

Biodiversity responses to predator control

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SONZ Workshop
Banks Peninsula, 8 August 2017



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Overview

- What are the effect sizes of biodiversity responses to predator control?
- Aims:
 - Compare biodiversity outcomes from different control regimes
 - Consider community-level responses (e.g. trends in diversity indices)
- Approaches:
 - Meta-analysis of outcome literature
 - Modelling biodiversity monitoring data, aggregated across multiple sites

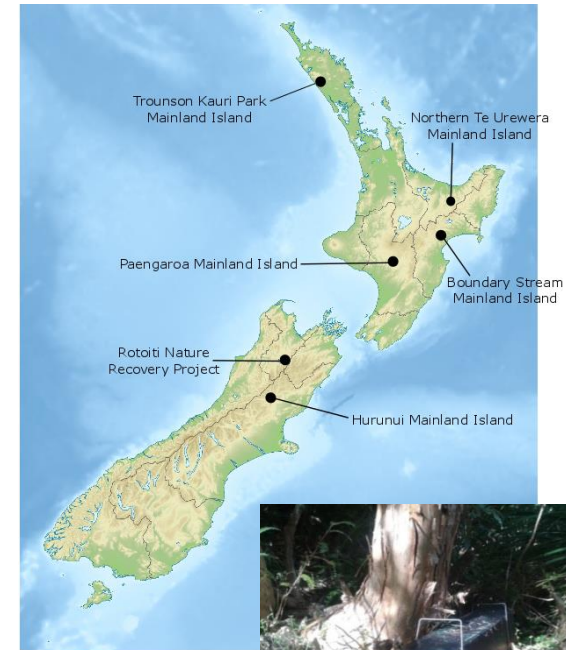
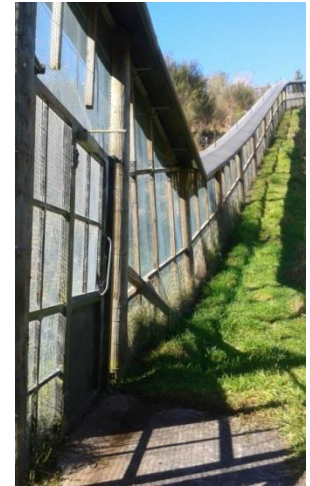


Major control regimes

| Regime | Outcome objective | Sites | Mammals targeted | Mammal control objective | Control method |
|--------|---|--|--|--|---|
| 1 | Ecosystem restoration – maximise indigenous dominance | Marine and lacustrine islands, ring-fenced sanctuaries | All (up to 14 species) | Eradicate all species | Aerial or ground application of brodifacoum, plus follow-up trapping, hunting, poisoning. |
| 2 | Ecosystem restoration – increase indigenous dominance | Peninsula-fenced sanctuaries, mainland islands | Typically possums, stoats, ship rats plus some of cats, ferrets, weasels, Norway rats, and hedgehogs | Sustained (sometimes seasonal) control of several key pest species | Initial or repeated (2-7 years) aerial poisoning with 1080, and/or sustained (usually annual) ground poisoning and trapping |
| 3 | Tb vector control | Forest and pastoral landscapes | Possums, ferrets, deer | Sustained or pulsed low numbers of target taxa | Aerial 1080 poisoning each 4-5 years, plus diverse ground poisoning and trapping |

Major control regimes

- Ring-fenced sanctuaries:
 - Restore ecosystems, maximise indigenous dominance
 - Eradication of all pest mammals
 - Reintroductions of threatened species
- Mainland islands (DOC and SONZ)
 - Restore ecosystems, increase indigenous dominance
 - Intensive, sustained control of key pests
 - Monitoring using standardised methods/measures



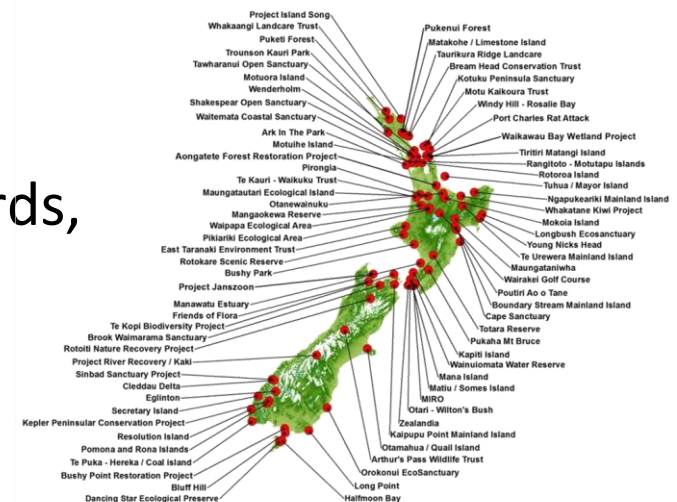
Key questions

1. How does indigenous biodiversity respond to pest control?
2. What are the ecological community-level responses to changes in pest abundance due to control?
3. How do responses differ among habitat types?
4. What are the time lags between changes in pest abundance and biodiversity response?



