



# FINAL REPORT - ERADICATION OF MYNA FROM KIRIBATI

Prepared for:

Ministry of Environment, Lands and Agricultural Development, Government  
of Kiribati.

Prepared by:

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**Photo 1: Tarawa – aerial view from near airport with Betio village in far distance.**

## Executive Summary

A programme to eradicate two species of myna from Kiribati was carried out between November 2014 and November 2015 by staff of the Environment & Conservation Division, Ministry of Environment, Lands and Agricultural Development with funds through the regional GEF-PAS Invasives project coordinated by UNEP and SPREP, assisted by international consultant Dave Butler. This involved two 2-week field trips supported by planning and organisational work and some awareness-raising.

In November 2014 one week was spent on Onotoa island where a small population had been established for more than a decade though no birds could be found, and one week at the Port Village of Betio, Tarawa the site of the birds' arrival in the country where four myna were located. In the recent trip two weeks were spent at Betio, the second one with the assistance of shooter Keith Marshall.

Four myna were located at Betio, three common myna (*Acridotheres tristis*) (a pair and a singleton) and one Jungle Myna (*A. fuscus*). These were followed from dawn for one week to identify their roosting and foraging sites, then all four were shot by Marshall using a shotgun and air rifle in two days in the second week. Further surveying and discussions with local people and school pupils resulted in no further birds being found.

It is considered likely that the species have been eradicated from the Gilbert Group which in turn means that they have been eliminated from the country. However several months with no sightings of further birds is needed to confirm this.

Preventing the re-establishment is a priority. The most likely pathway for further myna to reach Kiribati is by boat from a nearby country with significant populations (e.g. Fiji, Samoa, Cook Islands). Biosecurity planning for the Gilbert Group is being undertaken shortly as a separate activity within the GEF-PAS project.

The different techniques available for capturing and killing mynas were discussed. In the Betio situation shooting was clearly the most effective in a short time frame while preliminary work suggested that poisoning would also work. Trapping would have been difficult requiring a longer effort, though this may be the best technique to employ on 'outer' atolls such as Onotoa where the community has shown a commitment to become involved.

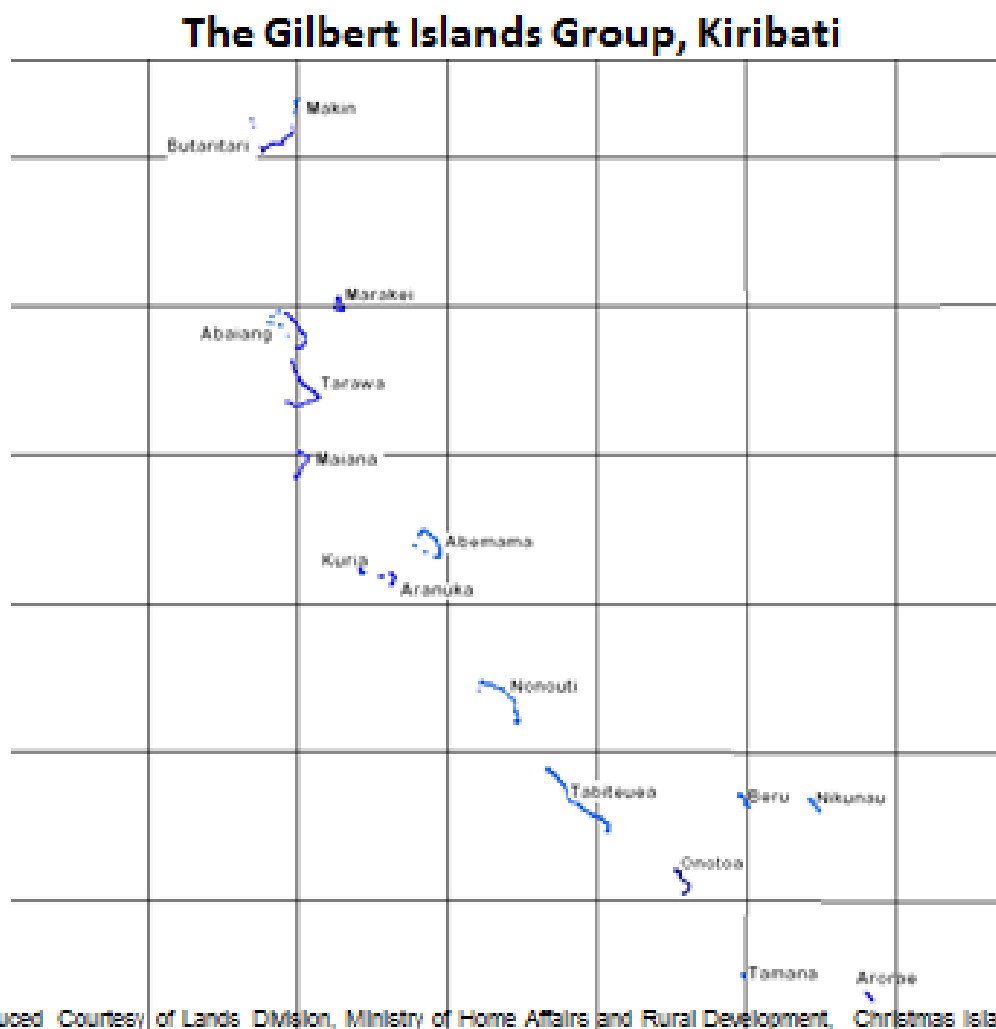
Observations of other bird species in Betio are recorded, including two new species for the country, one of which was unidentified and considered not native to the region.

