boobies and both species of frigatebirds, with associated impacts on their population sizes.
- d) Threatened species, notably the Phoenix petrel is being targeted in areas where the numbers of large seabirds are now depleted (Motu Upua, Ngaon te Taake).

The impact on colonies can be very rapid as evidenced on the heavily poached Big Nimroona and SW Nimroona Motu where the breeding numbers of large seabirds crashed between 2007 and 2009 (Fig 1). This is in contrast to the nearby Big Drum motu where there has been low to zero sign of poaching in 2007 and 2009 and which has retained its breeding numbers over the same time period. These graphs indicate how quickly poachers have depleted populations of the larger seabirds on the Nimroona motu. Areas currently being heavily poached are in the Central Lagoons area, e.g. Nimroona, Isles Lagoons close to the copra harvest areas, but others e.g. Drum, Koil, Turai are also vulnerable if targeted.

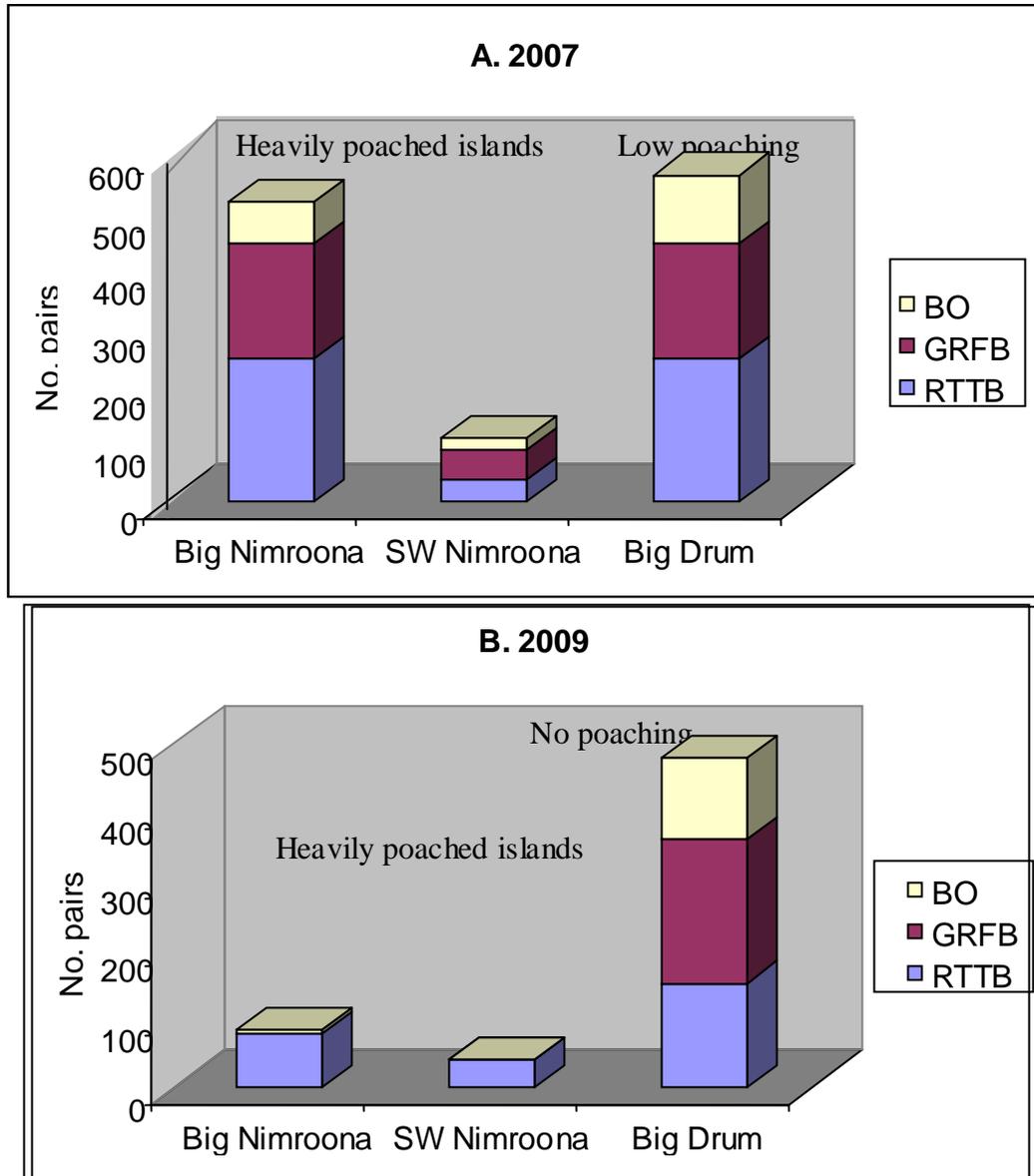


Fig 4.2 – Breeding pairs of red-tailed tropicbirds (RTTB), great frigatebirds (GRFB) and boobies of three species (BO) counted on the Nimroona Islands and Big Drum in A. May-June 2007 and B. 2009. High levels of poaching sign were found on Big and SW Nimroona but low to zero levels of poaching on Drum.

