

Tiritiri Matangi – an overview of 25 years of ecological restoration

Mel Galbraith^{1*} and Hester Cooper²

¹Department of Natural Sciences, Unitec Institute of Technology, Private Bag 92025, Auckland 1142, New Zealand

²Supporters of Tiritiri Matangi, PO Box 90-814, Victoria St West, Auckland 1142, New Zealand

* Author for correspondence (Email: mgalbraith@unitec.ac.nz)

Published online: 18 November 2013

Abstract: Tiritiri Matangi Island is a scientific reserve in the Hauraki Gulf, New Zealand that has a long history of degradation from human occupation. The ecological restoration of the island commenced in 1984, with revegetation, species translocations and management of invasive species. Ecological restoration projects are, in essence, experimental in that the restoration outcomes are not known. Thus, they offer opportunities for formal research to run parallel with the restoration process, to track, assess and critique ecological manipulations and the resulting outcomes. These research opportunities on Tiritiri Matangi have been taken up by ecologists from a number of tertiary institutions. The enhancement of the island's ecosystems through restorative actions, and the associated research, are indicative of a dual pathway inherent in ecological restoration projects.

Keywords: Tiritiri Matangi Island; ecological restoration

Introduction

"Ecological restoration projects are an experimental ecologist's dream. They provide opportunities for large scale manipulation of the very characteristics that we are beginning to suspect are fundamental to the ecology of populations, communities and ecosystems ... "

(Young et al. 2001)

Release of the first kakariki or red-crowned parakeet (*Cyanoramphus novaezelandiae*) onto Tiritiri Matangi Island in 1974 initiated a dual pathway for the island that continues today. While the core intention of the physical process of ecological restoration was the replacement of a degraded ecosystem with one of enhanced function and biodiversity, the ensuing changes to the island's ecosystem were also recognised as long-term research opportunities that were not available elsewhere in New Zealand at the time (Craig et al. 1995).

A brief restoration history

Tiritiri Matangi Island is a 220 ha scientific reserve in the Hauraki Gulf 28 km north of Auckland City. Tiritiri Matangi is now managed by the Department of Conservation (DOC), assisted by volunteers and a community group, the Supporters of Tiritiri Matangi (SOTM).

The island has a long history of human-induced degradation. Evidence from less-modified islands within the Hauraki Gulf suggests that pre-human Tiritiri Matangi is likely to have been a seabird-dominated ecosystem, with coastal forest of pohutukawa and kohekohe, remnants of which persist on the island (Esler 1978). Despite the almost total loss of vegetation, small populations of the more resilient bush birds persisted on Tiritiri Matangi, including an important local population of bellbird. The island's rugged coastline offered refuge to a number of coastal bird species, including grey-faced petrel (*Pterodroma macroptera*), blue penguin (*Eudyptula minor*), red-billed gull (*Larus novaehollandiae*), southern black-backed

gull (*L. dominicanus*), white-fronted tern (*Sterna striata*) and variable oystercatcher (*Haematopus unicolor*).

The original restoration plan for Tiritiri Matangi aspired towards an ecosystem characteristic of the Inner Hauraki Gulf Islands Ecological District. Restoration goals for the island (Department of Lands and Survey 1982; DOC 1995; Hawley 1997) have focused on extending and enhancing pre-existing flora, fauna and ecosystems of Tiritiri Matangi. This has included re-establishment of species formerly present on the island through the translocation of populations. However, restoration actions have also utilised the protected status of the island and the absence of mammalian pests for the conservation of indigenous species threatened elsewhere within New Zealand.

The lack of natural regeneration on the island was the stimulus to initiate a human-assisted restoration programme in 1984, enlisting members of the public as a voluntary labour force. This contribution by volunteers grew, with a community group, the Supporters of Tiritiri Matangi, forming in 1988. Since its inception, the group has shifted its focus from that of primarily a voluntary labour force, to that of management of the island's visitors, infrastructure and biodiversity. It now makes a significant financial contribution annually to the island. When the restoration started, the involvement of volunteers was both innovative and controversial. Tiritiri Matangi is now recognised as a premier site for conservation advocacy. It is held up as a model of community participation in conservation, and has inspired many other initiatives in New Zealand and worldwide. Details of this public involvement have been described elsewhere (Craig et al. 1995; Galbraith & Hayson 1995; Rimmer 2004; Galbraith 2013).