## Background

The Ministry of Environment, Lands and Agricultural Development (MELAD) received funds through the regional GEF-PAS Invasives project implemented by the United Nations Environment Programme (UNEP) coordinated by the Secretariat for the Pacific Regional Environment Programme (SPREP) to eradicate the two species of myna found in Kiribati. The Common Myna (*Acridotheres tristis*) and the Jungle Myna (*A. fuscus*) are two of the world's most destructive invasive species, originally from Asia. They damage food crops such as papaya and breadfruit, attack native birds, nest in the roofs of houses where they make a mess with their droppings, are very noisy, and can carry diseases and parasites.

### History of myna in Kiribati

Myna have been recorded on four atolls in the Gilbert Group: Tarawa, Onotoa, Tabiteuea North and Tabiteuea South (Figure 1). The main port of Betio on Tarawa is the apparent source of the birds for the other atolls.



**Figure 1: Map of Gilbert Group**

According to an early proposal to eradicate the birds there were apparently around 300 birds in the country by 2003, most of them at Betio with a small number at Bairiki Village (Saavedra & Peltenburg 2003). However this figure appears to be a projection based on a suggested 80 birds on Tarawa and 40 each on Onotoa and Tabiteuea. These figures too seem largely anecdotal and are

considered a very significant over-estimation, as one of the co-authors recalls that *“They were in very low numbers – I only ever saw up to two at a time I think”* (Peltenburg, S. pers. comm.).

Tarawa Island population history:

The issue of birds on Tarawa was first identified in 2003 but birds must have been present earlier than this to provide a source for birds moved to Onotoa in 1999 (see below).

In recent years, dawn surveys of the port area of Betio have yielded the results in Table 1 and there have not been reports of birds in other parts of the atoll.

Date	Survey findings
March 2012	Several myna seen
7, 9, 10 June 2012	At least 6 jungle myna (including a pair prospecting for a nest site) and 4 common myna (2 pairs) - one bird was unusually marked with limited feathers on the head.
March 2014	2 myna seen but survey was later in morning so it was less likely to detect all birds.
1–week, November 2014	3 common myna (a pair always together and a single) and 1 jungle myna. The unusually marked common myna seen in 2012 was not present. There was no evidence of breeding.
January 2015	Same 4 birds as Nov. 2014 with no signs of breeding.
5 May 2015	4 common myna (pair and 2 juveniles) and 1 jungle myna
6 June 2015	3 common myna (pair and a single juvenile. Was considered that the other juvenile had died).
23 September 2015	3 myna seen (pair of common and single of uncertain species)
1-week, November 2015	3 common myna (a pair always together and a single) and 1 jungle myna.

**Table 1: Results of surveys at Betio, Tarawa**

Onotoa Island history:

A small number of common myna were taken by an individual to the island in 1999. They eventually centred their activities in Otowae Village and reached around 10 birds at their peak. In November 2012 there were 2-3 pairs there and community members had destroyed a nest and killed two further birds. During a March 2014 survey only two birds were consistently seen at Otowae.

In November 2014 the GEF-PAS project team visited Onotoa for one week and concentrated their activities at Otowae (Butler & Teremita 2014). Upon arrival in the village the local community reported that they had seen no myna since around May. During repeated dawn surveys and interviews with householders in the village there were no sightings or reports of myna and it was concluded that the population had died out.

There was a report of a single myna being seen at Otowae a few months ago, after the November 2014 survey during which no birds were seen and it was concluded that the population had died out. Two staff of ECD, Regina Rotitaake and Victoria Hnanguie visited Onotoa on 22-23 October 2015 on sanitation-related work, and went to Otowae and spoke to villagers there. They also met with Agricultural Assistant, Kaboatina Temauri who accompanied the 2014 survey team. No evidence of

any remaining myna was found. If a bird does turn up at Otowae, the community there have proven themselves to be dedicated to prevent any breeding and kill individuals.

### Tabiteuea Island history

#### *Tabiteuea North*

A population was identified on this island in 2003, concentrated around the Government station at Utiroa, but the island was not included in the November 2014 pre-eradication survey as indications were that no birds remained. An ECD team visited the island through the KAP III mangrove follow up in 22-29 April 2015 and consulted with participants regarding the presence of myna birds. No indication of the presence of birds was reported and it was concluded that Tabiteuea North is free of myna.

#### *Tabiteuea South*

Tabiteuea South was visited by a Departmental team undertaking consultations for the National Biodiversity Strategy and Action Plan (NBSAP) in November 2014. During consultations at the Junior High School participants from Taku village claimed that a single myna had nested there at the Catholic Maneaba and they had apparently been in the village since 1999. The team visited Taku on 29<sup>th</sup> and 30<sup>th</sup> November 2014 to confirm the existence of myna through dawn surveys, consultation with villagers and site visit to nesting site. No myna were seen and apparently the nest at the maneaba was destroyed 3 days prior to the visit to Taku. The team concluded there was no significant evidence that birds remained.