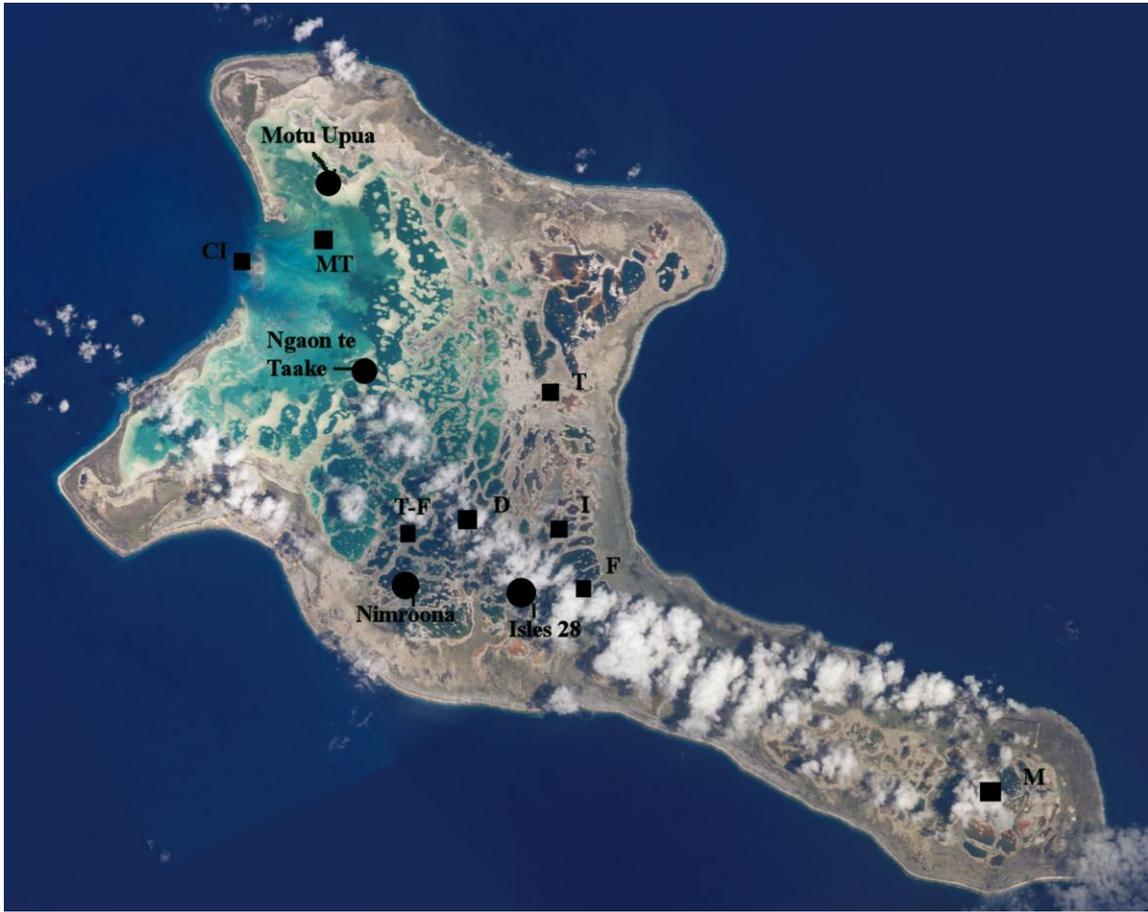


Fig 4.3 – Locations of known poaching areas of large seabirds in 2007 and/or 2009 (denoted by circles and sites named). Also included as squares are key locations where poaching could have devastating impacts on large birds in the future -from north to south potential impact sites are Motu Tabu (MT), Cook Island (CI), Turai (T in Dojin), Drum (D), Tonga-Fred (T-F), Isles lagoon (I), Frigatebird Island in Koil (F) and Mouakena (M), the latter of which has not yet been evaluated for poaching on large birds.

#### 4.3 Some changes in bird status at Kiritimati

##### Notable observations May-June 2009

- Motu Tabu is the single most important site in the world for Phoenix petrels and white-throated storm petrels, although many other motu in the central lagoons that have now been targeted for rats also support important numbers of these birds. Both species were breeding (incubating) and a few late stage chicks of Phoenix petrel were also found in May-June 2009,
- White-tailed tropicbirds have increased since being first sighted by Eric VanderWerf during the 2007 surveys, with sightings of small groups of up to 10 birds near the LINNIX office earlier this year (R. Bebe, K. Taabu, A. Teatata).

- They appear to be colonizing Kiritimati.
- Two colonies of lesser frigatebird are now present (Frigatebird Island in Koil Lagoon and on a motu in Dojin Lagoon) whereas in the past only one colony was known at Kiritimati (Jones 2000),
  - An estimated 500-1000 pairs of masked booby at Mouakena Lagoon (K. Taabu and A. Teatata pers. comm.) would make this globally one of the largest colonies. The species appears to be rare in the southern Line Islands where preliminary observations suggest that brown booby may have a significant stronghold (Kerr and Wragg 2008), but common on some of the Phoenix Islands,
  - Grey-backed tern colonies were being heavily depredated by kimoa on Big Drum (abandoned), North Drum and Frigatebird Island (Koil lagoon), c.f. healthy colony on rat-free Little Tibo.
  - Increased sightings of Kuhl's lory (*Vini kuhlii*) by members of the WCU over the past 2 years.

### Bokikokiko

Bokikokiko monitoring transects have been completed by WCU for three years running at Manulu Lagoon and other sites have been surveyed to add to the baseline. These are currently being analysed from which a brief plan will be developed based on the recommendations and methodology of Pierce et al (2007) and additional sites identified by WCU.

