



# Otanewainuku Kiwi Trust – Kokako Survey

*Final Report*

**May 2013**

*Prepared by:  
Conor Quinn & Carmel Richardson*



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# 1 Executive Summary

A kokako walk-through survey was conducted in Otanewainuku Forest during March 2013 to obtain data on kokako numbers resident in the forest, following two translocation releases of a total of 18 birds in 2010 and 2011. Prior to this survey two of the 18 birds were likely deceased, with one confirmed, as victims of predation outside the pest control management area.

The project successfully detected 16 birds during the project, two of which were found outside the pest management block. Estimated territories for a further four birds straddle the border of the pest management block, while the remaining ten birds all reside well within the pest management area.

The population generally seems to be split by capture location, with most of the Kaharoa birds having established territories north of the release sites, while the Rotoehu birds have established territories south of the release sites.

There were six pairs detected, a juvenile confirmed with one pair, and three other single birds. All pairs include birds from the same capture locations.

One pair from previous monitoring results was not detected, although this pair may be located well north of the pest management block. One other bird was not detected, although its male mate was observed extensively and was definitely single. Kokako song was heard during the survey in areas where subsequent fieldwork produced no results. Combined with a number of additional factors this leads us to conclude that not all kokako resident in Otanewainuku Forest were detected during this survey.

The results indicate that the adult survival rate is good, although birds aren't breeding as successfully as expected. However, a similar trend has emerged in other newly translocated populations and further research is required to better understand the variables involved in why this is happening.

The number of birds detected in the forest and the presence of at least one juvenile are a very positive sign for the establishment of a sustainable kokako population in Otanewainuku Forest.

The results support a number of recommendations, including:

- That the Otanewainuku Kiwi Trust (OKT) use the Kokako Management Folder to help guide their management of this kokako population and regularly seek advice from the National Kokako Recovery Group regarding any new strategies developed for assisting in the establishment of a sustainable translocated kokako population.
- Extending the pest control management area as far north as budget and resources allow.
- Conducting a kokako census in September 2014.
- Initiating an annual bird monitoring project in Otanewainuku Forest.

## 2 Introduction

The Otanewainuku Kiwi Trust (OKT) was formed in 2002 by Te Puke Forest and Bird and other members of the community in response to a decline of North Island brown kiwi in the Otanewainuku Forest. The forest consists of over 1200 hectares of virgin bush located 15km south of Tauranga.

The Trust operates under a Memorandum of Understanding with the Department of Conservation (DOC). DOC administers the land and provides technical advice and guidance on pest control and translocation of birds.

Pest control at Otanewainuku includes a mix of trapping for stoats, ferrets and feral cats, goat culling, and an annual bait station operation. The pest control area covers a 925 hectare block. On the back of successful predator control since 2002 overall bird numbers have increased in the forest. As well as translocating kiwi the OKT have recently translocated a number of kokako.

Otanewainuku previously maintained a population of kokako, but their numbers declined due to predation and the few remaining birds were removed to Little Barrier Island in the late 1980s. The forest's rejuvenation due to the pest control regime should provide kokako with suitable habitat for successful breeding and the goal is for a sustainable population to establish itself across the pest control block and beyond, in alignment with an expanded pest management area. There was anecdotal information that a bird from the remnant population had been heard in the forest prior to the translocation project commencing.

During 2010 and 2011 a total of 18 kokako were captured and transferred from Kaharoa Forest and Rotoehu Forest to Otanewainuku. Acoustic anchoring was conducted for two months at each of the release sites. At the site where Rotoehu birds were released Rotoehu song was played and at the site where Kaharoa birds were released Kaharoa song was played (Wills, 2012). The acoustic anchoring was conducted to prevent post-release dispersal, which is common after translocation (Armstrong *et al*, 1999).

Monitoring was carried out subsequent to bird release in 2010 and it was determined that, although some birds had died, breeding had taken place and juveniles were present within the forest. The monitoring produced bird locations and territories which are detailed in the map below.

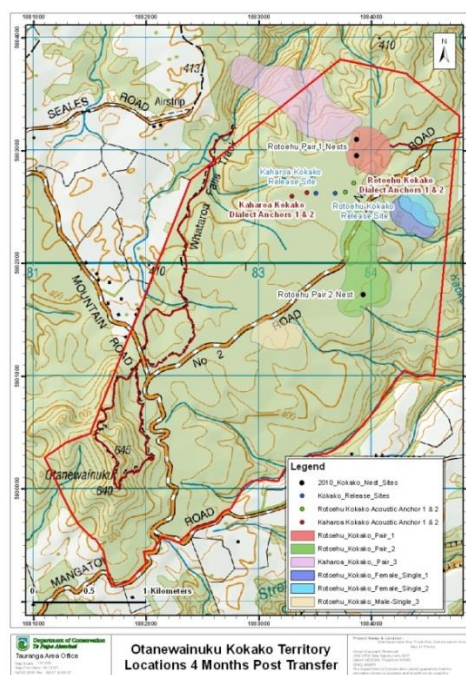


Figure 1. Otanewainuku Kokako Territory Locations Post Transfer 2010

The monitoring determined that some nesting had taken place, while a number of birds had moved outside the pest control area and subsequently returned. Another wave of monitoring in 2011, following the second release of birds, was unable to detect further nesting of pairs. This monitoring was of only a short duration so nesting may have taken place but was not detected. However, a short monitoring session in June-July 2012 detected three and possibly four juvenile kokako in the forest.

Of the birds released, 14 have been observed since. One has been confirmed as deceased, found outside the pest management area. Another is presumed to have suffered the same fate, while two have yet to be observed. Details for birds believed to be resident in Otanewainuku prior to the 2013 project can be found in table 1 below. The band combination identifies the colour of bands placed on a bird's leg(s), left leg first - then right leg (M=metal; R=red; O=orange; G=green; Y=yellow; W=white; B=blue; L=lime).