## History of myna eradication efforts

There were early unsuccessful attempts at eradication with cage traps, nesting box, slingshot, poison (not specified) and rat traps (Nagle, 2014) and the Invasive Species Programme of SPREP was approached for assistance (Saavedra & Peltenburg, 2003).

A funding proposal for scoping work was successfully submitted by Durrell Wildlife Conservation Trust to the Darwin Foundation in 2007 and John Allan from the British Central Science Laboratory visited Tarawa (and Samoa and Fiji) in 2008 with Jill Key of the Pacific Invasive Learning Network (PILN, 2007) as part of a study of training needs. They found just a single common myna at Betio and located a disused nest site.

The 2003 proposal was updated in 2007 but this does not seem to have progressed further.

A 2012 funding proposal by the Durrell Wildlife Conservation Trust for CEPF funds was successful in attracting funds for capacity building for invasive bird management in the region. A workshop in Samoa included discussion on the eradication on Kiribati which in turn secured some funds to advance this. However limited activities were undertaken.

Eradication was included as a major activity in Kiribati's work plan within the regional GEF-PAS project (2011-2016) and Butler, the international consultant recruited to assist, made two 2-week visits to the country in November 2014 and October 2015.

## Eradication programme

The programme was based on three elements, a pre-eradication survey in November 2014, the development of an eradication plan, and then the eradication itself in October 2015. The interval

between the survey and the eradication was longer than ideal and allowed a pair of common myna to produce two young.

The early months of 2015 were discounted for the operation after a review of climatic data due to the high likelihood of wet and stormy weather – a decision that proved correct given the difficulties the ECD experienced undertaking any dawn surveys over this period. A draft eradication plan was circulated in March identifying a range of proposed techniques including poisoning and trapping and having a shooter on standby. Feedback from several international experts suggested shooting should be adopted as the key technique and this was accepted and a lengthy process of securing the necessary approvals was put in place. In July, the project unfortunately lost the services of Keebwa Teremita who resigned as the GEF-PAS Invasives Project Coordinator to secure a permanent Government position. This role was not replaced and the management of the project was added to the work plan of George Taoaba, Biodiversity & Conservation Officer, and its oversight to that of Marii Marae, Senior Environment Officer. There were inevitable delays while they came up to speed with all the different project activities, with support from Ratita BweBwe, Wildlife & Conservation Officer.

### Pre-eradication survey – November 2014

It had been determined that this survey would cover Onotoa Island, to which there were only weekly flights, in addition to Betio Village, Tarawa, and it aimed to determine the numbers of birds present and follow their activities to identify possible approaches to killing them. No myna were detected on Onotoa (Butler & Teremita 2014) and only four located at Betio, 3 common myna and 1 jungle myna. The nocturnal roost site of three of the birds (a pair of common and the jungle) was identified as a large disused port crane allowing the pair to typically be followed for 2-3 hours after dawn to build up a good picture of their movements though the jungle myna was more elusive. The single common myna was observed on several occasions.

The survey also involved visits to the Junior Secondary Schools at Onotoa and Betio using a questionnaire featuring four bird species to obtain information of the distribution of myna. The inclusion of three other species, including one that was common and widespread, was designed to reduce the chance of false positives.

### Eradication Planning

A draft plan was completed on 31 March 2015, circulated widely, and finalised in July together with annexes containing details of the proposed New Zealand-based shooter, Keith Marshall and budget options for his involvement. Key planning activities including obtaining an Environment Licence from the Ministry of Environment, Lands and Agricultural Development for the use of the poison staricide, and obtaining approval from the Police Department for the involvement of Marshall and the importation of firearms and ammunition.

### Eradication

A two-week programme aimed at eradicating the myna present in Betio took place between 12 and 26 October 2015. There was a limited opportunity to schedule a visit prior to other commitments of Government staff in November/December (including turtle surveys), prior to the wetter season and before the end of the regional GEF-PAS project, so two weeks rather than a possible three were agreed on.

### Programme Week 1

The ECD team of George Taoaba, Marii Marae and Ratita BweBwe carried out surveys under the direction of Dave Butler. Birds were observed from dawn on most days of suitable weather. During this survey a pair of common myna used the port crane as their nocturnal roost, just as a pair had

the previous year. However no jungle myna used the crane, as one did last year, and instead a single common myna roosted there lower down. The pair could generally be followed for some hours though the single bird typically disappeared into the village to the south and was only seen occasionally. All three frequented trees near the Biosecurity Office near the middle of the day and it was here that the jungle myna was first located. In this area the pair of common myna was seen to chase off the single common myna. Much of the week was characterised by wet and windy weather. This made following birds more difficult but did extend their hours of foraging activity.

Butler and Bwebwe also checked a residential area of the village near the Catholic Cathedral where there had been earlier reports of birds, but interviews with householders tended to confirm that they were no longer present.

In addition a media announcement was prepared for circulation by radio informing the community about the work, the likely use of weapons and poison and encouraging them to report birds. Leaflets with photos and text were printed and placed around the village.

A meeting was held with the Principal of KIT and one of his staff was engaged to build a further trap to a design used in the Cook Islands.

### Programme Week 2

The team were joined by experienced shooter Keith Marshall who had been recruited by Butler to assist and spent the week in Betio following birds and targeting them with a shotgun or air rifle.

