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Translocations of North Island kokako, 1981-2011

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Abstract The North Island kokako (*Callaeas wilsoni*) is a threatened endemic passerine whose distribution has declined greatly on the New Zealand mainland due primarily to predation by ship rats (*Rattus rattus*) and brushtail possums (*Trichosurus vulpecula*). It persists in 21 populations, of which 10 (48%) have been established by translocation, and 1 has been supplemented by translocation. Of the 11 populations subject to translocation, 4 are on islands and the remainder are on the mainland; 7 translocations have resulted in successful new or supplemented populations and another 4 translocations are in progress. Translocations to another 5 sites did not establish breeding populations for various reasons. In total, there were 94 translocations of 286 kokako to the 16 sites, and the number released at a site averaged 18 (range 3-33) birds. Kokako were released at a site over an average period of 49 months (range 1-159 months) with a mean of 3 birds (maximum 10) released per day. The small numbers of kokako released and the long time required to complete a translocation were due to the difficulty and high expense of catching kokako. Translocations will continue to be important for the conservation of this species, to establish further new populations and to limit inbreeding depression and allele loss in existing populations.

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INTRODUCTION

North Island kokako (Callaeidae: *Callaeas wilsoni*) is an endemic New Zealand passerine classified as 'endangered' by Birdlife International but recently downgraded from 'nationally endangered' to 'nationally vulnerable' in New Zealand (Miskelly *et al.* 2008). Although the historical decline in kokako distribution was primarily the result of habitat clearance, the key cause of current decline and limitation is predation of eggs and chicks and occasionally adult females by ship rats (*Rattus rattus*) and brushtail possums (*Trichosurus vulpecula*; Innes *et al.* 1999). The recently improved conservation status of the kokako was due to effective and sustained predator control combined with translocation to new sites, some of which were predator-free offshore islands.

In 1999, only *ca.* 330 pairs of North Island kokako remained in 13 relict populations and a further 70 pairs existed on 2 islands to which kokako had

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been translocated in the previous decade. By 2010, the number had almost doubled to *ca.* 780 pairs in 21 populations, of which 10 (48%) populations were established and 1 had been supplemented by translocation. The current goal of kokako recovery planning is to reach 1000 pairs by 2016, in sustainable forest communities throughout the North I.

With the exception of 12 birds sourced from captivity, all translocated kokako have been captured from the wild by attracting them with playback into mist-nets set in gaps within their forest habitat. Birds were then either transferred to the new site immediately or held in temporary tent or permanently constructed aviaries for up to 10 days. The holding of birds was partly to aggregate kokako until enough had been caught, when all were moved together, and partly to hold birds while disease screening was carried out and results returned prior to release. Capture and transfer techniques are described in detail in Flux and Innes (2001) and one account is also described in Marsh (1995).

The purpose of this paper is to document all kokako translocations undertaken during the period from 1981-2011, briefly describing source and destination sites, translocation objectives and outcomes, and factors that have influenced translocation success. It expands and updates the brief review in the Appendix of Molles *et al*. (2008).

METHODS

We surveyed all available literature, mostly unpublished reports to the former New Zealand Wildlife Service, the current Department of Conservation (DOC), and to annual meetings of the North Island Kokako Recovery Group. We also contacted key people within DOC and at managed sites to check facts and to resolve uncertainties.

RESULTS

Excluding translocations to captive breeding facilities, from 1981 to 2011 there were 94 translocations involving a total of 286 kokako to 16 sites (Appendix 1). The total number of kokako released at a site averaged 18 (range 3-33) birds. They were released at a site over an average period of 49 months (range 1-159 months) with a mean of 3 birds (maximum 10) released per day. Most kokako were captured and removed from the largest managed remaining populations, including 59 birds from Te Urewera National Park, 46 birds from Mapara, 27 birds from Kaharoa, 25 birds from Rotoehu, and 15 birds from Waipapa. These are all forested, publically owned sites in the central North Island of New Zealand, administered by the New Zealand Department of Conservation. A further 25 birds were sourced via Mt Bruce National Wildlife Centre and other captive facilities, and 20 were captured from Tiritiri Matangi I to assist with the management of perceived inbreeding depression there.