**Table 1. Individual Bird Details Including Band Combination and Last Known Location 2011-2012**

CAPTURE LOCATION	SEX M/F	BAND ID	BAND COMBINATION	STATUS
KAHAROA	F	E-216409	Rm - L	<b>PAIR</b> Whataroa Area mostly outside boundary, North Block Line 15 extending up to 1km North on northern side of Whataroa Stream
KAHAROA	M	E-216410	Om - W	
KAHAROA	F	E-216411	Om - G	<b>PAIR</b> North Block Lines 23-25 mostly just outside Boundary
KAHAROA	M	E-216412	R - Om	
KAHAROA	M	E-216413	Rm - Y	<b>Possible Pair</b> on Mountain Line 36 - 38 from Walking Track South
KAHAROA	F	E-216217	Ym - G	
KAHAROA	M	E-216414	Om - B	South Block Line 8&9 BS 8 - 11 also located North Block Line 19 BS 16 with another unidentified kokako
KAHAROA	F	E-216415	Ym - Y	<b>PAIR Unknown Male</b> May be Om - B as listed above line 18 - 21 BS 16 - 17. Located with Juv following 15m behind
ROTOEHU	F	E-216401	m - W	Unknown
ROTOEHU	M	E-216402	m - Y	<b>PAIR</b> South Block Lines 9 - 11 BS 1 - 9
ROTOEHU	F	E-216403	m - R	
ROTOEHU	M	E-216406	m - B	<b>Possible pair</b> South Block Line 19 - 20 BS 2 May be pair also located North Block Line 8 - 9 BS 5 - 6
ROTOEHU	F	E-216418	Ym - W	
ROTOEHU	F	E-216404	m - O	<b>PAIR</b> North Block Lines 18 - 20 BS 6 - 12
ROTOEHU	M	E-216407	mO - O	
ROTOEHU	F	E-216408	mO - Y	Unknown

As only sporadic monitoring was carried out in 2012 OKT contracted First Words In Fauna (FWIF) to conduct a kokako survey project in March 2013. Reliable monitoring of populations founded by translocation is necessary to determine factors affecting the success of species translocations (Lovegrove 1996).

Anecdotal information from OKT members indicated that a number of birds had moved around the forest, but that some had stayed in proximity to release sites.

To provide OKT with the most cost efficient project a mixed methodological approach was chosen. This was designed to allow capture of as much data as possible regarding overall numbers of birds, as well as for territorial pairs, singles and juveniles, if present.

Fieldwork was to be conducted over 2-3 weeks, weather permitting, and northern ridgelines outside the Otanewainuku pest control area were also to be monitored as birds had been observed in this vicinity.

Our main objective was to determine how many kokako were present in Otanewainuku Forest as at March 2013. Secondary objectives were to determine:

- The number of translocated birds remaining (using band combinations for identification);
- Presence of unbanded birds;
- How many birds were territorial pairs;
- How many were single territory holders;
- Which birds previously detailed as pairs remained pairs;
- Which birds had formed new pairs;
- How many juveniles were present;
- Estimates of bird territories.

## 3 Methods

Due to time and budgetary considerations, combined with the large area (1000+ hectares) of study, it was determined that a mixed methodological approach would provide the best results. Previous monitoring results and current anecdotal evidence from OKT members was also used to estimate locations of birds and where pairs were most likely to be found.

### 1.1 Kokako Survey Methodology

A mix of 'Juvenile Survey' and 'walk-through' survey techniques was used to determine presence of kokako and juveniles, and to enable good coverage of the Otanewainuku forest. Two FWIF personnel conducted the survey; Conor Quinn and Carmel Richardson.

#### Survey Technique Overviews

Juvenile Surveys entail visiting areas where pairs have previously been known to have nested. Upon finding the pair the birds are followed multiple times until it is determined where the nest is, if the pair has successfully bred, and if juveniles are present.

A kokako walk-through survey is a quick survey method, used to determine whether kokako are present in an area or not, (distribution) and to give an indication of their abundance. This is a standard survey method used and recognised by the National Kokako Recovery Group. Walk-through surveys are usually undertaken on ridges and suitable kokako habitat.

Surveys are done in reasonable weather conditions, (i.e. not raining or windy) from dawn until early afternoon. Observers work along ridges and routes and will traverse the area of interest listening for kokako. If no kokako are heard in an initial five minute listening period, tape of local dialect is played, in the following sequence:

1. 3 mew calls, followed by 5 minutes listening.
2. 3 mew calls, followed by 5 minutes listening.
3. 30 seconds of local dialect song, followed by 5 minutes listening.

Survey areas are normally visited only once, (hence 'walk-through') and the electronic calling devices are used every 200 metres. On average 400 metres can be covered per hour, including 2-3 sessions using the electronic calling devices.

For both techniques; when kokako were seen or heard a compass bearing was taken, distance was estimated and GPS grid references were noted. All times and observations were recorded in the field, then written up and mapped. Upon finding a bird/pair a follow was conducted, as per the conditions allowed.

A follow constituted tracking the bird/pair for up to 90 minutes, with the track recorded using a handheld GPS device.

### 1.2 Methodology Considerations

Initially we began with the 'Juvenile Survey' technique and both observers travelled to sites where birds and bird pairs had been most recently observed. However, after three field work days without observing a single bird at any of these six locations it was determined that a full walk-through methodology would be initiated to cover as much of the study area as possible. This would present the best opportunity for observing as many birds as possible within the study period.

### 1.3 Location and Number of Walk-through Survey Tracks

- Most walk-through survey tracks inside the pest control area were conducted on bait station lines.

- Walk-through survey tracks outside the pest control area (north of the pest control block) were conducted on recognisable routes and/or ridge lines.
- 40 separate walk-through tracks were conducted during fieldwork.
- 155 waypoints were marked where playback sessions took place (see figure 2 below).
- Multiple playback sessions took place at a number of sites and 191 total playback sessions were logged during fieldwork.
- 12 separate follows of birds/pairs were conducted during fieldwork.