Update - 10 August 2009: Ratita indicated that a survey had been completed in habitat near Poland (identified as excellent looking habitat during the 2007 support work) and BKO were found on all stations

### Measuring seabird responses on the 23 de-ratted motu

During this visit 23 additional motu in the central lagoons were targeted for rats, and cats were also removed from two of these motu (Section 3). Most of these rat eradications are likely to succeed, therefore their value as bird islands will increase, particularly for Phoenix petrel, white-throated storm-petrel, three species of shearwater and 5-6 species of terns and noddies. The responses of the terns and noddies will be very easy to measure and the most important of these motu should be revisited annually ideally in May-June to search for pest and poaching sign and count seabirds. These important islets are (as per Section 4):

Drum - Big Drum, North Drum, East Drum  
 Nimroona – Big and SW Nimroona  
 Tonga-Fred – Big, SE and NW Tonga/Fred  
 Isles Lagoon motu, particularly Motu # 16.

When these islands are re-surveyed in May-June 2010, it would also be useful to re-survey birds on some of the motu on which kimoa are still present – e.g. count pairs of birds on each of Nimroona SE, SE Tibo, Isles 28 and other rat-infested motu in Isles

Lagoon and others. This would provide a scientific comparison of how quickly seabirds can respond to rat removal and could be published by WCU (with our support) in the conservation literature. A summary of bird-counts for all islands visited in May-June 2009 is provided in Appendix 1 and detailed island data-sheets along with vegetation descriptions will be sent to WCU in addition to this.

#### 4.4 Equipment needs

Equipment left with the WCU for additional rat baiting were GPS Garmin 60 (1), dry bag (1), bait buckets (2), tape measures (2 x 50 m), plastic scoops, plastic gloves (100), respirators (10), compass (2), and marking pens and other pens. Addition items included Petzl headlamps (2) which will be used for night patrols. Gloves and respirators were also left with Agriculture. Two empty barrels were cleaned and taken to WCU for use as pest-free containers for their island trips.

Office support to WCU included a hard copy of the 2007 report and a memory stick containing the following - past reports, representative photographs and draft data on pest eradication, biota, poaching, etc of the current visit May-June 2009, copies of vegetation photo points on Rawaki and McKean Island 2008.

Additional needs of the WCU were identified during the stay and are tabulated below. We were less successful at identifying needs of Agriculture due to management issues, but a tentative list is included below.

Table - Draft list of needs for WCU and Agriculture to be more effective

WCU		
Item	No.	Comment including key actions
Motorbikes	2-3	Ideally secondhand 125s e.g. older model SL125 or XL125 for ease of replacing parts
Trailer	1	Needed for transporting motorbikes and gear
Toyota tyres	2	Tarawa budget?
Radios`	3	Hand-held radios - existing Motorolas have inadequate range - G Wragg to advise brand/models/costs
Shotgun	1	One in NZ + ammunition could be brought to CXI after Orona work - Ray/Keith
Rat traps	20	20 annually - each project leader should aim to bring this no. of traps annually; more to Tarawa to help with eliminating rats from freighters
Cat cage traps	3	On the RV Bounty Bay - GW to coordinate
Poison bait	10	10 x 10 kg bags annually - project leaders to CXI import this amount annually; NZHC at Tarawa to investigate past support
Tapedeck	1	Aim for replacement of existing tape deck for April 2010 BKO - Ray
Binoculars	1	OK at present but check with Ratita on current situation in 2010
Digital camera	1	With video capacity - SPREP project?
GPS	1	Garmin 60 provided - download cord to follow - Ray
Headlamps	?	Two provided June 2009 - check with Ratita on situation in 2010 and beyond
Spotlight charger	2	Should be available in Honolulu

AA/AAA charger	2	From Hon - airfreight – Ray
Flagging tape	2	2 different colours e.g. pink and orange – Ray next trip
Laptop	1	For project management - SPREP project?
Photocopier	1	SPREP?
Filing cabinet	1	
Posters	X	In hand Henry Genthe?
Fact sheets	X	In hand Henry Genthe?
Old CXI maps	2-3	Check availability at Tarawa - Ray
Anti-virus	X	Check situation at Lands – Rat it a
Whiteboard	1	SPREP?
Uniforms, badges	30	Mainly L and XL – ex DOC shirts – Richard Anderson
GIS support	X	Need mapping support – in hand via Tarawa training?
<b>Agriculture (very provisional list)</b>		
Work plans	X	Biosecurity plans and protocols
Bait stations	10	5 freighted from Honolulu and 6 more due to arrive 18 August 2009 – Ray
Bait	X	Ongoing annual bait supply needed for ships and loading areas
Rat traps	20	20 annually - each project leader should aim to bring this no. of traps annually

## 5.0 CAPACITY BUILDING

### 5.1 Skill sharing

This project builds on previous work under the NZAID project and other projects. Key skill sharing outcomes for GoK staff stemming from the current work are summarized below.

#### Planning

Whereas all previous eradication planning (2008 NZAID workshop and 2008 PIPA eradications) had been completed by technical advisors, in this case WCU staff planned their own pest eradications prior to our arriving on the island. This plan was based around our earlier suggestions for feasibility studies, e.g. assessing suitability of islands, environmental issues and health and safety needs. On our arrival, this WCU plan had been reduced to a hand-written list of islands to target due to computer viruses eliminating the main plan, an ongoing impediment to effective management at Kiritimati.