Objectives and outcomes

The earliest releases of kokako to Little Barrier (Hauturu) and Kapiti Is were undertaken partly to rescue birds threatened on the mainland by felling of native forests, primarily in the Bay of Plenty, and partly to establish safe populations on pest-free islands as had been done successfully with other threatened bird species previously (Atkinson 2001; Innes *et al.* 2010). Consequently these sites received many translocations of very small numbers of birds over many years. However, research on declining mainland populations during the 1990s revealed substantial male excess due to high female mortality and poor nesting success in mainland populations (Innes *et al.* 1999; Flux *et al.* 2006), so in retrospect it was clear that few females and few young birds had been put on these islands (Brown *et al.* 2004).

From *ca.* 1996 onwards, most translocations of kokako were intended to establish new wild populations at large pest-managed sites and a few key healthy mainland populations were harvested for this purpose. These birds were frequently young, with equal numbers of females and males, and sometimes they could be caught in larger numbers, with up to 10 being released in a day. Translocations to these sites – at Pukaha, Boundary Stream, Ngapukeariki, Secretary I, Waitakere Ranges, Whirinaki and Otanewainuku – averaged 20 kokako and only 5 releases each. Further releases to these sites are likely, to maintain genetic diversity and limit inbreeding.

Releases at 3 sites (Hunua Ranges, Pikiariki and Puketi) were intended to supplement small remnant populations and speed population recovery. This was successful in the Hunua Ranges (Overdyck 1999; HS, *unpub. data*) after 4 releases and where original resident kokako were moderately abundant, but not at the other sites that had single releases and where few resident kokako remained.

Five kokako were placed on Lady Alice I (Northland) in an attempt to get offspring from one of the last remaining Puketi Forest kokako that was at the time perceived to have unique genetic material, but this was unsuccessful and in 2010 the Kokako Recovery Group recommended that remaining birds be removed and released in Puketi Forest along with others from nearby Mataraua Forest to establish a population *in situ*. Seven male kokako were translocated to Mokoia I (135 ha) in Lake Rotorua in Jun 2006 to allow tourists to see and hear the birds while removing the possibility of breeding. The release of males only was a political compromise after the Kokako Recovery Group

objected to establishing a breeding population on such a small island. Finally, kokako were placed on Tiritiri Matangi I starting in 1997 to attempt to preserve genetic material from Taranaki, where the species is now extinct. The intention was that a population of kokako with Taranaki genes would build up on Tiritiri Matangi I and then some individuals would be returned to a suitable pest-managed area in Taranaki. However, no suitable site has yet been prepared in Taranaki, and ongoing management to limit breeding between closely related individuals has been required on Tiritiri Matangi I. Nonetheless, the presence of kokako on Tiritiri Matangi I, which receives 35,000 visitors annually, has probably yielded advocacy benefit.

Overall, translocations have successfully established new populations at 6 sites (Little Barrier, Kapiti and Tiritiri Matangi Is, Pukaha (Mt Bruce), Boundary Stream and Ngapukeariki); successfully supplemented 1 small population (Hunua Ranges) and initiated population establishment at 4 sites (Secretary I (see below), Whirinaki, Waitakere Ranges and Otanewainuku). Sites listed as failures (Trounson Kauri Park, Pikiariki Ecological Area and Puketi Forest) by Miskelly & Powlesland (2013) received only 3-6 birds each and were not concerted efforts to establish populations.

Post-translocation dispersal

Radio transmitters have been attached to many kokako during releases in the last 2 decades but few of these data are available for analysis of post-translocation dispersal, mainly because the objective of telemetry was to sample short-term survival rather than movement. The accounts below are rather disparate, but the usual observed pattern is that first-released birds move widely (many km) for weeks or months before settling in territories. Subsequently released birds are likely to move less and settle faster.

Four kokako released on Kapiti I in Dec 1991 moved separately and extensively, exploring the whole 1970 ha island. After 3 months, 1 bird had settled in a territory but the other 3 had not (R. Empson, *unpub. report* to Kokako Recovery Group, Feb 1992). By 1994, however, kokako had established territories in the upper Kahikatea, Rangatira and Te Rere catchments which are dominated by mature tawa (*Beilschmiedia tawa*) forest associations, and most subsequently released birds as well as newly fledged juveniles also settled in these areas (Brown *et al.* 2004).

