# RESTORING BIODIVERSITY USING MAMMAL-FREE SANCTUARIES: IMPLICATIONS FOR BIRDS AND SEED DISPERSAL


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## Background

- Islands are global hotspots of biodiversity. They hold 1/5$^{th}$ of the world's land species in less than 5% of the earth's surface area. Many island species face extinction.
- The loss of island fauna may disrupt ecological processes that depend on animals, e.g. seed dispersal and pollination, exacerbating diversity decline in these biologically rich regions.
- Invasive mammals are the primary cause of extinctions on islands.
- In New Zealand, conservation organizations have constructed a network of 'mammal-free sanctuaries,' which exclude invasive mammals with predator-proof fencing to conserve native birds. Yet, critics have questioned whether sanctuaries effectively conserve native species and ecosystems, given a lack of evidence on project outcomes. Our research assessed whether sanctuaries are meeting conservation targets and thus represent a good use of limited funds.

### Steps to create a fenced mammal-free sanctuary:


## Research Questions

1) Do mammal-free sanctuaries in New Zealand enhance the diversity of bird communities and the density of native bird species relative to unprotected areas?

2) Do mammal-free sanctuaries in New Zealand enhance bird-mediated seed dispersal relative to unprotected areas?

## Methodology

**Jan-April, 2016-2017* - 3 paired sanctuary and reference study areas:**

*Data presented for 2016 only


1 Tawharanui Sanctuary & McElroy's Scenic Reserve

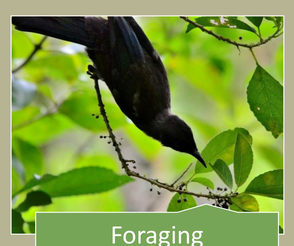
2 Maungatautari Sanctuary & Te Tapui Scenic Reserve

3 Rotokare Sanctuary & Tarata Conservation Area

**Data collected:**

5 min bird counts

Seed traps – dispersed seeds

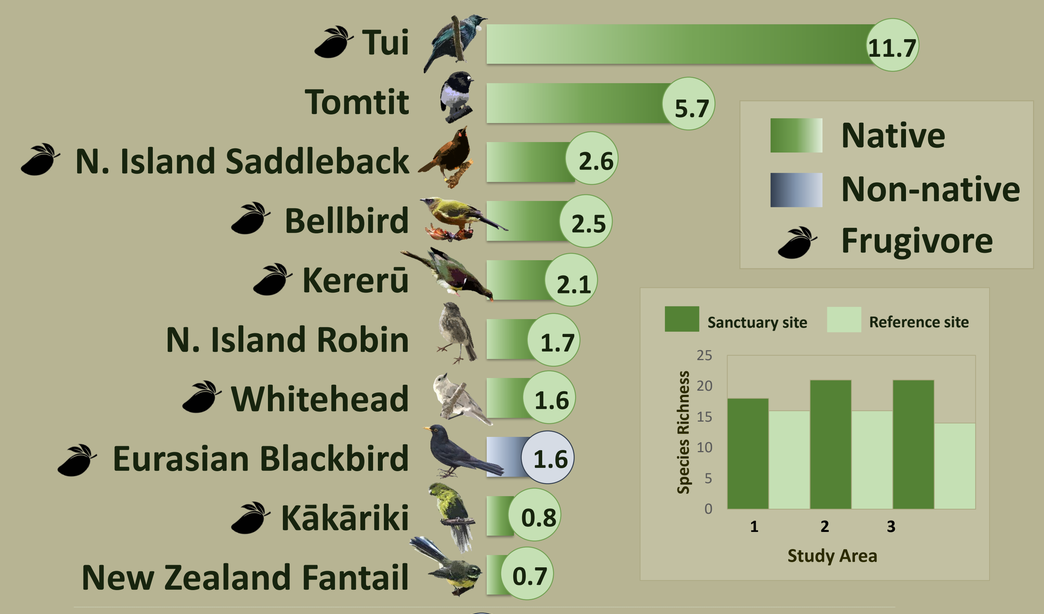


Foraging observations

**Compared density and diversity of birds, foraging rates, and densities of bird-dispersed seeds between sanctuary and reference sites.**