This initial planning by WCU provided some confidence to plan other projects, including additional islands on which to target rats, how to complete a general workplan and developing a plan for black rat monitoring. This is a significant step forward. There was less opportunity to engage with Quarantine staff, but significant discussion was held on the biosecurity risks facing the island and other islands in Kiribati and steps that could be taken, e.g. remove rats and other pests from inter-island boats.

## Technical

The technical skills that were learnt or honed by GoK staff during this work were similar to those in 2008 and included particularly:

- Use of GPS for calculating area of motu
- Setting up grids across motu – associated compass and line work
- Calculating bait needed and improving application skills, taking care in filling gaps in coverage, etc.
- Determining presence/absence of rats and cats from field sign, e.g. predation on bird eggs (rats), and partly consumed carcasses of adult birds (cat sign).
- How to eliminate cats from islets without using a gun
- Estimating minimum number of seabird pairs on a motu.

Although necessarily subjective, we judged that the uptake of technical skills was greater here than during both the workshop held in April 2008 and the PIPA work in May-June 2008. There may have been several reasons for this apparent difference notably that the 2008 workshop was of short duration and intensive and the 2008 PIPA work involved only two GoK staff. In contrast, the current 2009 work took place over 2 weeks and involved smaller teams of people on any given day which provided increased opportunity for individual learning and application of skills. In addition, we all came to know one another better on this occasion than we had previously.

### 5.2 Overall capacity building progress

There has been a noticeable increase in WCU staff engagement and enthusiasm at learning new skills and revising old ones since the 2007 survey and capacity building work (Pierce et al 2007). This may partly reflect the now annual visits, but it is more likely to be a combination of synergies, including the new leadership and structured approach at WCU. In addition, the application of rodenticide for rat eradication means that the WCU can now bring about recovery of bird populations quickly at both the PIPA and Kiritimati, the latter of which will be more readily monitored by the WCU. There is clearly more ownership of the WCU projects at Kiritimati than was previously the case. It is important to help consolidate these changes within WCU in a supportive way.

Progress with Quarantine has been more limited than that with the WCU. This may partly reflect our previous emphasis on eradication planning (although we did highlight biosecurity planning and biosecurity implementation measures in the 2008 workshop) together with the shortage of resources and/or guidelines to complete some jobs to a high standard, the very position that WCU were in during 2007. It could be that the inability to assist captains in keeping their ships pest-free reflects these shortfalls. The current availability of viable rodent bait (refer also Section 3.3 update) and an impending Biosecurity Act and associated biosecurity guidelines should greatly assist in this area. It is important to continue to support Biosecurity in areas of risks assessments, implementation of the most urgent biosecurity measures and ongoing surveillance.

## 6.0 CONCLUSIONS AND RECOMMENDATIONS

The WCU has made excellent progress over the past 12 months, with significant gains in many areas, notably management planning, staff development, motu rat eradications (a key focus of this visit), poaching patrols, island surveillance and biota monitoring. This progress has stemmed partly from the past and current capacity building support, but also the professional approach of the new OIC Ratita Bebe. We also acknowledge the sad loss of Ibeatabu Katabanin, which has severely impacted the Unit.

Biosecurity remains an unresolved serious problem for Kiritimati and Kiribati generally - without significantly improved quarantine effort, it will threaten to undermine recent biodiversity gains in Phoenix Islands and Kiritimati, and in the Line Islands generally.

The following overall recommendations are provided.

### Kiritimati biosecurity and quarantine (Agriculture)

1. Work with Kiritimati ships' captains to establish rodent bait stations on each of the Kiritimati ships that visit Kiritimati and other Line, Phoenix and Gilbert Islands and service bait stations until bait take ceases. Maintain 1-2 stations and traps on each ship, probably more on the largest vessels.
2. Develop biosecurity plans for Line Islands and implement these to ensure that invasive alien species do not arrive or depart on ships and aircraft visiting Kiritimati. These can be built on the imminent Biosecurity Act and biosecurity guidelines currently being developed for PIPA (CEPF/Pierce) and include protocols and annual replenishment of rodenticide bait and pesticides to combat pests arriving on vessels and/or aircraft.

### Motu kimoa removal (WCU)

3. Complete kimoa eradications on other motu where benefits to small vulnerable species are likely. These should be completed by late July to minimise the chances of killing te kewe and other waders.
4. Monitor priority islands from which kimoa have been targeted at least once per year to determine if kimoa are still absent.
5. Monitor responses of seabirds on ex-kimoa motu in May-June annually and publish results with outside support – could be done at the same time as 4 above.
6. Arrange with Agriculture for obtaining new rodent bait annually (for new eradications and contingency plans).
7. If cats are detected on the top priority rat-free motu (Motu Tabu, Cook, and now also motu in Drum, Tonga-Fred, Nimroona, Isles, Frigatebird, E Manulu), remove them immediately.

### Bokikokiko (WCU)

8. Continue with standard surveys of potential habitat of BKO, particularly where habitat loss/development is proposed.
9. Continue with annual monitoring of key BKO habitat (Manulu Lagoon, Boating

- lagoon, Crystal Beach) and evaluate others for inclusion e.g. Banana, Poland.
10. Send monitoring data to Ray for analysis and Ray to return graphs.