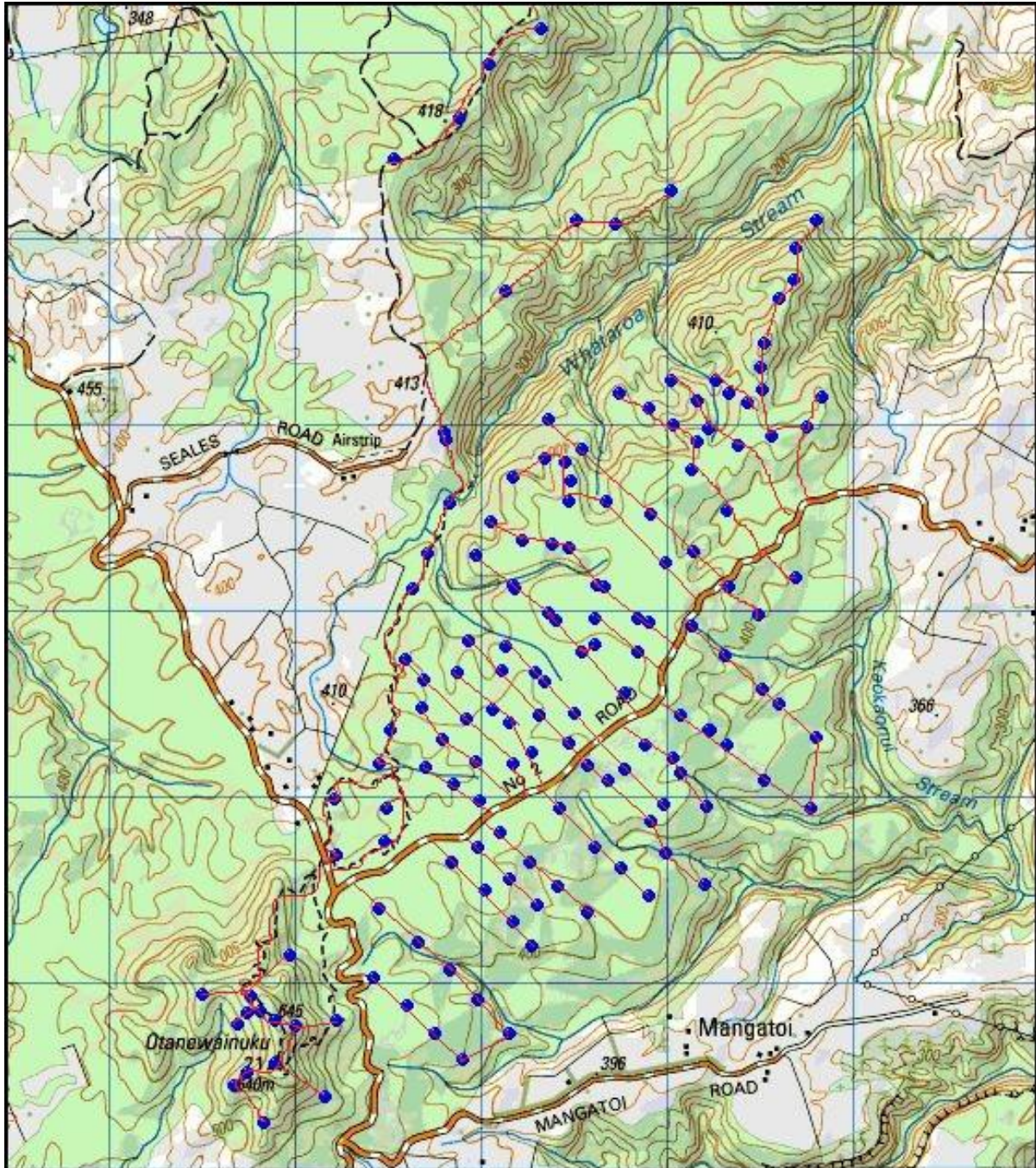


Figure 2. Marks of All Birdsong Playback Sites Logged During Fieldwork And Walk-through Survey Tracks

## 4 Results

A total of 16 birds were detected during fieldwork (figure 3 below). Initial visits to locations where birds/pairs had been previously observed provided no results.

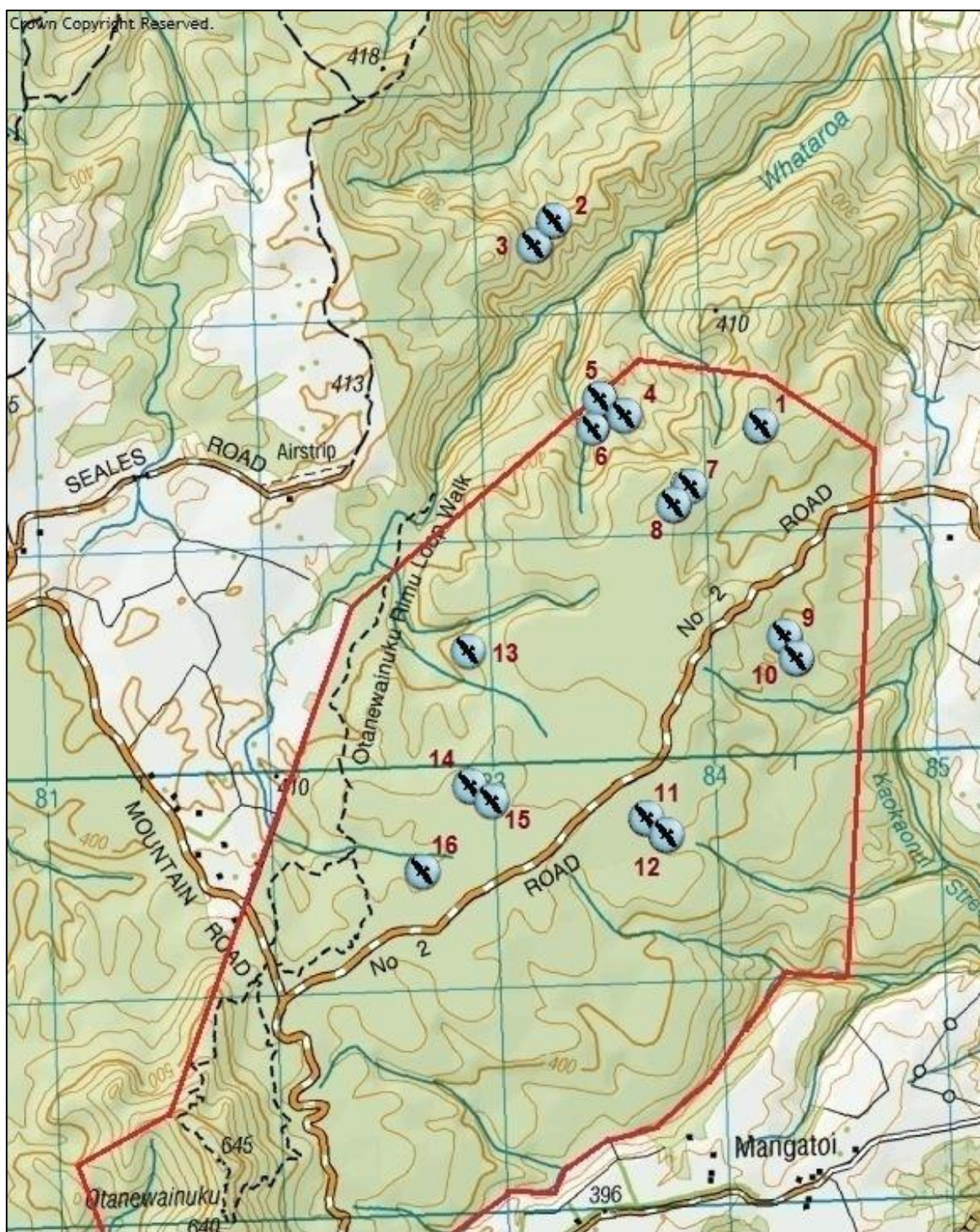


Figure 3. Locations of Kokako Detected During Walk-through Survey

Most birds were observed in the northern section of the forest, with a pair of birds confirmed outside the pest control block. Two pairs were found just south of No. 2 Road, while all other birds were observed north of No. 2 Road. One juvenile was confirmed (bird 6) with a pair (birds 4 & 5).