In 1995, 2 male kokako were translocated into Trounson Kauri Park, Northland (350 ha). One settled for at least 2 years but the second bird disappeared. In Oct 1996, a male and female were translocated into this block. After 3-4 weeks, both birds dispersed 10 km to the northwest to settle in Marlborough Forest, despite the possible anchoring presence of 1 previously released male in Trounson (Gillies *et al.* 2003).

In 1997, a juvenile male and 2 female kokako (1 adult and 1 juvenile) were translocated from Mapara to Pikiariki Ecological Area, Pureora. The adult female moved widely in Pikiariki before the transmitter signal ended after 42 days, and the bird was not seen again. Both juveniles travelled to and from the large adjacent Waipapa Ecological Area for 6-9 months, and were last sighted in shrubland adjacent to Pikiariki in May 1998.

Founder kokako released to 196 ha Tiritiri Matangi I in Aug 1997 ranged widely (up to 2.2 km between monthly fixes) for 3 months before settling into territories. Four males released 7 months later moved less and finally settled near the other birds (Jones 2000).

Four Mapara females were translocated to the Hunua Ranges in Apr 1997 to supplement a declining local population. All ranged up to at least 4 km but their movements were generally close to the core resident population. One young female moved less and bonded within a month to a local male, whereas only 1 older female bonded with a male, after 10 months (Overdyck 1999).

At Pukaha (Mt Bruce), 6 Mangatutu birds were released during Jul-Aug 2003. The birds explored all corners of the reserve, and if there had been a corridor of suitable vegetation, it is likely they would have left (Hancock & Silbery, *unpubl. report* to Kokako Recovery Group, 2004). Subsequently, 7 Mapara kokako were released in Sep 2005. Unlike earlier birds, they quickly settled and by Nov, 3 of the 7 were in established territories and all nested (Silbery & Studholme, *unpubl. report* to Kokako Recovery Group 2006).

A male and 5 female North Island kokako were released on Secretary I (8140 ha, Fiordland) with transmitters as part of a taxon substitution for the extinct South Island kokako (*Callaeas cinerea*) in Oct-Nov 2008 (Seddon *et al.* 2012). In the following 11 months, they ranged widely, up to at least 10 km (M. Willans, C. Wickes, *unpubl. report*).

Intensive monitoring of post-release dispersal has occurred at 3 sites involving trials of "acoustic anchoring" (see below). In each of these releases, radio-tracking occurred daily for 4–7 days post-release, with subsequent monitoring at longer intervals. Because each translocation involved multiple releases, birds from the earliest releases were located frequently during their first month at the new site.

In Ngapukeariki (2005; 19 birds translocated in 2 releases), individuals were monitored for 4–28 days post-release. The majority of 179 bird locations were within the core management area and <2 km from the release site; 17/18 trackable birds (1 transmitter

failed on the day of release) were located at least once during the initial monitoring period. In the first breeding season following release, 5 pairs settled on territories <2 km from the release site; during the same time period, 7 additional, non-territorial birds were also located (most multiple times) within 2 km of the release site (Molles *et al.* 2008).

During the translocation of kokako from Mapara to the Hunua Ranges in 2006 (14 birds, 4 releases), individuals were initially tracked for 6–8 days post-release (Speed *et al.* 2009, *unpubl. report*). Overall, individuals were located 4–26 times at 1–47 days post-release. At one day post-release, the average distance from the release site was *ca.* 450 m (12 birds, range 0–1800 m). The average distance increased to ~1000 m at day 7 (10 birds, range 140–2200 m) then dropped to ~700 m (8 birds, range 101-1700 m) at day 16, possibly reflecting a movement of some individuals out of transmitter range (Speed & Molles, *unpubl. data*). In the first breeding season following release, 2 Mapara-Mapara pairs held territories <1 km from the release site, as did a Mapara female who paired with a single, territorial Hunua male. Two further Mapara birds held territories as singles within 1 km of the release site, while 3 others wandered widely throughout the 1000 ha management area (Speed *et al.* 2009, *unpubl. report*). Although 4/14 birds released were not located in the 2006/2007 season, these birds were subsequently located within the management area, with all 14 known to be alive in or after 2008. The total forest area including the management area was 17,000 ha, so birds could have travelled much further.