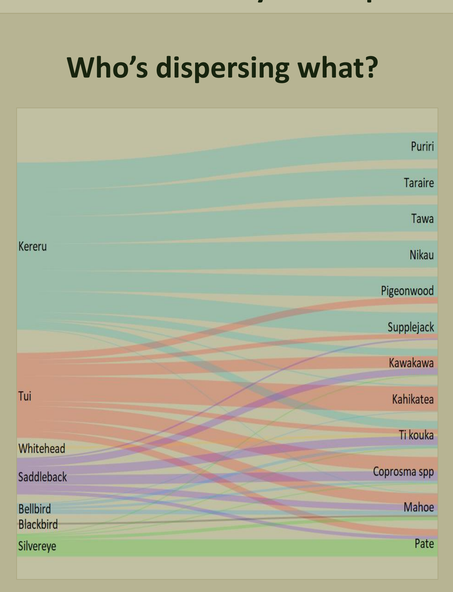
## Results

**Positive effect of mammal-free sanctuaries on bird diversity and densities for most species.** Effect = Mean change in density relative to reference sites.

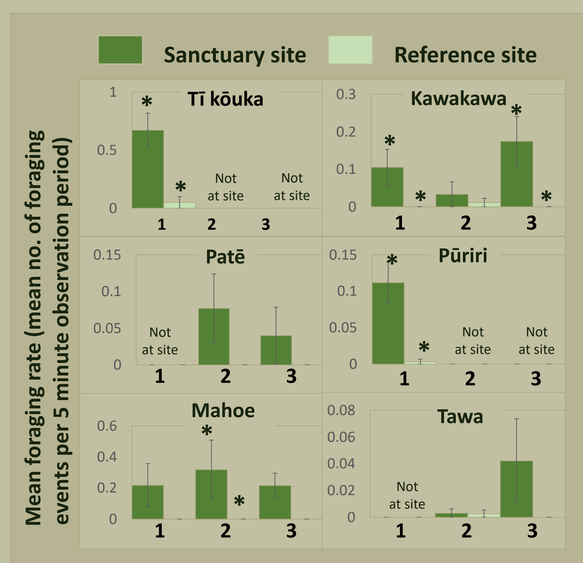



*95% confidence interval overlaps zero

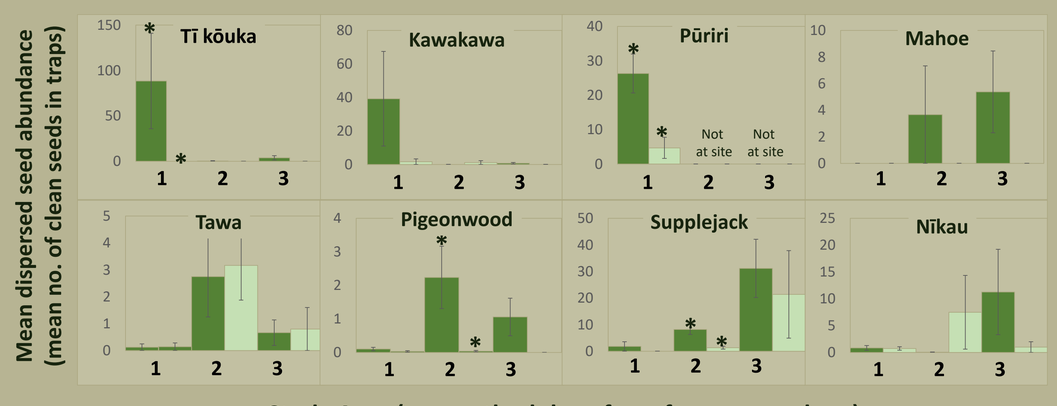
**Higher foraging rates and higher densities of dispersed seeds in mammal-free sanctuaries for many native plants**




Line thickness = frugivore importance




*indicates significant difference between paired sanctuary and reference site (Wilcoxin Rank Sum Test, $\alpha < 0.05$)




*indicates significant difference between paired sanctuary and reference site (Wilcoxin Rank Sum Test, $\alpha < 0.05$)

## Summary

- New Zealand's mammal-free sanctuaries substantially increase the density of native birds, while also enhancing bird-mediated seed dispersal
- We provide evidence that these sanctuaries, which require a large investment of conservation funds, are restoring biodiversity and ecosystem processes
- Our findings offer novel insight into the success of a conservation strategy relevant to the many ecosystems threatened by invasive predators globally