### Bird 1

Drawn by playback, a single Kaharoa male, with band combination RM-Y, this bird was first observed along the ridge line 1 hour up the track from the weir at coordinates E1884226 N5803434. The bird was followed twice, on different days, see follows A & B, which overlap, in figure 4. It was moulting (feathers missing on neck) and replied with full Kaharoa song, very responsive to playback. The second time the bird was found without playback and was observed feeding on kohekohe (*Dysoxylum spectabile*).

### Birds 2 & 3

Drawn by playback, this pair was first observed along the ridge track north of the pest control block, about 770 metres from the start of the track around coordinates E1883322 N5804387. One bird had band combination YM-Y while no bands were visible on the other bird. Both birds replied with full Kaharoa song and were followed twice on the same day (follows C & D, figure 4), two hours between the follows. During the second follow there was no song as the birds were feeding. They fed mostly on and in tanekaha (*Phyllocladus trichomanoides*).

### Birds 4, 5 & 6

Found without playback, these birds were observed first as a pair (birds 4 & 5), with an unconfirmed juvenile, at coordinates E1883842 N5803484 (bait line 22N, at bait station 16). Band combinations were RM-L & OM-W. The two adult birds appeared to be moulting. A follow was conducted (follow F, figure 4), with only tooks and mews heard, the birds feeding in a miro tree. Two-and-a-half hours later the birds were drawn to a playback session at a location approximately 300 metres from where first observed. At this point a juvenile was observed (bird 6) and another follow was conducted (follow E, figure 4). The two adult birds replied with full Kaharoa song.

### Birds 7 & 8

Found without playback, this pair was observed feeding in supplejack (*Ripogonum scandens*) on fruit, at coordinates E1883955 N5803214 (bait line 21N, close to bait station 9), with only tooks heard. Band combinations were M-O & MO-O. A follow was conducted, follow H, figure 4. On a different day this pair was found, without playback, at a location approximately 270 metres south-west of the first sighting. A second follow was initiated (G, figure 4). Full Rotoehu song was heard from both birds and the birds were observed feeding in tawa (*Beilschmiedia tawa*), supplejack (*Ripogonum scandens*) and kohekohe (*Dysoxylum spectabile*). Both birds appeared to be moulting with scruffy heads and uneven tails.

### Birds 9 & 10

Drawn by playback on both occasions, these birds were first observed at coordinates E1884307 N5802467 (bait line 6S, at bait station 4), with band combinations MO-Y & M-W. Both birds replied with full song on each occasion and two follows were conducted on the same day, one hour apart (follows K & L, which overlap, on figure 4). The birds were observed feeding on ripe mahoe (*Melicytus ramiflorus*) fruit, kohekohe (*Dysoxylum spectabile*) and kapuka (*Griselinia littoralis*). The birds appeared to be in moult and were observed courtship feeding twice.

### Birds 11 & 12

Drawn by playback, this pair were first observed at coordinates E1883694 N5801764 (bait line 12S, bait station 3). Birds remained high in tawa (*Beilschmiedia tawa*), but replied with full Rotoehu song. No opportunities to determine band combinations occurred. Repeated attempts to draw the birds into observable canopy/locations were unsuccessful. No follow was initiated.

### Bird 13

Drawn by playback at two different locations, this bird was confirmed at coordinates E1882986 N5802625 (bait line 14N, bait station 15). Bird remained high in tawa (*Beilschmiedia tawa*), replying with only tooks initially, then silent in response to any playback. Bird glided away after 10 minutes at a bearing of 270 degrees, in the direction of the first unconfirmed observation. No

band combination was able to be recorded and insufficient song was heard to determine capture location, i.e. neither Rotoehu nor Kaharoa song was heard. No follow was initiated.

#### Birds 14 & 15

Found without playback, this pair was first observed at coordinates E1882969 N5801881 (bait line 10N, just before bait station 6, from 5). Bird 14 was feeding in kohekohe (*Dysoxylum spectabile*) and a follow was immediately initiated (J, figure 4). The bird moved higher into the canopy and scaled a nearby tawa (*Beilschmiedia tawa*) before a band combination could be obtained. Within one minute bird 15 was detected high in the canopy interacting with bird 14. One bird was drawn back down to the kohekohe (*Dysoxylum spectabile*) with playback of mews, but band combination could not be determined. Follow was discontinued after 45 minutes when both birds remained high and obscured in the tawa (*Beilschmiedia tawa*) without making sound for fifteen minutes.

#### Bird 16

Drawn by playback, this bird was first detected at coordinates E1882667 N5801556 (bait line 7N, just after bait station 4, towards 5). Heard, but not seen, this bird replied with distorted Kaharoa birdsong, which included tooks, mews and garbled song. A follow was initiated (I, figure 4), but the bird was not seen during the follow and a band combination was not obtained. The follow was discontinued after 20 minutes when the bird was lost. Distorted song usually indicates that the bird is a juvenile/sub-adult & is practising singing