Post-release monitoring at Whirinaki (2009; 20 birds translocated in 4 releases) similarly involved 7 days of radio-tracking after each release. Average distance from the release site was *ca.* 200 m on the first day following release and ~600 m at day 7 (Bradley *et al.* 2012); average distance between daily locations was 433.66 ± 49.24 m, with no significant differences in distances between sexes or age classes (Bradley *et al.* 2012). Averages do not suggest a consistently directional movement of birds away from the release site, but the number of birds detected did decline over time. During the following 2 breeding seasons, territorial birds (4 pairs, 1 single) were located; all had settled 4–8 km from the release site (Bradley *et al.* 2012).

Acoustic anchoring

Releases to Ngapukeariki, the HunuaRanges (2006), and Whirinaki incorporated playback of kokako song recorded from the source population as a potential attractant for released birds. This technique, termed "acoustic anchoring" was initially attempted at Ngapukeariki as an alternative to the holding of captive birds on-site. At Ngapukeriki and the Hunua Ranges, most released birds approached to within 50 m of a playback speaker at least once (Molles *et al.* 2008, Speed *et al.* 2009 *unpubl. report*), in some cases leading to interactions with other released or local birds. In both of these releases, several released birds ultimately settled within 1–2 km of the acoustic anchor area; however, because the release location was within the playback area, and playback ended before most birds became clearly territorial, their settlement decisions cannot be clearly attributed to the use of playback. In contrast to these 2 earlier releases, speaker approaches were rare at Whirinaki (Bradley *et al.* 2012), where 2 key aspects of the playback setup also differed. In this translocation, speaker placement was based on equalising multiple speaker distances from the release site rather than maximising audibility, and relatively short, randomly ordered clips of song were broadcast rather than the longer, non-random clips used at the other 2 sites (Bradley *et al.* 2012, Molles *et al.* 2008). These differences, and/or effects of habitat preference (Bradley *et al.* 2012) may account for the differing behaviour of released birds at the 3 sites. While additional translocations (to Hunua Ranges 2007-2008 and Waitakere Ranges 2009-2010) also used playback to some degree, the length of playback, speaker placement and/or degree of monitoring for these releases varied, so little is known about the responses of birds to playback as a single factor.

Assortative mating based on dialect

Kokako song differs markedly between populations (Valderrama 2012). As kokako duet to defend territories, and their song is also likely to function in mate attraction and pair formation, translocated individuals might be expected to pair assortatively with respect to song dialect. Although some mixed-dialect pairs have formed in 2 of 6 populations involving multiple sources, kokako tend to mate with individuals from the same source (Bradley 2012). While this pattern applies to initially-released birds, their offspring may be much more flexible (Rowe & Bell 2007).

Egg swapping

Catching of kokako using mist-netting is generally difficult and expensive, and results vary depending on the catching site and environmental conditions. A swap of eggs between 2 sites (Tiritiri Matangi I and Hunua Ranges Kokako Management Area) was attempted in 2010 as a new method for the genetic management of kokako at these sites. Possible advantages include that it may be cheaper than translocating adults, have less potential for the transfer of avian diseases and ectoparasites between sites, involve less stress compared to transferring adult kokako; have less impact on

donor populations as there is no removal of adults and renesting is possible, and have less impact on source populations if eggs are removed from nests during years when predator management is not conducted and nesting attempts are likely to fail. Finally, young birds raised by their foster parents will learn the appropriate dialect for the area, avoiding dialect-based mate choice problems.

On 1 Dec 2010, 3 eggs were taken from a Hunua Ranges nest and replaced with dummy eggs. The Hunua eggs were taken to Tiritiri Matangi I and swapped with 3 eggs from a nest on the island, then the Tiritiri Matangi I eggs were taken to the Hunua nest, the dummy eggs removed and the replaced by the Tiritiri Matangi I eggs. On Tiritiri Matangi I, 1 egg hatched but the nest was found abandoned after a severe storm. The nest contained 1 nestling and no eggs. The Hunua nest was probably preyed upon as there was no evidence of eggs when staff inspected the nest after the kokako stopped visiting it.