Key restoration events have included:

- 1975–78 – island incorporated into the Hauraki Gulf Maritime Park in stages.
- 1976 – Tiritiri Matangi gazetted as a recreational reserve.
- 1980 – Tiritiri Matangi gazetted as a scientific reserve.
- 1983 – restoration concept and vision goes public, nursery established.

- 1984 – restoration planting starts.
- 1984–94 – vegetative cover increased from 6% to approximately 60% through the planting of 280,000 trees. These plantings have formed dense canopies in most places, shading out grass communities and creating leaf-litter communities; natural regeneration is evident as seeds of bird-dispersed plants germinate in the leaf-litter. The unplanted portion of the island is either regenerating naturally (at a slower rate), or left as grassland to provide a diversity of habitats. Archaeological sites were reserved from planting to prevent damage, initially from digging, and from subsequent root growth (Hawley 1997). This approach to management of archaeological sites continues.
- 1993 – eradication of kiore (Pacific rat *Rattus exulans*)
- recovery of fauna species extant on the island, with some species formerly not known to be present only showing up after a long period of recovery:
 - 2004 common gecko (*Hoplodactylus maculatus*)
 - 2007 giant centipede (*Cormocephalus rubriceps*)
- translocation of 15 fauna species:
 - 1973 kakariki / red-crowned parakeet (*Cyanoramphus novaezelandiae*)
 - 1984 tieke/North Island saddleback (*Philesturnus carunculatus*)
 - 1989 popokatea / whitehead (*Mohoua albicilla*)
 - 1990 pateke / brown teal (*Anas chlorotis*)
 - 1991 South Island takahe (*Porphyrio hochstetteri*)
 - 1992 toutouwai / North Island robin (*Petroica australis*)
 - 1993 kiwi pukupuku / little spotted kiwi (*Apteryx owenii*)
 - 1995 hihi / stitchbird (*Notiomystis cincta*)
 - 1997 North Island kokako (*Callaeas wilsoni*)
 - 2001 matata / North Island fernbird (*Bowdleria punctata*)
 - 2003 northern tuatara (*Sphenodon punctatus*)
 - 2004 miromiro / North Island tomtit (*Petroica macrocephala*)
 - 2006 Duvauzel's gecko (*Hoplodactylus duvaucelii*)
 - 2006 shore skink (*Oligosoma smithi*)
 - 2009 North Island rifleman (*Acanthisitta chloris*)
 - 2011 wetapunga / Little Barrier giant weta (*Deinacrida heteracantha*)
- translocation on/off the island of takahe and kokako to maintain genetic diversity.
- some species have reached population levels that can sustain 'harvest' for translocation to other restoration projects:
 - popokatea / whitehead
 - kakariki / red crowned parakeet
 - hihi / stitchbird
 - tieke / North Island saddleback
 - toutouwai / North Island robin
- since 1984 there have been annual programmes of weed control.
- management of Argentine ants (*Linepithema humile*) since discovery of an incursion in 2000. (The expectation is to achieve eradication.)

Research on Tiritiri Matangi

The ecological restoration of Tiritiri Matangi has always been underpinned by firm ecological science (Craig et al. 1995). Research carried out in the late 1970s indicated that natural regeneration of native woody vegetation would be inhibited in the absence of intervention (West 1980). This information provided the rationale for the revegetation programme (Craig & Vesely 2007). Since then, Tiritiri Matangi has been used as a research site by tertiary education institutions, with more than 70 post-graduate research projects completed to date with the island as the principal focus.

Biodiversity research and monitoring on Tiritiri Matangi is undertaken by the governing authority (Department of Conservation), post-graduate researchers and volunteers. Projects include assessments of specific populations to establish management actions, long-term studies of taxa to record changes over time, and issues associated with visitors. The findings of research subsequently inform management decisions for the island, and are also applied to other restoration projects.