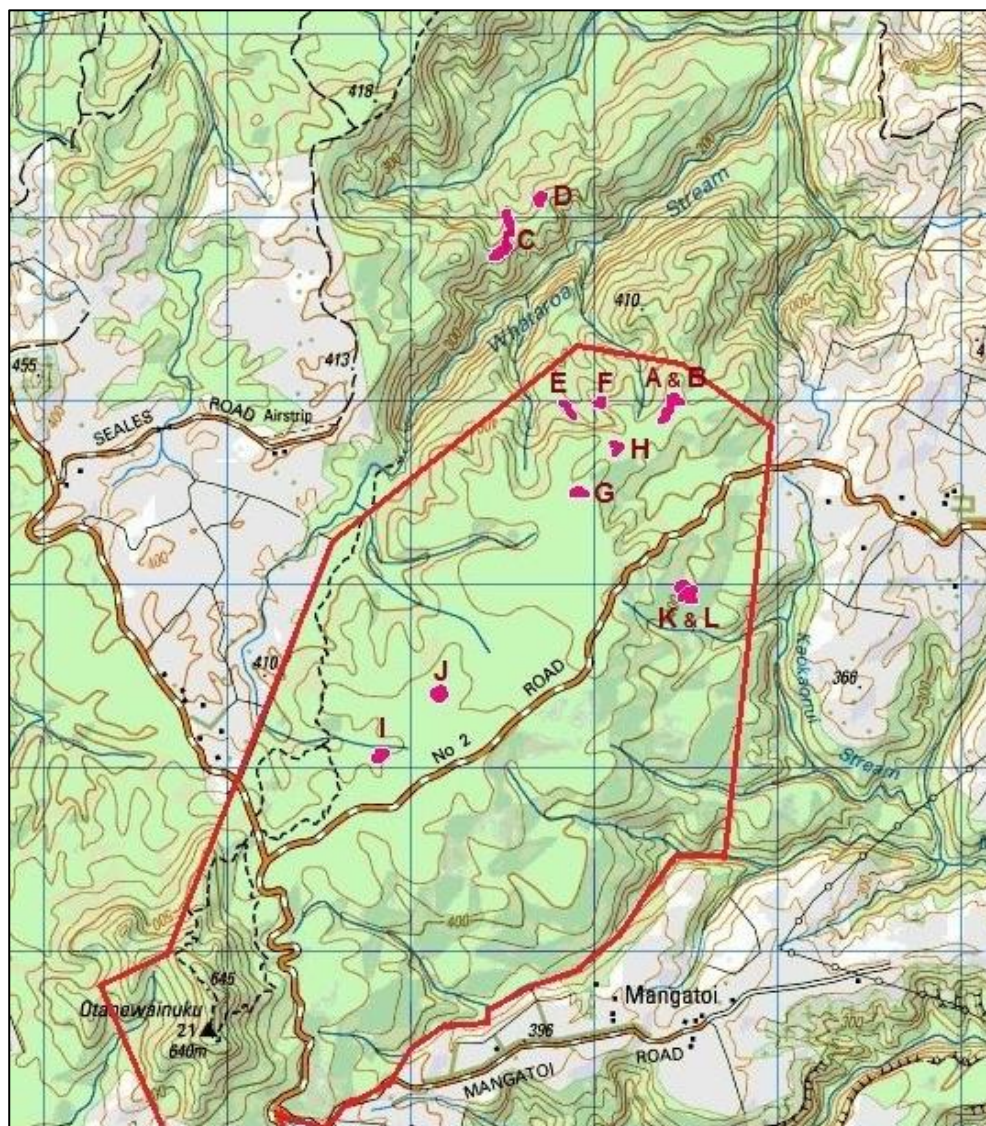


Figure 4. Kokako Follows Completed During Survey

#### 4.1 Estimation of Territories

Using coordinates from where birds were first detected and information obtained from follows conducted and personal observation of localised terrain, estimates of bird territories can be found in figure 5.

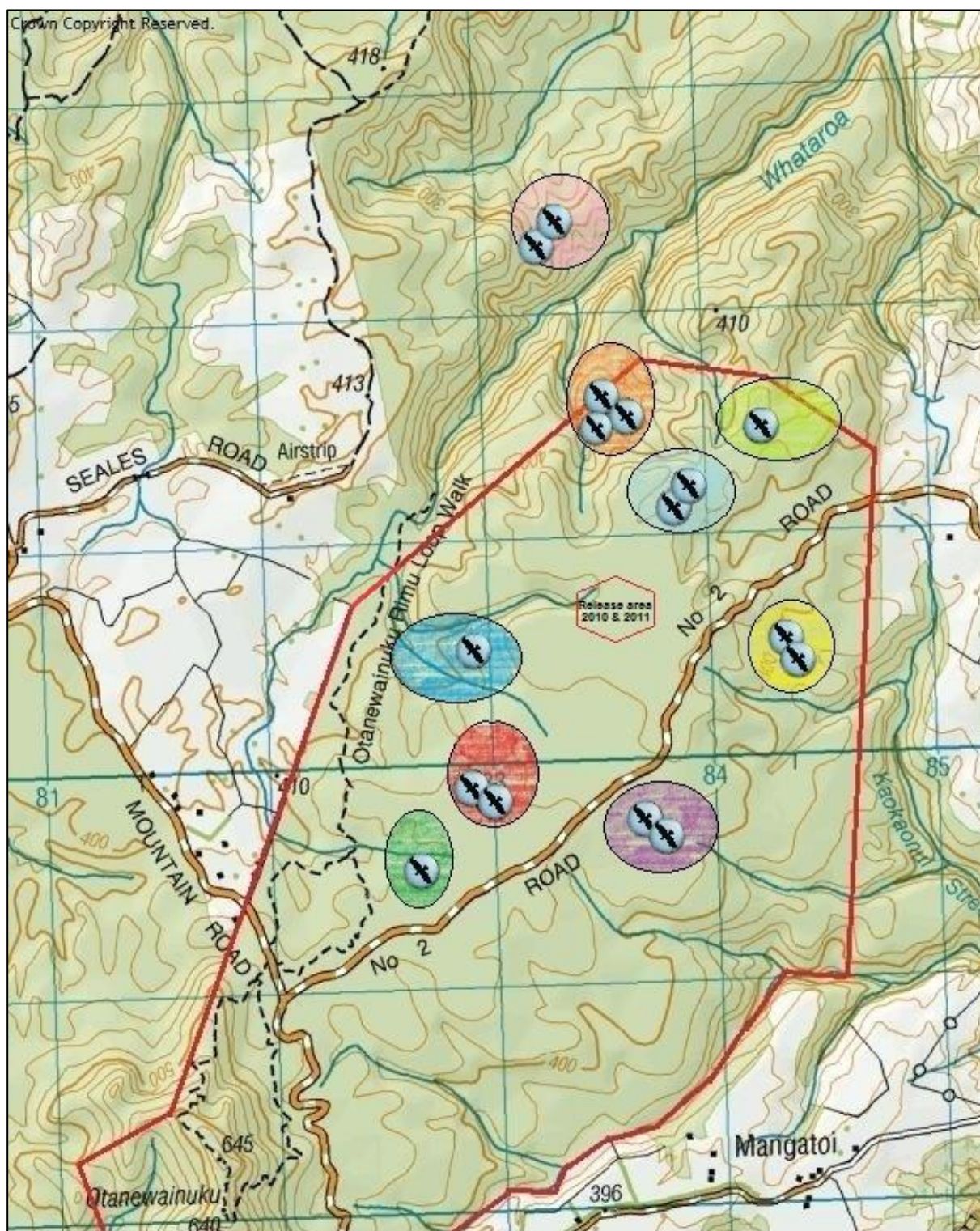


Figure 5. Estimation of Kokako Territories Detected During Survey

\*Please note: although we have included an estimated territory for bird 16 (estimated territory in green above) this bird is likely a juvenile and was probably 'roaming' with no established territory.