In addition Betio Junior Secondary School (photo 2) was visited to check whether pupils had seen birds outside the port area. One had been seen about a year earlier at the Meteorological Service compound which had been checked by the team and staff there had not encountered any recently.



**Photo 2: Robite Teate, Environment & Conservation Division, addressing pupils of Betio Junior Secondary School.**

## Results

The effort to shoot the birds began at dawn on the first morning after Marshall's arrival when the team was joined by two police officers, Itaia Rereua and Koruea Kaburara assigned to supervise the shooting. The pair of common myna repeated their behaviour of the previous morning, leaving their roost on the crane at 6.10am and flying across to the KOIL and then to the north of there. The team



found them foraging closely together in the yard with the storage sheds of Kiribati Fishing and the shotgun was set up with the aim of getting both birds with the single shot. This was duly achieved by Marshall after they flew up on top of a shipping container at a range of about 20m at 6.20am.

The team then moved to the landfill where the jungle myna was located briefly before flying into the trees behind. The team then moved to the Biosecurity Office as the heat of the day developed and the birds were considered likely to be seeking shelter. The jungle myna was spotted there soon afterwards and moved to an open branch of a breadfruit tree where Marshall shot it using the airgun braced against a parked vehicle at a range of about 15 metres at 8.40am.

The team split up, maintaining contact with 2-way radios, and moved between the landfill, the yards alongside the road to the port and the Biosecurity Office for several hours and eventually located the common myna at the landfill where it was brought across into the centre by playback of calls. One shooting opportunity was declined while the half of the team with the police arrived, as there were people in the vicinity. One shot was taken with the airgun at 12.20pm with the bird high in a breadfruit tree behind the landfill from a difficult position (photo 6) and missed. It was then seen briefly at Biosecurity at 2.20pm and relocated in the landfill at 4.45pm and a further shot taken with the airgun which scattered a few feathers but did not prevent the bird flying off strongly. At 6.11pm it was seen to fly to its usual roost spot on the crane.

The following day the bird was seen to leave the crane soon after 6am and fly south where it was lost among the trees. The team in two groups searched all the usual sites all day, playing tapes in the landfill and around the Biosecurity Office to no avail. Eventually at 5.30pm Taoaba and Marae saw the bird fly into the shipyard and called up the shooting team who were in the landfill. It was watched at a distance on a roof within the shipyard where a shot with the shotgun was declined as the range was considered too great to guarantee success. The bird flew to a tree where again no shot was taken as it was considered too far in among the branches, and then across to the crane to roost. The team raced around to the KPA yard and the bird was spotted in the open just above its usual roost site hidden at the top of the supporting tower. It was shot by Marshall using the air rifle braced against a container. All four known birds had been killed in the first two days of the shooting programme.

No further birds were located in surveys over the following three days covering the key sites and a wider area.



**Photo 3: Pair of common myna shot on container.**



**Photo 4: Some of team following shooting of pair (from left: Itaia Rereua, Keith Marshall, Dave Butler, Koruea Kaburara, George Taoaba).**



**Photo 5: Security guard Taruru with jungle myna shot at Biosecurity Office**



**Photo 6: Shooter Keith Marshall targeting single common myna in trees behind landfill.**

## Discussion - Technical

For the two weeks of the eradication attempt the team had a variety of possible techniques available:

1. Shooting
2. Poisoning with Starlicide
3. Cage Trapping
4. Mist netting
5. Noose trapping
6. Glue trapping

Observations during the November 2014 survey and this one identified that there were a pair of common myna (potentially the same individuals) that were relatively easy to follow from their night roost into a series of areas where they foraged on the ground. One of the first three techniques could be used to target them.

The single jungle myna (assumed to be the same individual) roosted at night on the crane in 2014 and at an unknown location in 2015 and proved impossible to follow as it typically disappeared into treed areas. It occasionally appeared in the landfill and fortunately used the same area as the common myna as a daytime roost and was seen feeding there on coconut flowers and berries of *Premna serratifolia*. Poisoning or trapping seemed very unlikely to work. The bird did respond occasionally to the playing of taped calls, flying from tree to tree in a situation where mist netting might have been possible, but finding a site where there was no wind or sun on the net would have been difficult. If a suitable night time roost was in use then noose trapping, or glue trapping if it was in a confined space, could have been tried. We did experiment by hanging up a ripening pawpaw at the daytime roost and setting out enough of these might have yielded a result and possibly a poisoning opportunity. However shooting was clearly by far the best option for this species.

The night time roost of the single common myna present in 2014 was never found and the bird seen fairly rarely, most often at the landfill, so would have been a challenging target. The 2015 individual roosted in the crane at a lower level than the pair, and used the same daytime roosting areas as they did (trees behind landfill and around Biosecurity Office) and was considered most likely to be the surviving offspring from the recent breeding. It could potentially have been targeted by poisoning or trapping in the landfill, but its movements were predictable enough that shooting should work.

### Shooting

Two weapons were chosen for this work:

- Harrington & Richardson Topper Model 158 12-gauge shotgun, with 7 ½ shot
- Sheridan c9a Air Rifle with Timberline 4½ x to 14x magnification telescope sight, and silencer, with 20 calibre pellets.

