Avian translocations to and from Tiritiri Matangi 1974–2013

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Abstract: Translocation has played a key role in modern New Zealand conservation. This is particularly evident on Tiritiri Matangi where 12 species of bird have been translocated between 1974 and 2013. Eleven of these species have successfully established on the island, six as large self-sustaining populations, one large managed population, two small managed populations and two small establishing populations. Several of these populations are sufficiently fecund to sustain harvest for translocation to other sites, with eight species being translocated in >33 translocation events since 1983. Tiritiri Matangi provides a useful case study for the evolution of modern New Zealand conservation. There have also been substantial benefits associated with these translocations for resource managers, scientists and particularly community-based conservation efforts.

Keywords: avian translocations; community conservation; New Zealand conservation; Tiritiri Matangi

Introduction

Translocation, the intentional (and sometimes unintentional) movement of plants and animals from one place to another by humans, has a long and intimate history with New Zealand conservation. Profound and rapid impacts on biodiversity undoubtedly occurred following the initial "translocation" of humans and other plants and animals to Aotearoa New Zealand and this legacy of ecosystem disruption continues into the present day (Caughley 1989; Holdaway 1989). But, in an ironic twist, this movement of organisms from one place to another, the very root of our conservation challenges, also offers a solution for saving and managing many of our threatened species.

The concept of moving species from hostile to safe habitats was first realised in New Zealand in the late 1800s with Richard Henry's heroic attempts to translocate and establish populations of kākāpō (*Strigops habroptilus*) and kiwi (*Apteryx* spp.) on Resolution Island in Fiordland (Hill & Hill 1987). Richard Henry's work was ultimately in vain when it became apparent in 1900 that mustelids (*Mustela* spp.) had invaded Resolution Island (Hill & Hill 1987). However, the concept of marooning species on safe islands was put to good use by the New Zealand Wildlife Service from the early 1960s and translocation has played a pivotal role in saving species such as the Chatham Island black robin (*Petroica traversi*) (Butler & Merton 1992), kākāpō (Powlesland et al. 2006) and New Zealand saddleback (*Philesturnus* spp.) (Lovegrove 1996) from imminent extinction.

The ongoing management of these and many other threatened species is facilitated by the judicious use of translocations (see http://rsg-oceania.squarespace.com/ and Miskelly & Powlesland (2013) for a comprehensive list of translocations in the New Zealand/Oceania region). Modern translocation practice itself has also followed a new and interesting evolutionary trajectory (Fig. 1). The eradication of introduced pests from both island and mainland sites using modern management techniques, particularly aerial poison delivery, has provided many new opportunities for conservation management and restoration. Subsequently, New Zealand translocation practise has evolved from one of marooning critically endangered species on pest free islands to translocation to islands and mainland sites following pest eradications (Fig. 1). These safe habitats facilitate the management of threatened and endangered species. They also provide opportunities for the translocation of species in lesser threat categories. Such species might carry out ecosystem functions including seed dispersal, pollination, predation or physical habitat modification through browsing, burrowing and nutrient transfer (Fig. 1). Ecological restoration is recognised as a valid reason for translocation in the IUCN (2013) translocation guidelines and it is clearly the basis for many translocations in

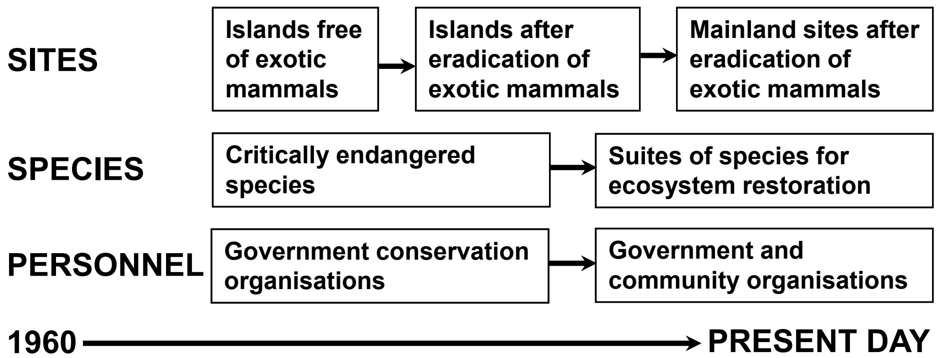

Figure 1. The evolution of New Zealand conservation 1960–2013 showing the progressive change in site, species and personnel characteristics associated with conservation actions.