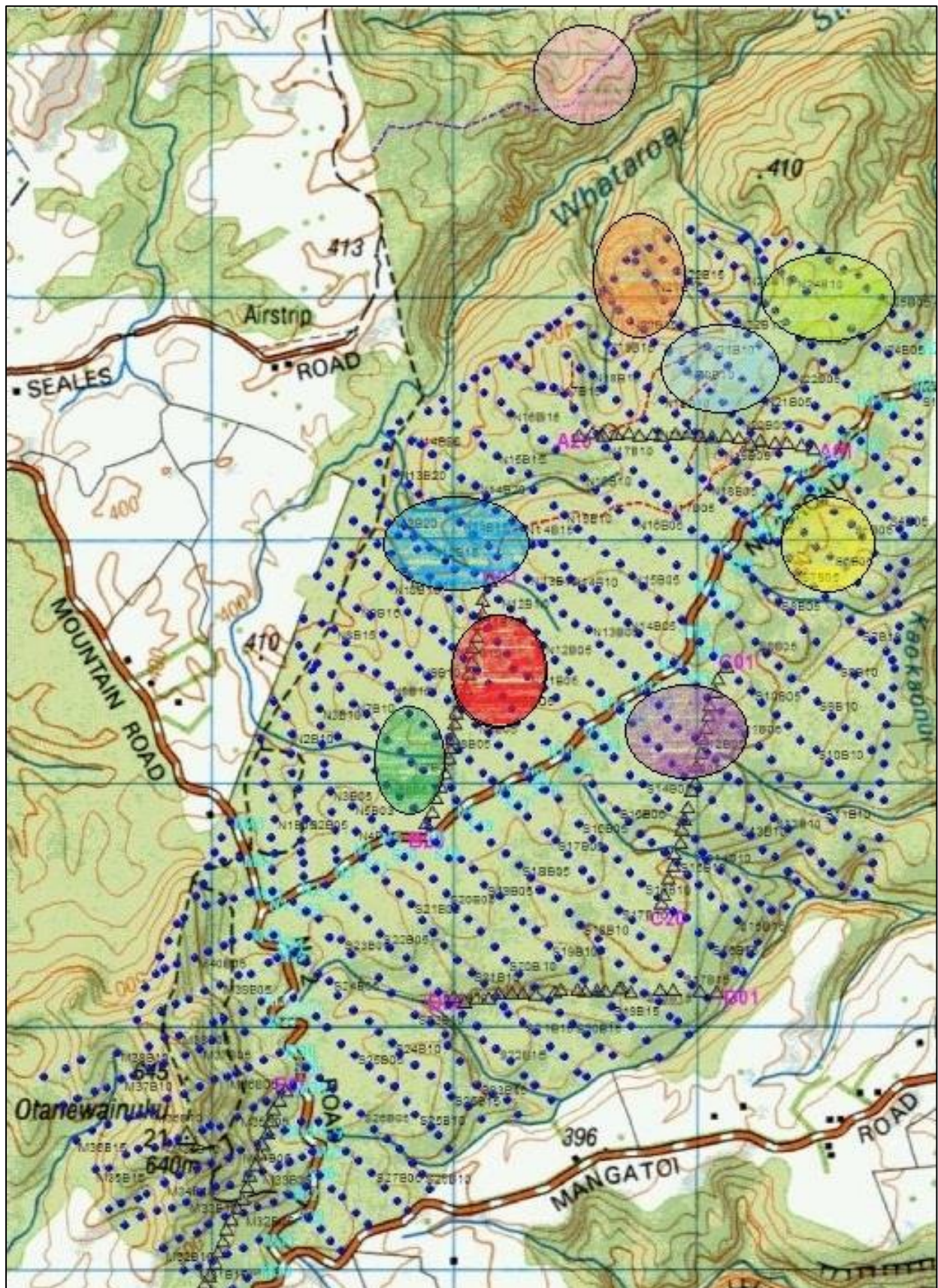


Figure 6. Estimation of Territories With Bait Line Grid Overlay

Figure 6 displays territory estimates and where territories for some birds straddle the pest management block's northern border. The pair observed north of Whataroa Stream is clearly located outside the pest management block.

## 4.2 Vegetation Observations

During the survey notes were taken regarding flowering and fruiting plants. During kokako follows and upon initial detection all feeding observations were also detailed. Findings are listed below.

**Table 2. Plants Observed Flowering March 2013**

Species	Details
Northern Rata ( <i>Metrosideros robusta</i> )	flowering
Kohekohe ( <i>Dysoxylum spectabile</i> )	flower buds
Tawari ( <i>Lxerba brexioides</i> )	flower buds
Nikau ( <i>Rhopalostylis sapida</i> )	some flowering & some dropping flowers

**Table 3. Plants Observed Fruiting March 2013**

Species	Details
Miro ( <i>Prumnopitys ferruginea</i> )	fruit were ripe & falling & abundance of fruit in trees
Tawa ( <i>Beilschmiedia tawa</i> )	fruit ripe & falling – light crop
Mahoe ( <i>Melicytus ramiflorus</i> )	ripe fruit
Supplejack ( <i>Ripogonum scandens</i> )	fruit ripe & falling – light crop
Red Matipo / Mapou ( <i>Myrsine australis</i> )	immature fruit
Clematis ( <i>Clematis paniculata</i> )	seeds ripe & falling
Nikau ( <i>Rhopalostylis sapida</i> )	immature fruit – many unripe fruit falling

**Table 4. Kokako Observed Feeding On As Initially Detected & During Follows**

Species	Details
Mahoe ( <i>Melicytus ramiflorus</i> )	ripe fruit
Kohekohe ( <i>Dysoxylum spectabile</i> )	flower buds
Puka ( <i>Griselinia lucida</i> )	fruit
Miro ( <i>Prumnopitys ferruginea</i> )	ripe fruit
Tanekaha ( <i>Phyllocladus tricomanoideis</i> )	mature seed/cone
Tawa ( <i>Beilschmiedia tawa</i> )	ripe fruit
Supplejack ( <i>Ripogonum scandens</i> )	ripe fruit
Clematis ( <i>Clematis paniculata</i> )	mature seed
Bag moth ( <i>Liothula omnivore</i> )	caterpillar

### 4.3 Additional Bird Species Observed

Other bird species observed in Otanewainuku Forest during the project.