A rangefinder was used to accurately assess distances to judge the drop of the air rifle pellet at longer ranges.

The shotgun provided the opportunity to take out more than one bird at a time, a good range (c.30m), and increased likelihood of a kill in difficult conditions, e.g. wind. However it created a loud noise that was potentially disturbing for the public. We were determined to use it to get the two of the pair together, though there was a possibility of a bird staying with or returning to its dead mate if the air rifle had to be used.

The air rifle, operated with a simple pump system providing no 'kick', had a silencer fitted and was very quiet. It offered the possibility of removing a bird from a group without the others responding,



high accuracy to pick out individuals from structures and trees, and greater safety for the public. It was necessary to re-calibrate the air rifle on arrival in Kiribati by test firing at a target, to check that it had not been knocked in transit.

This combination of weapons proved ideal in a busy port area. Either could have been varied, e.g. to provide for repeat shots or in the case of the air rifle to obtain greater power (useful if wind was a significant issue) and range. However a key was the shooter's familiarity and confidence with the weapons based on significant practice sessions in New Zealand targeting a golf ball at different distances up to 50m. It is important to note that a bird's vital organs are located quite high up in the body so the upper third formed the target area for the air rifle.

Shooting was facilitated by having two dedicated teams each with a vehicle and two-way radio so that the shooter could rapidly be on site when any sightings were made. An understanding of the birds' movements allowed the teams to be typically located either side of the harbour to try to continuously track birds. Each team benefited from having 2-3 people with one or two pairs of binoculars (ideally light with 8x magnification) so that someone was always watching any bird located. Taking eyes off a bird at the moment it chose to fly off could easily see it lost for the rest of the day.

A key reason for shooting to be so effective in Kiribati is that the birds showed no fear of people, were used to having large numbers of people around everywhere, and could be approached closely. On the landfill there were often people foraging for recyclables and birds flew off short distances when approached. There were several open roadways where waste had been recently bulldozed and we could move myna from one of these to the next, which would have allowed them to be targeted by a concealed shooter if required. They also typically perched in the open. Our planning had included building some high perches in the landfill but we discontinued this when we found that they frequently used a small branched tree with no leaves that we then proposed to target.

## Poisoning

The team imported a small amount of the bird toxin DRC1339 Starlicide from Animal Control Products in New Zealand. This was supplied as a powder mixed 50% with icing sugar which hides the bitter flavour and means that it is no longer classified as a hazardous substance for transport – the pure powder is mildly corrosive.

We had planned to use this according to a methodology supplied by Gerald McCormack and used in the Cook Islands:

- *Cook 250g rice with one tablespoon of sugar until al dente (soft outside, slightly hard inside). Drain and wash in cold water so the grains remain separate.*
- *Warm 20ml water and 20ml veg oil to about 37degC (warm to the little finger), put in closed vial and shake to mix, add 2.5g (1 packet) DRC1339 (Starlicide) and shake until all dissolved.*
- *Sprinkle over the cooked rice and mix thoroughly. Mix in about 100g of Corned Beef.*
- *Dry and store in a cool place out of sunlight. Use within five days.*
- *The poison is rapidly denatured by sunlight and rain. Place system in a shaded location.*

Pre-baiting was started at the landfill with rice cooked with sugar and mixed with sardine set out in tinfoil. One of the pair had been observed feeding in the remains of takeaway food in foil and this was also an attempt to reduce the take by dogs. A handful of rice was wrapped up leaving a small opening and this was fed upon by a bird and ignored by dogs over a 2-day period.

I have had some discussion about the number of grains of rice coated in starlicide that would be needed to kill a myna. We used the landfill for our initial baiting as the one place where the common myna visited consistently and could be readily observed. But they did not seem to feed for long on any particular item here but kept on the move, or were subject to disturbance, so getting a

significant number of grains eaten was a challenge. We were moving to pre-bait in a secure yard adjacent to the landfill where getting more grains eaten at a time seemed likely, though there was a risk that feral pigeons would also be attracted to this site.

The following calculation was provided by Bill Simmons of Animal Control Products, NZ (adjusted for myna weight of 100g and the use of 250g of rice).

*'If the myna's susceptibility to DRC1339 is similar to that of the blackbird and starling, (LD50 = 3mg/kg) we could guess the LD100 is around 5mg/kg. So if an adult myna weighs 100 grams, an individual bird needs 0.5mg of DRC1339.*

*If you apply 1 sachet of 2.5grams of DRC1339 per 250 grams of rice and if each rice grain is 0.05 grams, each of the 5,000 grains has 0.5mg of DRC1339 (assuming it is distributed evenly). So one grain of rice could be a lethal dose.*

*You should make some allowance for uneven distribution of DRC1339 in the bait and also decline in activity due to UV exposure, heat etc. Maybe 5 grains per bird would be a reasonable guess.'*

A different approach was taken on islands in the Atlantic where myna showing some aversion to starlicide, though whether this was aversion to taste or visibility, or simple bait aversion after associating cooked rice with illness and death of some flock members was uncertain (Chris Feare, pers. comm.). To avoid possible problems of palatability he ended up aiming for a 0.1 % concentration of starlicide in the rice. In his observations mynas tended to gobble up rice grains when they encountered them and if each grain had a lethal dose and a bird ate 30 grains in a feeding bout, a lot of the poison would be wasted and there was a potentially serious risk to non-target species. More research on the palatability of starlicide and ideal dosage is required but it seems likely that different concentrations will be appropriate in different situations.