New Zealand. The personnel carrying out translocations have also shifted. Once, translocations were the exclusive domain of government-employed conservation professionals. Now, government partnerships with community groups and research institutions are increasingly common (Fig 1).

Tiritiri Matangi provides a compelling case study of the evolution of conservation and translocation in New Zealand, particularly of birds, as it encompasses all of the elements found in the wider New Zealand context (Fig. 1); 1) initially there was just one introduced predator, the kiore (*Rattus exulans*) which was subsequently eradicated; 2) bird species translocated to the island range from the critically endangered such as takahē (*Porphyrio mantelli*) through to the relatively widespread such as the fernbird (*Bowdleria punctata*); 3) critically, the translocations themselves have moved from being government initiatives (the New Zealand Wildlife Service and the Department of Conservation) through to being conceived, planned and executed by the Supporters of Tiritiri Matangi (SOTM), a community group established with the explicit aim of restoring and protecting Tiritiri Matangi.

Here, I describe avian translocations to and from Tiritiri Matangi from 1973 to 2013, discuss the diverse outputs associated with these translocations and speculate on the future of translocations both to Tiritiri Matangi and within the wider context of New Zealand conservation.

Discussion

Avian translocations to Tiritiri Matangi 1973–2013

The first species to be translocated to Tiritiri Matangi was the red crowned kākāriki (*Cyanoramphus novaezelandiae*). Considerable romantic myth surrounds this translocation, the story being that the birds were unintentionally released onto the island from a boat unable to proceed to Cuvier Island due to a storm (Rimmer 2004). Compelling though this story might be, it is inaccurate. The release of red crowned kākāriki was planned and executed by the New Zealand Wildlife Service in 1974 (Rimmer 2004). The context for this translocation is unclear, although it was undoubtedly motivated by species conservation objectives. Subsequent translocations to Tiritiri Matangi were carried out under formal management documents. The first management plan was prepared by the Department of Lands and Survey (1982) for the Hauraki Gulf Maritime Park Board. The primary focus of this plan was the revegetation of Tiritiri Matangi to facilitate introduction of rare and endangered animals and plants and to provide a site for the general public to see these species. The potential for translocations was recognised due to the absence of introduced mammals (with the exception of kiore), "natural fertility", reliable water sources, permanent ranger staff and the revegetation programme (Department of Lands and Survey 1982). The 1982 plan recommended North Island saddlebacks (*Philesturnus rufusater*) for immediate introduction and took the establishment of red-crowned kākāriki as an indicator of potential success. The presence of ground birds on Tiritiri Matangi, including pūkeko (*Porphyrio porphyrio*), brown quail (*Coturnix ypsilophora*) and spotless crake (*Porzana tabuensis*), was likewise seen as an indication that kiwi and takahē might be successfully introduced within 5–10 years. Translocation of hihi (*Notiomystis cincta*), whiteheads (*Mohoua albicilla*) and North Island robins (*Petroica longipes*) was recommended when revegetation was more advanced. North Island fernbirds (*Bowdleria punctata vealeae*) were considered appropriate for immediate translocation but were of lower priority than rarer species. The Department of Lands and Survey (1982) recognised that an ordered plan for translocations would help maintain public interest and it should at least be partially tied to revegetation. A flexible research-based approach was also advocated whereby monitoring and assessment would precede enactment of subsequent stages of the plan.

The second Tiritiri Matangi working plan (Hawley 1997) was prepared by the Department of Conservation. It acknowledged the considerable success in revegetation, kiore eradication (1993), successful translocations, and the outstanding level of public participation (Hawley 1997). It reiterated the objective to restore Tiritiri Matangi as a site for threatened fauna and flora (Hawley 1997). North Island fernbirds were again included as an appropriate introduction, whereas kōkako (*Callaeas cinerea*), rifleman (*Acanthisitta chloris*), North Island tomtits (*Petroica macrocephala toitoi*), shore plovers (*Thinornis novaeseelandiae*) and banded rails (*Rallus philippensis*) were assessed as having potential for translocation but only on an experimental basis or much later in the restoration to avoid impacts on resident species. In contrast with the 1982 plan (Department of Lands and Survey 1982) which only discussed one possible non-avian introduction (tuatara, *Sphenodon punctatus*), the 1997 plan (Hawley 1997) assessed 12 reptile species, six invertebrate species, and bats, signalling a shift from an exclusive focus on bird translocations.