**Table 5. Other Bird species Observed - In Relation to Forest Habitat**

COMMON NAME	SCIENTIFIC NAME	OBSERVED IN FOREST	OBSERVED FOREST EDGE OR ABOVE	ENDEMIC, NATIVE OR INTRODUCED
Paradise Shelduck	<i>Tadorna variegata</i>	-	✓	Endemic
Australasian Harrier/ Kahu	<i>Circus approximans</i>	✓	✓	Native
NZ Falcon / Karearea	<i>Falco novaeseelandiae</i>	✓	-	Endemic
Californian Quail	<i>Callipepla californica</i>	-	✓	Introduced
Pheasant	<i>Phasianus colchicus</i>	-	✓	Introduced
Wild Turkey	<i>Meliagris gallopavo</i>	-	✓	Introduced
Pukeko	<i>Porphyrio porphyria</i>	-	✓	Native
Black-Backed Gull / Karoro	<i>Larus dominicanus</i>	-	✓	Native
NZ Woodpigeon / Kereru	<i>Hemiphaga noveaseelandiae</i>	✓	✓	Endemic
Sulphur-Crested Cockatoo	<i>Cacatua galerita</i>	-	✓	Introduced
Kaka	<i>Nestor meridionalis</i>	✓	-	Endemic
Eastern Rosella	<i>Platycercus eximius</i>	-	✓	Introduced
Morepork / Ruru	<i>Ninox novaeseelandiae</i>	✓	-	Native
Kingfisher / Kotare	<i>Halcyon sancta</i>	✓	✓	Native
Welcome Swallow	<i>Hirundo tahitica</i>	-	✓	Native
Hedge Sparrow	<i>Prunella modularis</i>	-	✓	Introduced
Blackbird	<i>Turdus merula</i>	✓	✓	Introduced
Song Thrush	<i>Turdus philomelos</i>	-	✓	Introduced
Whitehead / Popokatea	<i>Mohoua albicilla</i>	✓	-	Endemic
Grey Warbler / Riroriro	<i>Gerygone igata</i>	✓	✓	Endemic
Fantail / Piwakawaka	<i>Rhipidura fuliginosa</i>	✓	✓	Native
Tomtit / Miromiro	<i>Petroica macrocephala</i>	✓	✓	Endemic
North Island Robin / Toutouwai	<i>Petroica australis</i>	✓	✓	Endemic
Silvereye / Tauhou	<i>Zosterops lateralis</i>	✓	✓	Native
Bellbird / Korimako	<i>Anthornis melanura</i>	✓	✓	Endemic
Tui	<i>Prosthemadera novaeseelandiae</i>	✓	✓	Endemic
Chaffinch	<i>Fringilla coelebs</i>	✓	✓	Introduced
Starling	<i>Sturnus vulgaris</i>	-	✓	Introduced
Kokako	<i>Callaeas cinerea</i>	✓	-	Endemic
Australian Magpie	<i>Gymnorhina tibicen</i>	-	✓	Introduced

In all, 30 different bird species were observed during the project, including eight native species. Eleven endemic species were detected with good numbers of North Island robin and tomtit noticeable in many parts of the forest.

## 5 Discussion

Sixteen birds detected during the survey is a positive sign for maintaining a sustainable population of kokako in Otanewainuku Forest. Although not all translocated birds were accounted for we can deduce a number of likely candidates from birds detected, but not identified through band combinations. See the table below for our conclusions.

**Table 5. Updated Bird Details March 2013**

Figure 3 number	CAPTURE LOCATION	SEX M/F	BAND ID	BAND COMBINATION	STATUS
1	Kaharoa	M	E-216413	RM - Y	<b>SINGLE</b> previously noted as one of a pair on mountain line 36-38 (with Kaharoa female band no. YM - G) but now observed as single in north-west corner of pest management block, with territory likely to extend outside pest management block.
2	Kaharoa	F	E-216415	YM - Y	<b>PAIR</b> located 750-800 metres along ridge track north of Whataroa Stream outside pest management block. Bird 3 was unbanded but previously suspected as Kaharoa bird OM - B. However, we believe this is a new unbanded bird.
3	Unknown	M	Unknown	Unknown	
4	Kaharoa	F	E-216409	RM - L	<b>PAIR + Juvenile</b> located around line 22North bs16, along to the end of the line, with their territory likely to straddle the northern border of the pest management block.
5	Kaharoa	M	E-216410	OM - W	Pair was previously located in a similar area.
6	N/A	Unknown	N/A	N/A	
7	Rotoehu	F	E-216404	M - O	<b>PAIR</b> located along line 21North around bs9. Previously detected in a similar area, further south between lines 18North-20North bs-6-12.
8	Rotoehu	M	E-216407	MO - O	
9	Rotoehu	F/M	E-216408	MO - Y	<b>PAIR</b> located along line 6South at bs4. Both previously detailed as unknown location and both noted as female. Due to their courtship behaviour this is not likely the case and one bird is male.
10	Rotoehu	F/M	E-216401	M - W	
11	Rotoehu	F	Unknown	Unknown	<b>PAIR</b> located along line 12South around bs3. Band combos unable to be confirmed. Singing Rotoehu song, this pair is likely to be the Rotoehu pair previously located around lines 9South-11South between bs1-9 (male: M - Y; female: M - R)
12	Rotoehu	M	Unknown	Unknown	
13	Unknown	Unknown	Unknown	Unknown	<b>SINGLE</b> located on line 14North bs15. Unable to confirm band or song dialect.
14	Rotoehu	F	Unknown	Unknown	<b>PAIR</b> located along line 10North between bs5-6. Band combos unable to be confirmed. Although insufficient song was heard to determine dialect, this pair is likely to be the Rotoehu pair previously located around line 8North-9North bs 5-6 (male: M - B; female: YM - W).
15	Rotoehu	M	Unknown	Unknown	
16	Unknown	Unknown	Unknown	Unknown	<b>SINGLE</b> located at line 7North between bs4-5, possibly a juvenile of Kaharoa descent.
Not found	Kaharoa	F	E-216411	OM - G	<b>PAIR</b> previously detected around lines 23North-25North mostly just outside pest management boundary in the north. Possibly in area but not detected, or has moved further north and was not present in survey area.
Not found	Kaharoa	M	E-216412	R - OM	
Not found	Kaharoa	F	E-216217	YM - G	Previously noted as one of a pair (with Kaharoa male band no. RM - Y) but was not observed. Possibly in survey area and not detected, but the fact it was not observed with the bird regarded as its mate means it has probably not survived.

Of the sixteen birds previously confirmed from prior monitoring projects we believe thirteen were detected during this survey. Kokako song was also heard from areas that were subsequently surveyed but no birds were found. It is therefore likely that all birds residing within Otanewainuku Forest were not detected during this survey.

In regards to Kaharoa bird (band combination YM - G), research has found that 7% of pairs split each year for reasons other than mate death (Flux *et al* 2006). This bird may still be resident in the forest but not observed in this survey.

The survey was conducted during March 2013, the third month of a national drought, and the forest was quite dry. Some epiphytes and ferns were noticeably wilting and many flowering and many fruiting plants had dropped flowers/fruit. Mature rimu trees had numerous dead foliage sprigs. It is possible that these conditions may have had an impact on kokako courtship and/or feeding behaviour and, as a result, birds were less conspicuous and more difficult to detect.

No cuckoos were heard during the survey. This seemed unusual as shining and long-tailed cuckoo generally remain in Bay of Plenty forests through March and are still vocal. Drought conditions may have played a part here as well, with birds migrating earlier as a result. However, currently there is no conclusive evidence to support such a hypothesis that the drought had an impact on behaviour of either kokako or cuckoo.

Considering the drought conditions the forest was in a relatively good state. Only light browse by ungulates was noticed and very little pig sign was present.

Another possible reason for our difficulty in detecting birds in the early stages of the survey was that the stress of the translocation process made birds wary of certain types of kokako song playback (Dickens *et al.*, 2010). John Innes (*pers. com.*) stated that there is no convincing evidence that this would be a factor and kokako can be difficult to detect at times for a number of various and unrelated reasons.