We enjoyed the irony shown in the photo below. When we came to spread cooked rice as non-toxic bait in the landfill we found that someone had dumped a large number of sacks of rice! Happily this did not soften enough to be of any potential attraction to myna during the programme.



**Photo 7: Sacks of rice dumped at landfill.**

## Cage trapping

We had built one PeeGee Myna and Starling trap and an 'Atiu Twin-door Myna Trap' was under construction. However we did not pursue trapping while we tried shooting and poisoning as the two preferred options. Only the pair of common myna was followed long enough to identify several foraging areas where trapping could have been attempted, but the other techniques could be more easily applied at these. Had the capture of a call bird been likely through the use of another technique such as netting or noose trapping, then trapping might have been more worthwhile. We had small crow-like decoys of about the right size which we planned to paint up and use along with taped calls if required.

Trapping would probably be the method of choice on an outer island such as Onotoa where the community had shown themselves prepared to get involved to keep their villages free of the birds. There are large open spaces where traps could readily be set up and food baits should prove attractive.

## Mist netting

We recognised that mist-netting a 'smart' bird like a myna would be challenging. However the daytime roost area provided a suitable site to try this if we had needed to with some low trees, shade and shelter from wind. We had also managed to move the jungle myna around there once at a catchable height using taped calls. A net could also possibly be placed if a bird was observed to feed on a pawpaw using a regular flight route.

## Noose and glue trapping

We were equipped with plastic mesh and fishing line to construct a mat of nooses if a suitable situation to use this had arisen. In 2014, birds were quite often seen to perch on floodlights. A mat on the ground in a feeding area might also have been effective as a means of catching a call bird. Glue traps, as used for rodents, were suggested as a possible last resort if the roost sites of the birds in the crane could be accessed and were sufficiently confined that they could be 'walled' with glue. The humanness of such an approach was certainly a factor for consideration and there would have been a requirement to access the birds soon after capture, to euthanise them or extract them unharmed with the use of cooking oil (as a call bird).

## Use of taped calls

We had several calls of the two species downloaded from the xeno-canto website [www.xeno-canto.org](http://www.xeno-canto.org) which we played on occasion using a 'Portable Active Bluetooth Music Player' model BE-13 bought locally. Marshall also had calls on other equipment. We did not use these for the pair as experience in 2014 had shown no responsiveness, presumably because there was no territoriality going on. However both the single birds did show some response to the calls of their conspecific, which served to locate the common myna in the landfill on one occasion and caused both to approach in the direction of the observer. This response was not very pronounced but enough to suggest it is worth having this capability on hand.

It was remarkable at what distance one could hear the calls of the myna as there were no similar calls in the area. The birds were however relatively quiet, calling mostly from the crane upon emerging first thing in the morning and before 'retiring' at night.

## Discussion – failure of myna to establish significant populations in Kiribati

There is uncertainty about the initial establishment of the populations of the two myna species in Kiribati, how many founders there were, whether there was a single founder event, and what numbers were reached in the first few years. It seems that the initial establishment was at Betio and there was some spread of birds to other sites on Tarawa including Beariki and Beckinbeu (in the vicinity of the Otintaai Hotel). Common myna were taken from Tarawa by members of the same family to Onotoa and Tabiteuea North.

What is clear is that neither species have thrived in Kiribati despite more than ten years of presence. On Tarawa, birds have apparently failed to establish outside Betio, and in that village they have hung on in small number for more than a decade with occasional breeding preventing populations dying out. It is tempting to suggest that the single jungle myna killed in 2015 was the same individual seen in November 2014, though its night roost site had shifted from the port crane to an unknown locality. Similarly the pair of common myna may have also been the same birds as last year as they again roosted high up on the crane though moved from the pulley system on the jib to that of the gantry (photo 8). The single common myna is considered most likely to be a surviving offspring of the pair as it also roosts on the crane, which the bird present in 2014 did not, and was seen being chased away by them near the Biosecurity Office whereas no interactions were observed between the pair and single in 2014.

The failure of the two species to establish significant populations on any of the three atolls that they reached in Kiribati could be a founder effect – i.e. in each case insufficient productive, compatible birds arrived to get a population going strongly. It seems more likely to indicate that the environment is not very suitable for the species, for myna have shown a similar pattern on other atolls. (Pratt et al. 1987) record that there was a breeding population of common myna on Kwajalein Atoll, Marshall Islands that died out. Twelve common myna reportedly arrived on Fakaofu Atoll, Tokelau on a boat from Samoa in May 2004 and the population reached an estimated 40 birds by January 2006. During a feasibility study for eradication carried out in May 2006 (Nagle 2006) only three jungle myna could be located!<sup>1</sup> An eradication programme was put in place that included destruction of nests and eggs. Two myna were photographed there in 2010 but none were apparently present by 2012 (Conservation International 2013). A single bird was possibly seen on Nukunonu Atoll 64km away in 2011, but visits to both atolls in September 2012 found no myna and the population is considered to have died out (Pierce et al. 2012).