In all, 12 species have been released on Tiritiri Matangi in more than 22 translocation events. Some species, such as fernbird, were translocated on more than one occasion, and takahē and kōkako are frequently moved for meta-population management (Table 1). The translocations to Tiritiri Matangi have been remarkably successful, particularly when compared with international translocation success rates (Griffith et al. 1989; Wolf et al. 1996; Fischer & Lindenmayer 2000), with only one species, the North Island tomtit failing to establish. Red-crowned kākāriki, North Island saddlebacks, whiteheads, North Island robins, little spotted kiwi (*Apteryx owenii*) and North Island fernbirds have all formed large self-sustaining populations. With the provision of supportive management (nest boxes, ectoparasite management and supplementary feeding) translocated hihi have also grown into a substantial and fecund population which fulfils a critical role in hihi conservation through substantial research output and the provision of birds for translocation to new sites (Table 2; and see Armstrong and Ewen, and Thorogood et al. this issue). The small size of Tiritiri Matangi (220 ha) prevents the establishment of viable self-sustaining populations of takahē and kōkako, but both are managed as meta-populations as part of the ongoing recovery of these endangered species. Critically, both species act as important advocacy birds as, for many New Zealanders, Tiritiri Matangi will be the first, and perhaps only, place where they will encounter these species in a semi-wild situation. The value of these experiences cannot be underestimated. Habitat limitations on Tiritiri Matangi similarly prevent brown teal (*Anas chlorotis*) from establishing a viable self-sustaining population. However, it is possible the Tiritiri Matangi teal will form part of a greater Hauraki Gulf population, with dispersal between the island and other restoration sites (e.g. Motuora and Motutapu Islands), particularly those with translocated populations of brown teal (e.g. Tāwharanui Regional Park). It is too early to assess the success of the recently (2009–2011) translocated riflemen, but

Table 1. Avian translocations to Tiritiri Matangi 1974–2013

Year	Species	Conservation status*	Source popn.	No. released	Current popn.	Notes	Reference
1974 1976	Red crowned kākāriki	D2*	Captive reared	84	C. 600		L. Ortiz Catedral pers. comm.
1984	North Island saddleback	D2	Cuvier Island	24	C. 1000		Lovegrove 1996; Brunton & Stamp 2007
1987 1990 2002	Brown teal	D2	Captive reared	6 6 7	C. 8	Insufficient habitat on Tiritiri Matangi for a self-sustaining population but likely to form part of a wider Hauraki Gulf meta-population	
1989 1990	Whitehead	NT	Little Barrier Island	40 40	C. 1000		K.A. Parker unpub. data
1991	Takahē	B1	Burwood Bush	2	9	Ongoing translocations to and from Tiritiri Matangi for meta-population management	M. Fordham pers. comm.
1992 1993	North Island robin	NT	Mamaku Plateau	44 14	C.75	Significant research output; see Armstrong and Ewen this issue	D.P. Armstrong pers. comm.
1993	Little spotted kiwi	D2	Kapiti Island	10 6	C. 50		M. Fordham pers. comm.
1995 2010	Hihi	B2	Little Barrier Island	37 20	C. 133	Significant research output; see Armstrong and Ewen and Thorogood et al. this issue	J.G. Ewen pers. comm.
1997 1998	Kōkako	B3	Various	3 4	C. 16	Ongoing translocations to and from Tiritiri Matangi for meta-population management	M. Fordham pers. comm.
2001 2002	North Island fernbird	D1	Orewa	13 12	C. 80		K.A. Parker unpub. data
2004	North Island tomtit	NT	Hunua Ranges	32	0	Failed following rapid dispersal from Tiritiri Matangi after initial release	B.A. Hughes unpub. data
2009 2010 2011	North Island rifleman	D1	Little Barrier Island	31 9 15	C. 35		S. Fordham pers. comm.

*Conservation status after Miskelly et al (2008); B1 *Nationally critical*; B3 *Threatened, Nationally vulnerable*; D1 *At risk, declining*; D2 *At risk, recovering*; D2* *At risk, relict*; NT *Not threatened*.

post-release survival and initial breeding success suggest this species will also establish successfully on Tiritiri Matangi (S. Fordham, pers. comm.).