*Rattus rattus* monitoring (WCU/Agriculture)

11. Implement monitoring plan in the key areas of potential impact (Section 4.1).
12. Encourage reports of black rats from the public in areas beyond Banana.

Poaching (WCU)

13. Refine patrol areas to also include priority bird areas of Drum, Nimroona, Koil and Isles Lagoons (Section 4.2).
14. Support MLPID in its plans to evict campers from the copra areas as this will discourage poaching in the Carver way sections of the Central lagoons area.

Additional survey (WCU)

15. Carry out counts of masked boobies at Mouakena Lagoon and count the two species of frigatebirds at Turai Motu as these represent significant populations.
16. Measure the precise areas of Motu Tabu and Cook Island with a GPS in preparation for any rat baiting that may be needed as an emergency response to rat invasion.

General management suggestions

17. Discuss with MELAD staff in Tarawa means of improving effectiveness of Biosecurity at Kiritimati and Kiribati generally. This should include infrastructural needs, plans, protocols and staff development. Ideally this should include an increased role for local government, e.g. by WCU and Quarantine reporting to a local manager in MLPID. This would also allow important local opportunities for promotion rather than being promoted to other locations in Kiribati (Ray, SPREP).
18. Seek funding for a small technical support and capacity development package to the WCU that includes prompt advice, analysis, mapping, strategic feedback, publication support, etc. This will build on the synergy injected by the new OIC at Kiritimati coupled with recent motu restoration. This should include an annual support visit and total cost of US\$c.20,000 annually. (Ray/SPREP/PII)
19. Seek funding for WCU vehicles, technical equipment and other needs (options include MELAD budget, CEPF/SPREP and other project support, and specific funding bids. (Ratita to coordinate)
20. Consider the replacement of the late Ibeatabu's position at WCU with one of the keen young Temporary workers (MELAD).
21. Address the virus issues at Kiritimati and improve the situation for internet users (MELAD).
22. Organise uniform shirts and badges for WCU staff (Ray/Richard Anderson).

## ACKNOWLEDGEMENTS

We thank the Secretary for MLPID Manikaoti Timeou for his hospitality and advice

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## APPENDIX 1 – SUMMARY OF BIOTA ON CXI MOTU MAY-JUNE 2009

### 1. DRUM LAGOON

Observers: Ratita Bebe, Derek Brown, Ray Pierce, Ngauea Rabaul, Katareti Taabu, Aobure Teatata, Kiuera Rakenang, Mamarau

Pests - **P** = present, *P* = baited today, *I* = removed today, 0 =no sign, ? = unknown

Birds - **bold** = breeding, *c* = common, bird numbers = pairs (i.e. each prospecting bird or pair, eggs, downy chick, old chick are all regarded as 1 pair),

Bird abbreviation are standard 4 letter abbreviations of English name - PHPE = Phoenix Petrel, etc.

Island	North Drum	East Drum	Big Drum	Little Drum 4	SE Drum 5	SE Drum 6
Area ha	2.5	1.0	6.1	0.2	0.1	0.6
Date	1/6	1/6	29/5	29/5	29/5	29/5
Time	1400	1300	1000	1400	1420	1430
Kimoa	<b>P</b>	<b>P?</b>	<b>P</b>	0	0	0
Cat	0	<b>I</b>	0	0	0	0
Poaching	0	0	0	0	0	0
PHPE	0	0	<b>C</b>	0	0	0
WTSW	0	0	<b>C</b>	0	0	0
CHSW	0	0	<b>C</b>	0	0	0
AUSW	0	0	<b>C</b>	0	0	0
WTSP	0	0	0	0	0	0
RTTB	<b>3</b>	<b>5</b>	<b>152</b>	0	0	0
MABO	0	0	2	0	0	0
BRBO	0	0	<b>4</b>	0	0	0
RFBO	<b>3</b>	<b>2</b>	<b>111</b>	0	0	0
GRFB	<b>5</b>	0	<b>210</b>	0	0	0
LEFB	0	0	0	0	0	0
GRCT	0	0	0	0	0	0
GRBT	<b>300+</b>	0	1	1	0	1
SOTE	0	0	0	0	0	0
BRNO	<b>1</b>	0	<b>3</b>	<b>3</b>	<b>4</b>	0
BKNO	0	0	<b>9+</b>	0	0	0
BLNO	1	0	6	<b>3</b>	0	<b>2</b>
WHITE	0	0	<b>6</b>	0	0	0

## 2. NIMROONA LAGOON AND FRED-TONGA LAGOON

Observers: Ratita Bebe, Derek Brown, Ray Pierce, Ngauea Rabaul, Katareti Taabu, Aobure Teatata, Mamarau, Kieura Rakenang