Population monitoring is always an element of a species translocation, often carried out as a component of a post-graduate research project. This monitoring is essential to assess the post-release survivorship of the population, but, typically with post-graduate research on the island, is subject to a finite time period. Sustained ongoing monitoring of species is increasingly being carried out by SOTM volunteers, either as SOTM initiatives or as collaborative projects.

There is a developing shift in research focus from that initiated by tertiary institutions considering research techniques and topics of academic interest, towards research initiated by SOTM that seeks to address long-term management issues. It is expected that this shift will result in the integration of research projects to address key issues on the island. Both types of research, however, may be supported by SOTM through direct funding and research grants.

Summary

The Tiritiri Matangi 'journey' supports a duality, identified by Bradshaw (1987), that is inherent with ecological restoration – that of environmental enhancement and research outcomes. There is no question that the integrity of the island's ecosystem has been enhanced as a result of the restoration actions. Research outputs over the same period demonstrate that our understanding of human-induced succession processes, and knowledge of ecology in general, has been extended, perhaps supporting the assertion that ecological restoration is the 'acid test' of our understanding of ecology (Bradshaw 1987; Ewel 1987). The collective scientific publications and post-graduate research projects that have focussed on the ecology of Tiritiri Matangi are indicative of the research component of ecological restoration duality.

Acknowledgements

We wish to thank John Craig and Dan Blanchon for their constructive comments of the draft manuscript.

References

- Bradshaw AD 1987. Restoration: an acid test for ecology. In: Jordan JR, Gilpin ME, Aber JD eds. *Restoration ecology: a synthetic approach to ecological research*. Cambridge, UK, Cambridge University Press. Pp. 23–29.
- Craig J, Mitchell N, Walter W, Galbraith M, Chalmers G 1995. Involving people in the restoration of a degraded island: Tiritiri Matangi Island. In: Saunders DA, Craig JL, Mattiske EM eds. *Nature Conservation 4: The role of networks*. Chipping Norton, NSW, Australia, Surrey Beatty & Sons. Pp. 534–41.
- Craig J, Vesely E 2007. Restoring natural capital reconnects people to their natural heritage: Tiritiri Matangi Island, New Zealand. In: Aronson J, Milton SJ, Blignaut JN eds. *Restoring natural capital: science, business, and practice*. Washington DC, USA, Island Press. Pp. 103–111.
- Department of Conservation 1995. *Conservation management strategy*. Auckland, NZ, Department of Conservation.
- Department of Lands and Survey 1982. *Tiritiri Matangi Island working plan*. Auckland, NZ, Hauraki Gulf Maritime Park Board.
- Esler, AE 1978. Botanical features of Tiritiri Island, Hauraki Gulf, New Zealand. *New Zealand Journal of Botany* 16: 207–26.
- Ewel JJ 1987. Restoration is the ultimate test of ecological theory. In: Jordan WR, Gilpin ME, Aber JD eds. *Restoration ecology: a synthetic approach to ecological research*. Cambridge, UK, Cambridge University Press. Pp. 31–34.
- Hawley J 1997. *Tiritiri Matangi Island Working Plan*. Auckland, NZ, Department of Conservation.
- Galbraith MP 2013. Public and ecology—the role of volunteers on Tiritiri Matangi Island. *New Zealand Journal of Ecology* 37: 266–271.
- Galbraith MP, Hayson CR 1995. Tiritiri Matangi Island, New Zealand: public participation in species translocation to an open sanctuary. In: Serena M ed. *Reintroduction biology of Australian and New Zealand fauna*. Chipping Norton, NSW, Australia, Surrey Beatty & Sons. Pp. 149–54.
- Rimmer A 2004. *Tiritiri Matangi: a model of conservation*. Auckland, NZ, Tandem Press.
- West CJ 1980. Aspects of regeneration on Tiritiri Matangi Island. Unpublished MSc thesis, University of Auckland, Auckland. 173 p.
- Young TP, Chase JM, Huddleston RT 2001. Community succession and assembly: comparing, contrasting and combining paradigms in the context of ecological restoration. *Ecological Restoration* 19: 5–18.