Avian translocations from Tiritiri Matangi 1983–2013

It is a clear sign of success that many species translocated to Tiritiri Matangi have formed populations robust enough to sustain harvest for translocation to other sites. Eight species have been translocated from Tiritiri Matangi to 20 different sites in more than 33 translocation events since 1983 (Table 2). All eight species have been translocated multiple times and two of these, takahē and kōkako, are frequently moved for meta-population management. Overall, success rates have been lower than for species translocated off Tiritiri Matangi. This is a reflection of the sites to which they are being translocated. Generally, translocations to small protected islands (e.g. Motuihe and Motuora), peninsulas (Tāwharanui) and fenced sites (Karori) have been relatively successful, whereas those to large contiguous habitats with mixed protection (e.g. Hunua, Waitakere, Great Barrier Island) have had less success (Table 2).

Tiritiri Matangi is a favourable site for translocation events because the populations are well monitored, the island is easy to access and there are suitable aviary facilities. Even though Tiritiri Matangi is relatively small (220 ha) several populations (e.g. robins and hihi; see Armstrong and Ewen this issue) are very fecund and can sustain surprisingly high harvest rates. Some caution needs to be exercised as repeated translocations of translocated populations can perpetuate genetic bottlenecks (Briskie & Mackintosh 2004; Hale & Briskie 2007; Jamieson 2007). However, these can be avoided through supplementary translocations from genetically diverse sites.

Table 2. Avian translocations from Tiritiri Matangi 1983–2013

Year	Species	Release site	No. released	Popn. size	Notes	References
1983	Bellbirds (*Anthornis melanura*)	Shakespeare Regional Park	22		Failed translocation	Lee 2005
2010		Waiheke Island, Motuihe Island, Hamilton Botanic Gardens/	100		Failed translocation	T.G. Lovegrove unpub. data
1992	North Island saddleback	Mokoia Island	24	C. 1000		Lovegrove 1996 K.A. Parker unpub. data
1997		Moturoa Island	26	0	Failed translocation	Hooson & Jamieson 2003
2002		Karori Sanctuary	39	C. 120		R. Empson pers. comm.
2005		Motuihe Island	20	C. 50		Parker & Laurence 2008
2011		Rangitoto and Motutapu Island	40	C.40	100% survival in the four months following translocation. Successful breeding recorded	C. Mathers; H. Speed; K.A. Parker unpub. data
2013		Maungatautari	40	C. 40		K.A. Parker unpub. data
1999	North Island robin	Wenderholm Regional Park	21	C. 10		T.G. Lovegrove unpub. data
2004		Little Windy Hill, Great Barrier Island	30	C. 10		J. Gilbert pers. comm.
2005		Glenfern Sanctuary, Great Barrier Island	27	C. 10		T. Bouzaid pers. comm.
2007		Tāwharanui Regional Park	21	C. 30		T.G. Lovegrove unpub. data
2003	Whitehead	Hunua Ranges	40	unknown	Probable failure	T.G. Lovegrove unpub. data
2004 2008 2011 2012		Ark in the Park (Waitakere Ranges)	55 50 100 97	unknown	Frequent sightings	M. de Poorter pers. comm. A. Warneford unpub. data
2013			100			K.A. Parker unpub. data
2007		Tāwharanui Regional Park	45	> 100		T.G. Lovegrove unpub. data
2008		Motuora Island	41	C. 80		K.A. Parker; S. Graham unpub. data
2011		Moturoa Island	40	unknown		A. Warneford unpub. data
2005 2010	Hihi	Karori Sanctuary	60 5	C. 50		R. Empson pers. comm.
2007 2008		Ark in the Park Waitakere Ranges	59 60	unknown	Probable failure	M. de Poorter pers. comm.
2009 2010 2011		Maungatautari	59 37 40	>80		K.A. Parker; J.G. Ewen; K. Richardson;
2010		Kapiti Island	30	C. 130		C. Smuts Kennedy
2013		Bushy Park	44	C. 35		unpub. data
2007	Diving petrel (*Pelecanoides urinatrix*)	Motuora Island	30	unknown	Breeding activity recorded	Gardner-Gee 2011
2008			66			
2009			94			

Kōkako	Various	-	-	Ongoing translocations to and from Tiritiri Matangi for meta-population management
Takahē	Various	-	-	Ongoing translocations to and from Tiritiri Matangi for meta-population management

Translocation benefits

I have previously stated that translocations are best viewed as multidisciplinary endeavours that provide benefits for wildlife, resource managers, scientists and the human community (Parker 2008). Translocations to Tiritiri Matangi have provided all of these benefits. Important populations of threatened species have been established on the island, four of which (little spotted kiwi, brown teal, North Island kōkako and North Island saddleback) have had an improvement in their conservation status since 2005 (Miskelly et al. 2008). Novel techniques have also been developed for managing these species, another valuable outcome for resource managers. A Web of Science database search using the key term "Tiritiri Matangi" reveals >76 scientific papers associated with translocated species and citation results suggest some of these, particularly those associated with long-term population studies, have had a large impact on the scientific community (see Armstrong and Ewen this issue). In addition, more than 32 graduate student theses (Honours, Masters and PhD; D.H. Brunton, pers. comm.) have been associated with translocated species, demonstrating the valuable role of Tiritiri Matangi as a training ground for emerging scientists and resource managers.