Lagoon	Nimroona			Fred-Tonga			
Island	SE (1)	Little (2)	Big (3)	Big F-T	Big SE	Little SE	NW Motu
Area ha	3.9	0.6	6.5	3.5	0.8	0.3	1.3
Date	1/6	30/5	30/5	31/5	31/	31/5	31/5
Time start	1000	1330	1000	1000	1200	1300	1400
Kimoa	<i>P</i>	<i>P</i>	<i>P</i>	<i>P</i>	<i>P</i>	0	<i>P</i>
Cat	0	0	0	0	0	0	<i>I</i>
Poaching	50	0	108	0	0	0	0
PHPE	<b>50+</b>	<b>3</b>	<b>c.100</b>	<b>2+</b>	0	<b>1</b>	<b>2</b>
WTSW	<b>P</b>	0	<b>100s</b>	<b>P</b>	0	0	0
CHSW	<b>P</b>	0	<b>12+</b>	<b>P</b>	<b>2</b>	0	0
AUSW	<b>P</b>	0	<b>P</b>	0	0	0	0
WTSP	0	0	0	0	0	<b>1</b>	0
RTTB	<b>41</b>	<b>11</b>	<b>78</b>	<b>109</b>	<b>20</b>	<b>10</b>	<b>28</b>
MABO	0	<b>1</b>	0	<b>12</b>	0	<b>1</b>	0
BRBO	0	0	0	<b>7</b>	0	0	0
RFBO	0	<b>1</b>	<b>7</b>	<b>67</b>	<b>21</b>	0	<b>24</b>
GRFB	0	0	0	<b>700</b>	<b>31</b>	0	<b>13</b>
LEFB	0	0	0	<b>P</b>	<b>P</b>	0	<b>2</b>
GRCT	0	0	0	0	0	0	0
GRBT	0	1	0	0	0	0	0
SOTE	0	0	0	0	0	0	0
BRNO	0	<b>30+</b>	<b>2</b>	<b>P</b>	<b>P</b>	<b>11</b>	0
BKNO	<b>9</b>	0	<b>2+</b>	<b>9</b>	0	0	0
BLNO	<b>2</b>	0	0	0	0	<b>1</b>	0
WHTE	<b>5</b>	0	<b>4</b>	<b>2</b>	0	0	0

### 3. NGAON TE TAAKE, DOJIN AND EAST MANULU LAGOON (EML)

Observers: Derek Brown, Ray Pierce, Ngauea Rabaul, WCU Temps

Lagoon	Ngaon te Taake		Dojin		East Manulu Lagoon		
Island	Big Ngaon	3 Island Chain	Turai		South Motu	Central Motu	East Motu
Area ha	18.4	2.2	2.6		?	c.1	<1
Date	2/6	2/6	2/6		2/6	2/6	2/6
Time start	1000	1120	1230		1330	1400	1400
Kimoa	P	P	P?		0	0	<b>P</b>
Cat	0	0	0		0	0	0
Poaching	107+	0	0		0	0	0
PHPE	0	0	0		0	0	0
WTSW	0	<b>1</b>	0		0	0	0
CHSW	0	0	0		0	0	0
AUSW	0	0	0		0	0	0
WTSP	0	0	0		0	0	0
RTTB	<b>117</b>	<b>33</b>	<b>P</b>		0	<b>5</b>	<b>1</b>
MABO	0	0	0		0	0	0
BRBO	<b>3</b>	0	0		0	0	0
RFBO	<b>20</b>	0	<b>P</b>		0	0	0
GRFB	<b>22</b>	<b>22</b>	<b>2500+<sup>1</sup></b>		0	0	0
LEFB	0	0	<b>2500+<sup>1</sup></b>		0	0	0
GRCT	0	0	0		0	0	0
GRBT	0	0	0		<b>100+</b>	<b>50+</b>	0
SOTE	0	0	0		0	0	0
BRNO	<b>1</b>	0	0		<b>50+</b>	<b>20+</b>	0
BKNO	<b>5</b>	0	0		0	0	0
BLNO	0	0	0		<b>c.10</b>	<b>c.10</b>	0
WHITE	<b>10+</b>	0	0		0	0	0

Note 1: very approximate estimates

#### 4. ISLES LAGOON

Observers: Derek Brown, Ray Pierce, Aobure Teatata, Katareti Taabu, WCU Temps

Island	1	2	3	4	5	7	16	13
Area ha	<1	1.4	0.5	1.4	0.3	4.1		1.2
Date	5/6	5/6	5/6	5/6	5/6	5/6	5/6	
Time	1400	111 0	114 5	1030	1100	1215	123 0	
Kimoa	?	<i>P?</i>	<i>P?</i>	<i>P</i>	<i>P</i>	0	<i>P</i>	<i>P</i>
Cat	0	0	0	0	0	0	0	0
Poaching	0	0	0	0	0	0	0	0
PHPE	0	<b>1</b>	0	0	0	0	<b>3</b>	0
WTSW	0	0	<b>3</b>	0	0	0	<b>5+</b>	<b>2</b>
CHSW	0	0	0	<b>P</b>	0	0	<b>3</b>	<b>2</b>
AUSW	0	0	0	0	0	0	<b>3</b>	<b>2</b>
WTSP	0	0	<b>1</b>	0	0	0	0	0
RTTB	0	0	0	<b>7</b>	0	0	0	<b>9</b>
MABO	0	0	0	0	0	0	<b>9</b>	<b>1</b>
BRBO	0	0	0	0	0	0	<b>6</b>	<b>2</b>
RFBO	0	0	0	<b>11</b>	0	0	<b>177</b>	<b>6</b>
GRFB	0	0	0	<b>15</b>	0	0	<b>100</b>	0
LEFB	0	0	0	0	0	0	0	0
GRCT	0	0	0	0	0	0	0	0
GRBT	0	0	<b>F</b>	<b>F</b>	0	0	0	0
SOTE	0	0	0	0	0	0	0	0
BRNO	0	10+	0	<b>F</b>	<b>F</b>	<b>1</b>	10	50
BKNO	0	0	0	0	0	0	0	0
BLNO	0	<b>3</b>	0	1	1	0	0	<b>1</b>
WHITE	0	0	0	0	0	0	0	0