DISCUSSION

Population establishment of kokako through translocation has been successful by the definition of Miskelly & Powlesland (2013) as at least some of the populations are established and expected to persist for at least 50 years under the current site management regime'. This is the case when adequate numbers of kokako (15+) were released and control of key pests at the release site was effective. Sites meeting this criterion are Hauturu (Little Barrier I), Kapiti I, Tiritiri Matangi I, Hunua Ranges, Pukaha (Mt Bruce Scenic Reserve), Boundary Stream Mainland I and Ngapukeariki. However, kokako persistence on Tiritiri Matangi I is dependent on management of inbreeding, and the size of the populations at Kapiti I, Pukaha, Boundary Stream, Hunua Ranges and Ngapukeariki in 2010-11 all about equal the initial number of birds translocated. Probably, at unfenced mainland sites, this slow establishment reflects the difficulty of keeping key pest mammal populations very low (Gillies *et al.* 2003; Burns *et al.* 2011). Slow establishment on Kapiti I appears to relate to low recruitment, and we suspect that this applies to some mainland sites also; the demography of translocated populations deserves further study.

Some translocated kokako subsequently moved out of pest-managed areas; this occurred at Ngapukeariki, Whirinaki and in the Waitakere Ranges. Although there is anecdotal evidence that acoustic anchoring may help to attract birds to a target area and facilitate social interactions among released birds, there has not yet been a robust experimental test of the technique. To date, speaker locations in carefully monitored trials have sometimes been confounded with the particular place where birds were released (Ngapukeariki, HunuaRanges, Whirinaki). In other translocations which used playback, speakers were moved repeatedly and/or operated inconsistently. Overall, released birds do not appear to avoid playback speakers, and find them at least as attractive as live, captive kokako (Molles *et al.* 2008). Even in releases involving minimal monitoring, playback can be a low risk, inexpensive and potentially informative addition to a translocation project provided it is planned before catch teams begin work. Although it is difficult to conduct a carefully-controlled and intensively-monitored experiment in tandem with a kokako translocation, it is hoped that this can be achieved in the future. A strong test should provide released birds with a choice between playback and no-playback areas with similar physical characteristics and vegetation, and preferably allow researchers to monitor the movements of birds for a period of several days before playback begins.

The settlement process after translocation seems similar to natal dispersal, in which juvenile and subadult kokako move many km through many occupied territories before settling near other kokako. Mean kokako natal dispersal distances are 910 m at Kapiti I (n = 25, I. Flux, *pers. comm.*), 2041 m at Mapara (n = 82, I. Flux, P. Bradfield, *pers. comm.*), 1272 m at Rotoehu (n = 20) and 1397 m at Otamatuna (Te Urewera National Park, n = 47, J. Hudson, G. Jones, C. Thyne, *pers. comm.*). Post-translocation dispersal movements may be larger than transmitter studies have been interpreted as showing because at some times in all studies, some transmitter signals cannot be found.

The small numbers of kokako released and the long time required are mostly due to kokako being difficult and expensive to catch, so that achieving even minimum totals for genetic and population security objectives always requires several releases, each of small numbers of kokako. There are no signs that this limiting factor can be alleviated soon. Cost has already prevented kokako being translocated to pest-fenced, 3,400 ha Maungatautari (Waikato) for about 4 years, despite this site being completely free of ship rats, possums and stoats and larger than Little Barrier I. Egg or nestling transfers offer some advantages, as described above, but they demand finding nests at similar stages of incubation, which is laborious and also expensive.

A new kokako recovery plan is currently in preparation. The priority for reintroductions in this plan is for establishing kokako within suitable ecosystem conservation projects where the management requirements of kokako will complement the requirements of other species or ecological processes at the site. Kokako formerly occurred throughout forested New Zealand and

translocation is the fastest way to restore the species to at least some of its former range. A basic requirement is for effective, sustainable control of key pest mammals (ship rats and possums, and preferably stoats) on at least 1,000 ha of suitable forest habitat.

Genetic analysis of blood and feather samples from remaining original kokako populations showed low genetic variability and limited geographic structuring, which suggests that historically gene flow occurred regularly between all populations, or that the current population is the result of recent recolonisation from glaciation and volcanism refugia (Double & Murphy 2000, Hudson *et al.* 2000). However, small residual population size currently limits both the genetic variability remaining and the number of individuals that can be harvested for translocation. Both of these restrictions can result in genetic bottlenecks (Jamieson 2011) by accumulating inbreeding depression, and allele loss by genetic drift (Jamieson & Lacy 2012). Modelling suggests that both releasing small numbers for reintroductions and then restricting the population to small numbers at carrying capacity will result in the loss of rare alleles through genetic drift (Weiser *et al.* 2013; I. Jamieson, D. Hegg, *pers.comm*.).