The community benefits, particularly as demonstrated by the formation of the SOTM, are especially valuable. While initial translocations to Tiritiri Matangi were carried out by the New Zealand Wildlife Service, there has been a shift towards partnerships between research institutions and the SOTM, so much so that the most recently translocated species, the rifleman, was largely initiated, funded and executed by the SOTM in partnership, and with support from, the University of Auckland and the Department of Conservation. Release ceremonies associated with translocated species are very popular, attracting groups of up to 600 people along with extensive media coverage (Rimmer 2004). The SOTM volunteers play key roles in the monitoring and management of translocated species. This community participation is important because public opportunities for connecting with the natural world and participating in conservation management are crucial to meeting broad conservation goals (Parker 2008). Critically, many other restoration groups have also been inspired to initiate their own projects following the success of the SOTM.

Conclusions

Avian translocations to and from Tiritiri Matangi encapsulate a particularly successful element of New Zealand conservation and demonstrate the changes that have occurred over the modern era of New Zealand conservation management (Fig. 1). Translocations to Tiritiri Matangi will continue to be an important element of the restoration of the island but the focus is likely to shift from terrestrial birds. Recent translocations have included shore skinks (*Oligosoma smithii*), Duvaucel's geckos (*Hoplodactylus duvaucelii*) (see Baling et al. this issue) and wetapunga (*Deinacrida heteracantha*). Burrowing seabirds are an essential component of New Zealand ecosystems (Bellingham et al. 2010) and have an important impact through burrowing activity, vegetation modification and, critically, through the transfer of nutrients via guano deposition, regurgitations and adult, egg and chick mortality (Warham 1996; Mulder & Keall 2001). The link between terrestrial and marine ecosystems (Department of Lands and Survey 1982) and the role of seabirds as essential components of the ecosystem (Hawley 1997) was acknowledged in early Tiritiri Matangi management plans, but there was no discussion of seabird translocations. There are two main reasons for this. First, the 1997 plan (Hawley 1997) considered petrels and shearwaters (Procellariidae) would naturally re-establish on the island. Second, very few seabird translocations had been carried out in New Zealand up to 1997 (Miskelly et al. 2009), whereas considerable expertise for terrestrial translocations had existed since the 1960s. However, since 1997, there have been important advances in seabird translocation techniques (Miskelly et al. 2009) and several species are recommended for introduction in the new Tiritiri Matangi Biodiversity Plan (Supporters of Tiritiri Matangi 2013). So, there are clearly still exciting opportunities for avian translocations to Tiritiri Matangi, including seabirds and even ecological analogues (Parker et al. 2010), such as the New Zealand snipe (*Coenocorypha spp.*), to replace the extinct species that once existed in the Auckland region.

Tiritiri Matangi is currently one of the most important sources of birds for translocation to restoration projects in the Auckland region (Table 2). Many of the translocated species will go on to act as important source populations themselves for both natural and translocation-assisted dispersal. Together, all of these restoration sites will contribute to greater connectivity for the benefit of biodiversity restoration.

Tiritiri Matangi has had a definite terrestrial bird bias in translocation over the last 36 years but increasingly other species are being targeted as part of a broader ecological approach to restoration of the island. The challenge for new restoration projects is to observe what has worked for pioneering projects such as Tiritiri Matangi, draw on the best ecological knowledge available, and avoid becoming a living modern version of the Victorian glass case display i.e. a collection of aesthetically pleasing but largely unrelated specimens. Already, good restoration plans are being developed for NZ islands, e.g. the Motuora Native Species Restoration Plan, developed to guide the explicit ecological restoration of Motuora, another Hauraki Gulf Island (http://www.motuora.org.nz/species.aspx). While avian translocations will continue to play a key role for Tiritiri Matangi and many other ecological restoration projects, sound ecological knowledge must always guide the way.

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