**5. ISLES LAGOON CONTINUED (IS) AND KOIL LAGOON (K)**  
**Observers: Derek Brown, Ray Pierce, Katareti Taabu, WCU Temps**

Island	Is20	Is21	Is22	Is24	Is28	Big Koil	NW Koil	SW Koil
Area ha	0.5	1.2	1.5	1.5		7-10		3
Date	6/6	6/6	6/6	6/6	6/6	6/6	6/6	6/6
Time	1000	10300	10500	1120	1210	1330	1430	1330
Kimoa	?	<b>P</b>	<b>P</b>	P	P	P	?	<b>P</b>
Cat	0	0	0	0	0	0	0	0
Poaching	0	0	0	0	69	0	0	0
PHPE	0	<b>1</b>	0	0	0	<b>3</b>	0	0
WTSW	0	0	<b>1</b>	<b>2</b>	0	<b>5</b>	0	<b>75+</b>
CHSW	0	0	<b>1</b>	0	0	<b>2</b>	0	<b>2</b>
AUSW	1	0	0	0	0	<b>2</b>	0	<b>2</b>
WTSP	0	0	0	0	0	0	0	0
RTTB	0	0	<b>5</b>	<b>2</b>	<b>7</b>	<b>17</b>	<b>P</b>	<b>11</b>
MABO	0	0	0	<b>1</b>	<b>1</b>	<b>2</b>	0	<b>1</b>
BRBO	0	0	<b>1</b>	0	0	<b>2</b>	0	<b>5</b>
RFBO	0	0	<b>11</b>	<b>11</b>	0	<b>2</b>	<b>P</b>	<b>3</b>
GRFB	0	<b>1</b>	<b>24</b>	<b>84</b>	<b>12</b>	<b>30</b>	<b>P</b>	<b>55</b>
LEFB	0	0	0	0	0	<b>450</b>	0	0
GRCT	0	0	0	0	0	0	0	0
GRBT	0	0	0	0	0	<b>100</b>	0	0
SOTE	0	0	0	0	0	0	0	0
BRNO	1	0	0	0	4	5	0	2
BKNO	0	0	0	0	0	0	0	0
BLNO	0	0	0	0	0	0	0	1
WHITE	0	0	0	0	0	0	0	0

## 6. TIBO AND AMBO CHANNELS

Observers: Ratita Bebe, Derek Brown, Ray Pierce, Katareti Taabu,

Island	North Tibo	East Tibo	West Ambo	South Ambo	East Ambo
Area ha	0.8	3.8	0.3	1.4	0.4
Date	7/6	7/6	7/6	7/6	7/6
Time	1030	1115300	13000	1320	1400
Kimoa	<b>P</b>	P?	0	<b>P?</b>	0
Cat	0	0	0	0	0
Poaching	0	Old	0	Old	Old
PHPE	<b>1</b>	0	0	<b>2</b>	<b>1</b>
WTSW	<b>1</b>	<b>1</b>	0	<b>5</b>	<b>3</b>
CHSW	<b>2</b>	<b>2</b>	0	<b>3</b>	<b>3</b>
AUSW	0	0	<b>1</b>	0	<b>1</b>
WTSP	0	0	0	0	<b>Old</b>
RTTB	<b>15</b>	<b>6</b>	1	<b>19</b>	<b>8</b>
MABO	0	0	0	0	0
BRBO	0	<b>4</b>	0	0	<b>1</b>
RFBO	<b>3</b>	<b>84</b>	0	<b>27</b>	<b>1</b>
GRFB	<b>1</b>	<b>98</b>	0	<b>17</b>	<b>9</b>
LEFB	0	0	0	0	0
GRCT	0	0	1	0	0
GRBT	0	0	<b>60+</b>	0	0
SOTE	0	0	0	0	0
BRNO	<b>6</b>	<b>1</b>	<b>20</b>	<b>5</b>	<b>30+</b>
BKNO	0	<b>1</b>	0	0	0
BLNO	0	0	<b>20</b>	0	0
WHITE	0	0	0	0	0