Birds have generally settled in territories adjacent to the release sites, where habitat allows. The settlement process after translocation seems similar to natal dispersal, in which juvenile and sub-adult kokako move many kilometres through occupied territories before settling near other kokako (Innes *et al* 2013). In a translocation context, chronic stress may instigate greater movement away from the release site as a form of stress avoidance behaviour (Dickens *et al.*, 2010). As well as stress, habitat and searching for a mate can force a bird to travel large distances (5-20km) through suitable habitat. That may be the case for one Kaharoa pair that was not found during the survey and had been detailed as moving quite a distance north in previous monitoring. However, the rest of the birds seem to have congregated around the plateau where the release sites were located. Most Kaharoa birds have settled north of the release sites while most Rotoehu birds have settled south of the release sites.

With more kokako pairs in Otanewainuku than single adult birds it is hoped that another one or two successful breeding seasons will result in fledged young, descending from different capture locations, pairing up. Although the birds are well spread across the forest females are mobile and can travel through numerous territories before selecting a mate (Innes & Flux 1999). Row & Bell (2007) also found that a female fledged in the translocation forest chose a mate whose syllable repertoire was very different to her father, which suggested that female mate choice may be based on songs they become familiar with post-fledging. In Otanewainuku some of the estimated territories of Rotoehu and Kaharoa pairs are in close proximity, so differing song dialects will be likely heard during fledging, decreasing the likelihood of original dialect based preference in pairing.

Although many of the birds detected were pairs, and many of these pairs have existed through numerous breeding seasons since the birds were first translocated, the production of chicks is very low compared to rates for pairs resident in either Rotoehu or Kaharoa, which both have seen marked population increases in recent years, mostly due to breeding success (Flux *et al* 2006). A conservative estimate using previous research on breeding patterns (Innes *et al* 1996) would suggest that 75% of pairs should have fledged at least one chick per year, which would result in at least 8 additional juveniles birds present in the forest (at an estimated 75% survival rate). As this was not the case it would appear that the current breeding level in Otanewainuku is lower than our conservative estimate.

There have been similarly low fledgling rates in other translocated populations, such as Ngapukeariki, (John Innes *pers. com.*) and further research is needed for help in understanding why translocated populations seem to take much longer to breed successfully in their new habitat. The most positive sign for Otanewainuku Forest is that adult survival rates appear to be good and many birds are remaining in what have/should become successful breeding pairs. The fact a juvenile was confirmed with a breeding pair during this survey is a very positive sign, as has been the presence of juveniles in previous monitoring.

Once pairs begin to breed successfully, especially the Kaharoa birds north of the release sites, the fledged birds will likely move into areas outside the pest management block. The most suitable habitat for kokako outside the pest management block is in the north so it is especially important that pest control is extended out to the ridge north of the Whataroa Stream and beyond, in preparation for a kokako population increase from this founder population. Once this occurs then there is the option of future translocation from other expanding populations to maintain genetic diversity.

Even if more kokako were translocated from each origin population, once juvenile recruitment increases, pair formation should show no original dialect based preference in pairing. Overall pair formation should then increase, and any translocated kokako left unpaired will most likely pair with a juvenile, allowing a founding population to become self-sustaining much sooner (Rowe & Bell 2007).

Further research is required to explore how many and when more founder kokako should be added to the existing translocation sites to retain current allelic diversity. Translocations for this purpose need to be weighed against those for establishing yet more new populations (Innes *et al* 2013).

## 6 Recommendations

### Future planning:

- That OKT use the Kokako Management Folder to help guide their management of this kokako population and regularly seek advice from the National Kokako Recovery Group regarding any new strategies developed for assisting in the establishment of a sustainable translocated kokako population. Particularly in relation to increasing chances for breeding success and future translocation possibilities, when a juvenile population has developed, to assist in maintaining genetic diversity within the Otanewainuku kokako population (The Kokako Management Folder can be downloaded at <http://www.doc.govt.nz/documents/science-and-technical/TSOP19.pdf>).
- New populations of kokako, established by translocated birds from different capture sites, is still a relatively new method of starting a population. There are still many unknowns, and much can be learnt from early monitoring. Therefore as much relevant study as possible should be conducted in Otanewainuku Forest. Research could identify potential problems before they arise and allow early intervention to assist in species survival and/or breeding success.

### Pest Control:

We recommended that the OKT extend their pest control management area to include:

- The long ridge north of the pest control block running parallel to the Whataroa stream. This ridge is extensive in size, diverse in habitat and already has a resident pair of kokako. Pest control along this ridge would help protect that kokako pair and buffer the northern end of the management block (where most of the kokako presently live). An improved track and bait station system along the top of the ridge is recommended as soon as possible. Side spurs can have tracks and bait stations added later.
- The north end of the main north ridge inside the management area. This ridge has a track along most of its distance, with tracks crossing it (Nth Line 25 being the end line). Extending the track to the ridge end and adding bait stations would be easy and inexpensive. Extending pest control to the end of this ridge would help to buffer the north end of the main management block from invading pests.
- The fence line from the north end of the management area, just north of the Whataroa Falls to the end of the Seales Road Track. Pest control along this fence line would help to create a buffer to the north end of the block. This fence line is an 'edge', between forest and farmland, an area where many pest animals would be active, therefore bait stations and traps (for mustalids) would be very effective if placed along it.

### Kokako Monitoring:

- That OKT plan to have further surveys of the kokako population carried out over the next few years and seek advice from the National Kokako Recovery Group regarding this.
- We would recommend carrying out a full kokako Adult Census of the block in the spring of 2014 (September-October), followed by a Juvenile Survey the following summer in the late summer/autumn, as budget allows.

### Bird Monitoring:

- As part of outcome monitoring of the pest control management strategy for Otanewainuku Forest we recommend conducting an annual bird monitoring project. The project would obtain data relating to bird abundance across the forest, which would inform further strategy development for the pest management area and allow monitoring of some biodiversity trends. The monitoring would obtain annual results regarding all species resident in the forest and provide a robust dataset of results that could also assist with pest strategy development for at risk species such as kiwi and kokako. By determining

how overall bird abundance has changed as a result of predator control, recommendations could be made on how to improve pest management in specific areas, which could be directly relevant for kiwi and kokako. There would also be the opportunity to include the northern area of the forest, where pest control is yet to be initiated, in the bird monitoring project. This would allow a baseline level of abundance to be obtained before pest control is started, and subsequent re-measures would present results whereby the impact of a pest control programme could be measured.

- We would recommend that funding priority for OKT in terms of future monitoring it set as this: Kokako Adult Census – first priority; Annual Bird Monitoring – second priority; Kokako Juvenile Survey – third priority.

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## Appendices

### Appendix A – Field Sheets