In ideal situations myna can be very productive – e.g. a jungle myna clutch is of 3-6 eggs and they can breed twice in a season (Feare & Craig 1999). On Kiribati productivity has apparently been limited – e.g. only two juveniles produced from a 2014 attempt and no evidence of multiple clutches.

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<sup>1</sup> It seems likely that the birds were misidentified initially, but interesting to see the figure of 40 which was also used to describe some of the early number in Kiribati. In both cases inexperienced observers presumably saw a small number of very active birds and badly misjudged how many were actually present.



**Photo 8: Night roosts of different birds on disused port crane, Betio.**

**Key:**

1. Pair of common myna – November 2014 – hidden inside around pulleys
2. Jungle myna – November 2014 – tucked in under plates on main jib
3. Pair of common myna – October/November 2015 - hidden inside around pulleys
4. Common myna - October/November 2015 – hidden between crane and top of tower

Tarawa does have a very high population density with over 3000 people per square kilometre, much higher than Auckland or Sydney cities for example (Te Beretitenti 2012a). There are very few open areas as favoured by myna for feeding, and competition from feral cats and dogs, rats and feral pigeons. The port village of Betio has more open areas including large company yards and sportsgrounds as well as landfill providing regular food, so it makes sense that this is where populations can persist. These may also be supplemented by new individuals arriving by boat.

The outer atolls of Onotoa and Tabiteuea North have lower population densities of 97 and 124 per sq. km. respectively (Te Beretitenti 2012b, 2012c). However there is limited availability of scrap food and low faunal biodiversity with few insect species to provide food. Conditions appear more favourable for jungle myna rather than common myna given their greater use of fruit-bearing trees such as coconut and pawpaw. But people grow the latter very close to their houses and would be unlikely to tolerate any birds eating the fruit.



Even though Kiribati does not offer ideal conditions for myna birds, this does not mean that they can be discounted as a future threat. There are a number of examples of alien species arriving in a country and taking years to become an invasive problem, associated perhaps with them adapting to local conditions or the arrival of individuals genetically programmed to behave in different ways that allow them to thrive. Preventing the arrival of further myna must remain a priority and this is discussed in the next section.

## Discussion – Preventing future establishment of myna in the Gilbert Group

Myna are most likely to reach Kiribati by boat from countries in the region where the birds are well established. The port of Betio on Tarawa receives the vast majority of such traffic, particularly cargo and fishing vessels. However there are occasional cruise boats, e.g. some departing Apia, Samoa that visit Bonriki, Tarawa, and others that visit other atolls in the Gilbert Group. The first priority is to prevent myna from reaching the Group, concentrating particularly on Betio, and the second priority to stop any birds moving to other islands on inter-island shipping.



**Photo 9: Loading one of the inter-island boats at Betio.**

Biosecurity staff currently board vessels visiting Betio at sea before permitting them to dock or anchor. However this is close enough to shore that any myna are likely to fly to land before they can be intercepted and either dealt with or the boat turned away. Birds thus need to be killed at sea, or detected early and eradicated if they reach land. One of the remaining tasks of the GEF-PAS Invasive Species Project is to produce a pest control plan for shipping and Early Detection and Rapid Response Plan and these are expected to develop detailed provisions targeting invasive birds like mynas.

If mynas are detected in Betio in the future, shooting them would be the preferred approach. Currently my understanding is that the only people with firearms (shotguns) on Tarawa are the Maritime Police. However Environment Officers on Kiritimati have been licenced and trained to use

shotguns in the past, primarily for control of feral cats. It is suggested that discussions are held to create some institutional capacity to carry out shooting of invasive birds on Tarawa. This should be a more cost-effective solution than the alternative which would be to again bring experienced shooters in from overseas.

## Acknowledgements

The eradication was a strong team effort. Keebwa Teremita, the initial Project Coordinator, established the groundwork for the programme and ably organised the pre-eradication survey. When he left to take up a permanent Government job, staff members George Taoaba and Marii Maraе stepped in to manage the project and lead the eradication team assisted in the field by Ratita Bwebwe and with education and advocacy work by Robite Teaete and Regina Rotitaake. I am very grateful to the field team for their dedication, which involved driving to the site very early in the morning, day after day, and keeping the birds under intense observation. The senior staff of the ECD, Taouea Reiher (Director) and Taulehia Pulefou provided consistent support and took a strong interest in the project. I was appreciative of the opportunity to meet with the Government Secretary, Ministry of Environment, Lands and Agricultural Development to acknowledge the support of the Government.

Keith Marshall did a terrific job as the shooter. He undertook considerable practice and planning before the operation and rapidly adapted to the local situation to remove the four birds with minimal drama. John Frank Tabeibeti of Biosecurity Division was a very supportive presence during the pre-survey and the eradication and his experience and dedication were much appreciated. Security guard Taruru was a wonderful observer at the Biosecurity Office in Betio. The support of the management of that Division is also acknowledged.

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It was a rewarding experience to play a role in bringing all these people together to achieve what we hope to be a successful outcome to a 10+year process to free Kiribati and its people from the impact of myna birds.

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Ko bati n rabwa!

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## Annex 1: Permitting requirements for weapons and ammunition.