At most sites little is known about the fate of translocated kokako following release. As yet we have not established a clear relationship between the number of transferred individuals and the true founder population (*e.g.* Jamieson 2011). At Ngapukeariki only 7 of 19 released birds are known to have nested, and many nesting attempts are unsuccessful at recruiting young. On Kapiti I it is estimated that <10 individuals have given rise to the current population (I. Flux,*pers.comm*.). These results suggest a need for further research to gain a clearer understanding of the founder size, if we are to protect these important sites from future inbreeding.

The current recovery group stipulation for future kokako sites to be at least 1,000 ha should ensure that at least 200 kokako are present at carrying capacity, well above the estimate of *ca*. 50 individuals at which chances of inbreeding depression are high (I. Jamieson, D. Hegg, *pers. comm*.). Further research is required to explore how many and when more founder kokako should be added to the existing translocation sites outlined in Appendix 1 to retain current allelic diversity. Translocations for this purpose need to be weighed against those for establishing yet more new populations. Finally, sustaining unmanaged populations at small sites such as Tiritiri Matangi I (196 ha) is clearly genetically inviable, but can perhaps be managed by careful addition and removal of particular individuals, and may be yielding valuable advocacy outcomes due to the many encounters between kokako and visitors.

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Appendix 1

Sites to which North Island kokako have been translocated between 1981 and 2011, ordered chronologically by the date of the first translocation to each site. The list excludes translocations to captive institutions. All separate translocations to each site are listed, also chronologically, with the total number of kokako and number of females respectively given for each one in brackets. A question mark indicates that the sex of translocated birds is unknown. The latest known population size (usually number of pairs at Aug 2012) is given at the end of each account; this total excludes territorial, unpaired birds.

To Little Barrier I (Hauturu). 32 kokako from: Matawharau Block, Rotoehu (1,?), Oct. 1981. Kaharoa (6,?) Mar 1982. Puwhenua, Mamaku Plateau (2,?), Mar 1982. Mangapapa Rr, Mamaku Plateau, (1,?), Jun 1982. Oropi (1,?), Jun 1982. Oropi (2,?), Nov 1982. Te Rerenga Stream, Mamaku Plateau, (2,?), Dec 1982. Puwhenua, Mamaku Plateau, (1,?), Dec 1982. Matawharau Block, Rotoehu, (5,?), Mar. 1983. Matahina, (6, ?), Jul-Oct 1986. Matahina, (3, ?), Feb 1988. Great Barrier Island (2,1) 1994. Population 2012 unknown, estimated at 100 prs.

To Kapiti I. 33 kokako from: Te Rauamoa and Hauturu Trig (4,0, both Waikato), Dec 1991. Te Rauamoa (2,0), Feb 1993. Manawahe (4,1, Bay of Plenty), Mar 1993. Makino (2,0, Taranaki), Sep 1993. Manawahe (1,1), Apr 1994. Mt Bruce National Wildlife Centre (NWC) (1,1), Sep 1994. Otorohanga Kiwi House (1(1), Sep 1994. Mt Bruce NWC (2,1), May 1995. Little Barrier Island (2,1), Jun 1995. Mt Bruce NWC (1,1), Sep 1995. Little Barrier Island (3,2), Mar 1996. Little Barrier Island, (2,?), Mar 1996. Mt Bruce NWC, (2,?), Mar 1996. Mapara (1,0, King Country), Oct 1996. Mapara (4,2), Nov 1996. Mt Bruce NWC, (1,0) Jan 1997. Population 2012 20 prs.

To Trounson Kauri Park. 6 kokako from: Mataraua Forest (2,0, Northland), 1995. Mataraua Forest (2,1), Oct 1996. Mataraua Forest (2,?), 1998. Population 2012 0 prs.

To Pikiariki Ecological Area (Pureora). 3 kokako from: Mapara (1,1), Aug 1997. Mapara (2,1), Sep 1997. Population 2012 0 prs.