**APPENDIX 2 - MOTU ON WHICH RAT BAITING OCCURRED, JUNE 2009**

<b>Motu</b>	<b>Size (Ha)</b>	<b>Total bait (kg)</b>	<b>Bait #1 (kg/ha)</b>	<b>Int. days</b>	<b>Bait #2 kg/ha</b>	<b>Notes</b>
Drum	6.1	135	16.4	6	5.75	c.390 m to mainland to S, 150 m to N Drum (then 150 m to mainland)
North Drum	2.5	60	18	3	6	150 m to mainland.
East Drum	1.0	15	15	-	none	c.30 m to mainland. Cat seen & killed. Presumed very low kimoa density due to cat. Cat has killed individuals of all 5 tubenose species on CXI plus GB Tern
Big Nimroona	6.5	125	12.3	5	6.9	100 m to mainland, but c.50 m more of bare coral to nearest veg.
NW Nimroona	0.6	20	16.6	5	16.6	c.50 m water gap to mainland, plus bare coral spit 50 m+. 30 m water gap to Big Nimroona, plus 60+ m of bare coral
SW Nimroona	3.9	88	14.9	3	7.7	Only 25 m water gap to mainland, but >100 m between vegetation. Connected to Nimroona by thin bare shellbank c.250-300 m long.
Big Fred/Tonga	3.5	80	11.4	7	11.4	Main part 2.4, long thin peninsula 1.1 ha. 40 m of water gap to mainland
SE Fred/Tonga	0.8	18	12.5	7	10	c.40 m water gap to mainland (NB. 0.3ha islet 80 m offshore nearby was rat-free)
NW Fred/Tonga	1.3	35	26.9	-	none	Cat seen & killed, no burrowing petrels left. c.40 m to mainland to S.
E isle, E. Manulu Lagoon	0.75	10+	13.3	-	none	30 m to mainland, c. 60m to rat-free W isle.
Isles Lagoon 2	1.4	20+	17.1			Good distances (100 m-plus) to mainland or 'stepping stone' islets
Isles Lagoon 5	0.3	6+	20			80 m to S of Isle 2
Isles Lagoon 3	0.5	10+	20			100 m-plus to mainland
Isles Lagoon 4	0.1	1+	10			Unclear kimoa status but within 120 m of Isle 2 so baited as precaution
Isles Lagoon 13	1.2	20+	16.6			100 m-plus to mainland
Isles Lagoon 16	4.1	57+	13.9			Small unmapped islets/banks toward peninsula to south. Overall distance >200 m but distances between stepping stone islets often <50 m

Isles Lagoon 21	1.2	20+	16.6			Secure – well over 100 m to any other land
Isles Lagoon 22	1.5	22+	14.6			Secure – well over 100 m to mainland. Treat as unit with Isle 23
Isles Lagoon 23	0.1	1+	10			Unclear kimoa status, baited in case – close to Isle 22
SW motu Koil	3	30+	10			Good distance to mainland, 100 m-plus
SW Islet Koil	0.1	0.8+	c.8			Unclear kimoa status but c.70 m to SW Isle, baited as a precaution.
NW Tibo	0.8	10+	12.5			Between 50-100 m offshore. Probable kimoa presence due to absence of smaller birds but could not be confirmed during 30 minute survey. Baited as security.
Big Ambo	1.4	20+	14.3			Secure motu – over 100 m to smaller motu to NW, and more than that to mainland. Good veg diversity. Ph petrel present
23 motu						
TOTALS	42.65	803.8				

**Rat-free motu surveyed:**

	Size	Notes
Drum Lagoon SE isle	0.2	Brown noddy and blue- grey noddy nests
Drum Lagoon SE isle 2	<0.1	2 brown noddy nests/chick
Drum Lagoon SW	0.6	2 smaller islets in close proximity to S – prob also rat-free but not surveyed
Fred/Tonga SE isle 2	0.3	Phoenix petrel, white-throated storm petrel
Isles Lagoon 7	0.2	100m+ to mainland. Probably no kimoa as no predation evident on lots of eggs on ground
Ambo Channel small NW motu	0.3	Two sections separated by 20m of v. shallow water. Nesting gb terns, bg noddies
Ambo Channel small E motu	0.4	Nice diversity of veg and ground cover. Several storm petrel eggs, breeding brown noddy
Little or E Manulu Lagoon W motu	c.0.7	Breeding grey-back terns,
(8 motu) TOTAL	2.8 ha	

**Rat-inhabited islands surveyed but not treated:**

Island	Size	Reason for not baiting
Ngaon te taake	18.6	Hard coral substrate in most places, little habitat for burrowing seabirds, though a few Ph petrels and shearwaters present
Ngaon te taake S1	1.0	Possible as a group, but low priority as only 20m water to first islet from mainland, and similar distances between.
Ngaon te taake S2	0.9	
Ngaon te taake S3	0.3	
Turai	2.6	V. high density of frigatebirds – disturbance issue. Poor soil for petrels, and high probability reinvasion from 2 points <30m from mainland
Isles Lagoon 24	1.5	Insufficient bait on day – several smaller islets in close proximity would need to be treated simultaneously, a lower priority but would be reasonably secure
Isles Lagoon 28	2.3	Heavily poached. 60-70 m to mainland, so a possible lower priority but whole group of islands and islets needs to be done at same time (some smaller ones (0.1 ha) are not shown on map. Isles 24,25,26 (all <1 ha, not visited) would need to be done at the same time
‘Frigate Island’ Koil Lagoon	c.8	Only c. 50 m gap to mainland at north end. Good range of birds present incl Phoenix petrel and shearwaters.
Tibo Channel, big motu	3.8	Kimoa reported, but lower priority – largely hard coral pan unsuitable for burrowing birds, but good vegetative cover in places. Would be very secure 200m-plus to shore.
TOTAL	39 ha	9 motu

**Islands visited – Unclear Rat Status, not baited:**

Isles Lagoon 20	0.5	Low habitat diversity. Few burrowing birds. Probably rat-free - no obvious evidence during visit.
NW motu, Koil Lagoon	0.6	Low habitat diversity. Few burrowing birds. Probably rat-free - no obvious evidence during visit.

**Motu still needing survey:**

Main Manulu Lagoon (several motu)  
 3 motu in lagoon N of Ambo/Tibo Channels (near Cottel Dam)  
 2 motu in Ambo Channel, S of causeway  
 6 motu in two separate lagoons, Tenei Rababa, S of Carver Way  
 At least 4 motu in lagoon SE of Nimroona, near Carver Way.