This annex identifies the permitting requirements to bring a shooter, firearms and ammunition to Kiribati from New Zealand which may be useful for future reference. The firearms and airgun pellets could travel with the shooter as checked-in baggage, whereas the shotgun ammunition had to travel as air cargo as dangerous goods with assistance of a freight company. Shipping of ammunition should be more cost-effective if time allows.

Required from Kiribati:

- Approval from Police Department for involvement of the shooter and the temporary input of specified firearms and ammunition – based on a request letter with details of the project, the skills and experience of the proposed shooter and a copy of his NZ Firearms Licence.
- Kiribati Firearms Licence from Police Department supplied with approval above.
- Customs approval for temporary importation of firearm and ammunition.

Required from New Zealand:

- Consent to Export Strategic Goods from Ministry of Foreign Affairs and Trade
- 'Permit to Import Restricted Airguns/Firearms/Restricted Weapons/Parts' from New Zealand Police (Surplus shotgun ammunition was not air-freighted back to NZ and re-imported but handed over to Kiribati Police).
- Approval from Air New Zealand to travel with firearms as checked-in luggage.
- Involvement of freight company with dangerous goods licence to organise freighting of ammunition.

Required from Fiji (Travel from NZ to Kiribati involved an overnight stay in Nadi):

- Approval from Civil Aviation Authority of Fiji to Fiji Airways to carry small arms and ammunition on specific schedule
- Approval from Fiji Airways to carry the arms and ammunition
- Support from Fiji Border Police and Customs for the firearms to be held overnight in the armoury at Nadi in transit in both directions



**Photo 10: Detective Inspector Laurence Randolph inspecting the weapons with shooter Keith Marshall upon arrival.**

## Annex 2: Other bird records.

Spending two weeks searching for and observing myna in Betio provided the opportunity to identify the other birdlife using the port area as below. One species, the greenshank may be a new record for the country as it is not listed for Kiribati by Birdlife International ([www.birdlife.org](http://www.birdlife.org)) or Wikipedia ([www.en.wikipedia.org](http://www.en.wikipedia.org)). The sharp-tailed sandpiper is not listed by the former. An unidentified passerine is also considered new to the country.

### Unknown passerine

This was a significant observation representing a new species that has presumably arrived in Kiribati from overseas which could theoretically be an invasive species and a threat if more than one individual arrives. A single small bird was observed briefly in flight in the treed area between the Kiribati Institute of Technology and the nearby Community Police Base. I only glimpsed it briefly largely as a silhouette, sparrow-sized or smaller, and got the impression that it was brownish but could not confidently rule out any plumage colour. Taoaba also saw it for longer and noted an undulating flight with the bird repeatedly flapping fast in a slightly upward direction, then gliding down. We visited the area on several other occasions but never saw it again.

One small Asian species found in the region (Fiji) with the same flight characteristic is the red avadavat<sup>2</sup> (*Amandava amandava*) of which the female has dull colouring. This is a grain eater that is not considered invasive and seems unlikely to thrive on Kiribati.

#### **Eastern Reef Heron (*Egretta sacra*)**

Several birds (5-10) were seen feeding in the landfill and the shoreline around the harbour.

#### **Pacific Golden Plover (*Pluvialis fulva*)**

Individuals and small groups in landfill, open yards, sportsgrounds and on roofs of buildings totalling c.100.

#### **Ruddy turnstone (*Arenaria interpres*)**

The most common wading bird with small groups in landfill, open yards, on roofs of buildings and on the shore totalling c.200.

#### **Sharp-tailed sandpiper (*Calidris acuminata*)**

A single bird seen in shallow pools in the landfill.

#### **Bar-tailed godwit (*Limosa japonica*)**

A single bird seen in shallow pools in the landfill.

#### **Wandering tattler (*Heteroscelus incanus*)**

Commonly see around landfill, open yards, on roofs of buildings and on the shore – 30 or so in all.

#### **Greenshank (*Tringa nebularia*)**

A single bird seen in shallow pools in the landfill (as photo).

#### **Crested tern (*Sterna bergii*)**

Single bird seen.

#### **Black-naped tern (*Sterna sumatrana*)**

Seen in small numbers (totalling 8-10).

#### **Black noddy (*Anous minutus*)**

Several 100 birds nesting in different locations around the port, nest-building or incubating but not yet feeding chicks.

#### **White tern (*Gygis alba*)**

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<sup>2</sup> This species is also a popular cage bird so if it was the bird seen it could possibly have been brought into the country deliberately and escaped from captivity.



Breeding in small numbers on trees throughout the area.

**Pacific imperial-pigeon (*Ducula pacifica*)**

Present in significant numbers throughout the village – not hunted in Kiribati.

**Feral pigeon (*Columba livia*)**

Small flocks present in port particularly around the KPA yard, Copra factory and KOIL yard totalling c.60.

**Long-tailed koel (*Eudynamys taitensis*)**

A single bird was observed flying to and fro from trees in and behind the landfill (as photo).



**Photo 11: Greenshank with turnstone in background at landfill.**



**Photo 12: Long-tailed koel in tree behind landfill.**



Figure 2: Betio Island – Dec 2013 satellite imagery – Google Earth





Figure 3: Key sites used by myna at Betio.





Photo 13: from crane to yards 2 & 3.



Photo 14: from crane towards landfill.



Photo 15: from near entrance to shipyard (11) looking back towards 8.