To Tiritiri Matangi I. 18 kokako from: Mt Bruce NWC (ex Mapara, 1,0), Aug 1997. Mapara, (2,1), Aug 1997. Mt Bruce NWC (ex Mapara, 4,0), Mar 1998. Mt Bruce NWC (ex Taranaki, 3.2), Jun 2007. Otorohanga Kiwi House (1,0), Jun 2007. Waipapa, (2,2), Oct 2007. Mt Bruce NWC (ex Taranaki, 1,1), Aug 2008. Mt Bruce NWC (1,0), Aug 2008. Waipapa, (3,?), Oct 2010. Population 2012 7 prs.

To Hunua Ranges. 33 kokako from: Mapara, (4,4), Apr 1998. Mapara (14,6), Sep-Oct 2006. Tiritiri Matangi I (4,4), May-Jun 2007. Waipapa Ecological Area (4,3, Pureora), Sep-Oct 2007. Tiritiri Matangi I (4,1), Apr 2008. Tiritiri Matangi I (3,2), May 2010. Population 2012 25 prs.

To Boundary Stream. 20 kokako from: Te Urewera National Park, (6,3), May 2001. Te Urewera National Park, (4,2), Jul 2001. These 5 pairs were kept in captivity at Boundary Stream and released with their offspring 3 years later. Te UreweraNational Park, (10,6), Aug-Sep 2007. Population 2012 14 prs.

To Pukaha (Mt Bruce Forest). 16 kokako from: Mangatutu (5,4), Jul 2003. Mangatutu (1,0) Aug 2003. Mt Bruce NWC (captive bred ex Mangatutu; 4,2), May 2004. Mangatutu (2,1), Oct 2004. Mt Bruce NWC, (1,1), Aug 2006. Mt Bruce NWC, (captive bred ex Mapara; 1,1), Nov 2007. Kaharoa, (2,0), Sep 2010. Population 2008 9 prs.

To Lady Alice I. 5 kokako from: Kaharoa (2,2, via Hamilton Zoo), Apr 2004. Puketi Forest, (1,0), Apr 2005. Mataraua, (1,1), Jun 2006. Auckland Zoo, (1,0), Jun 2006. Population 2012 0 prs.

To Ngapukeariki (East Cape). 19 kokako from: Te Urewera National Park (9,4), Jul 2005. Te Urewera National Park, (10,5), Aug 2005. Population 2012 11 prs.

To Mokoia I (Lake Rotorua). 7 kokako from: Tiritiri Matangi Island (7,0), Jun 2006. Population 2012 0 prs.

To Puketi Forest. 6 kokako from: Mataraua Forest, (2,2), Nov 2007. Mataraua Forest, (2,2), Dec 2000. Auckland Zoo (1,1) Oct 2008. Mt Bruce National Wildlife Centre (1,1), Nov 2008. Population 2012 0 prs.

To Secretary I (Fiordland). 27 kokako from: Mapara, (8,5), Oct 2008. Mapara, (2,2), Oct 2008. Kaharoa, (5,2), Sep 2009. Rotoehu, (10,6), Sep 2009. Kaharoa, (2,0), Oct 2009. Population 2011 2 prs.

To Whirinaki. 20 kokako from: Te Urewera National Park, (6,2), Aug 2009. Te Urewera National Park, (4.0), Sep 2009. Te UreweraNational Park, (7,6), Sep 2009. Te Urewera National Park, (3,1), Oct 2009. Population 2010 4 prs

To Waitakere Ranges. 22 kokako from: Waipapa, (2,1), Sep 2009. Waipapa, (3,2), Sep 2009. Waipapa (1,1), Nov 2009. Tiritiri Matangi I, (2,1), May 2010. Mapara, (3,?), Sep 2010. Tunawaea (2,?, Pureora), Oct 2010. Tunawaea (4,?), Oct 2010. Tunawaea (3,?), Oct 2010. Tunawaea (2,?), Oct 2010. Population 2012 5 prs.

To Otanewainuku. 19 kokako from: Rotoehu, (5,4), Aug 2010. Rotoehu, (3,1), Sep 2010. Kaharoa, (2,1), Sep 2010. Kaharoa, (4,1), Aug 2011. Kaharoa, (4,2), Sep 2011. Rotoehu, (1,1), Sep 2011. Population 2012 6 prs.