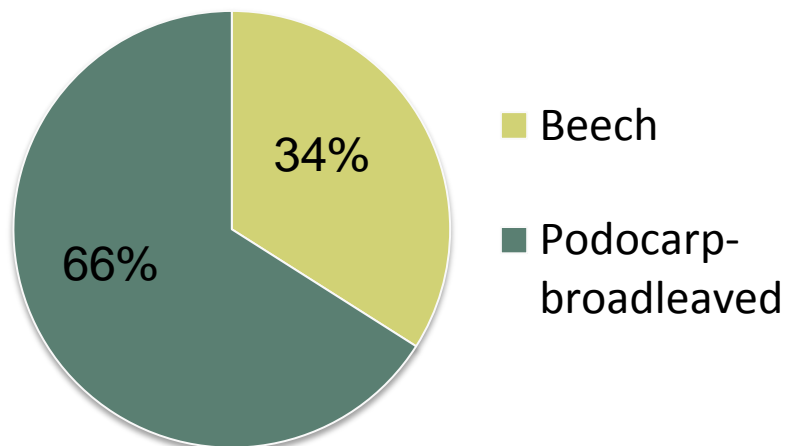
Biodiversity monitoring database

- Database of biodiversity monitoring data from managed sites
- 782,322 records
- 21 sites (18 sanctuaries, 3 DOC Mainland Islands)
- 17 unfenced, 4 fenced
- 1995-2016
- 438 species (birds, invertebrates, lizards, vegetation and pests)

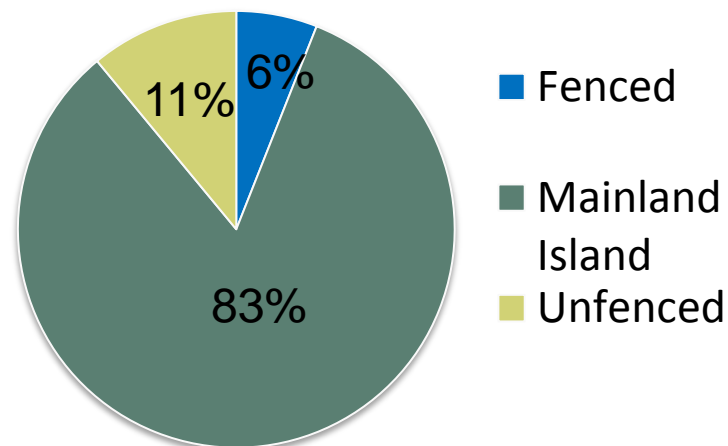


Biodiversity monitoring database

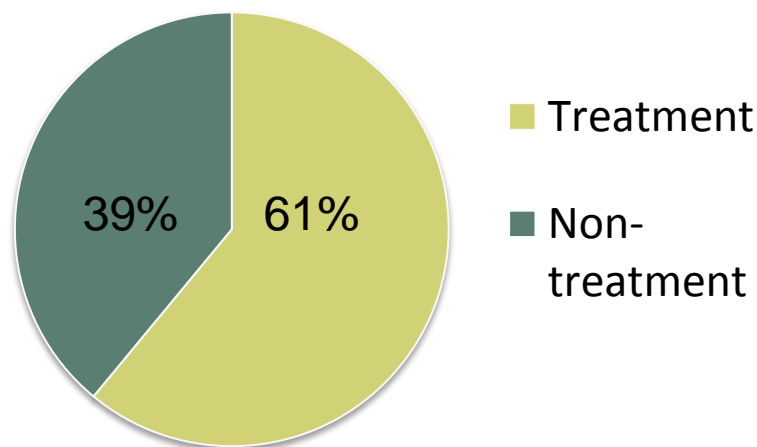
Habitat



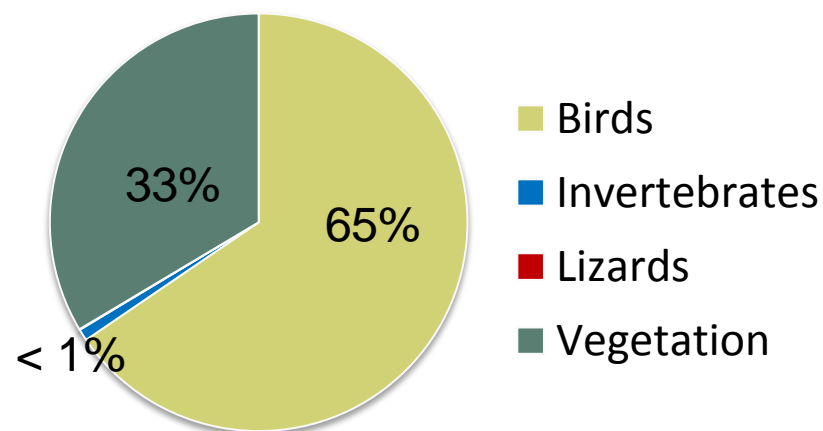
Site Type



Treatment type



Taxa



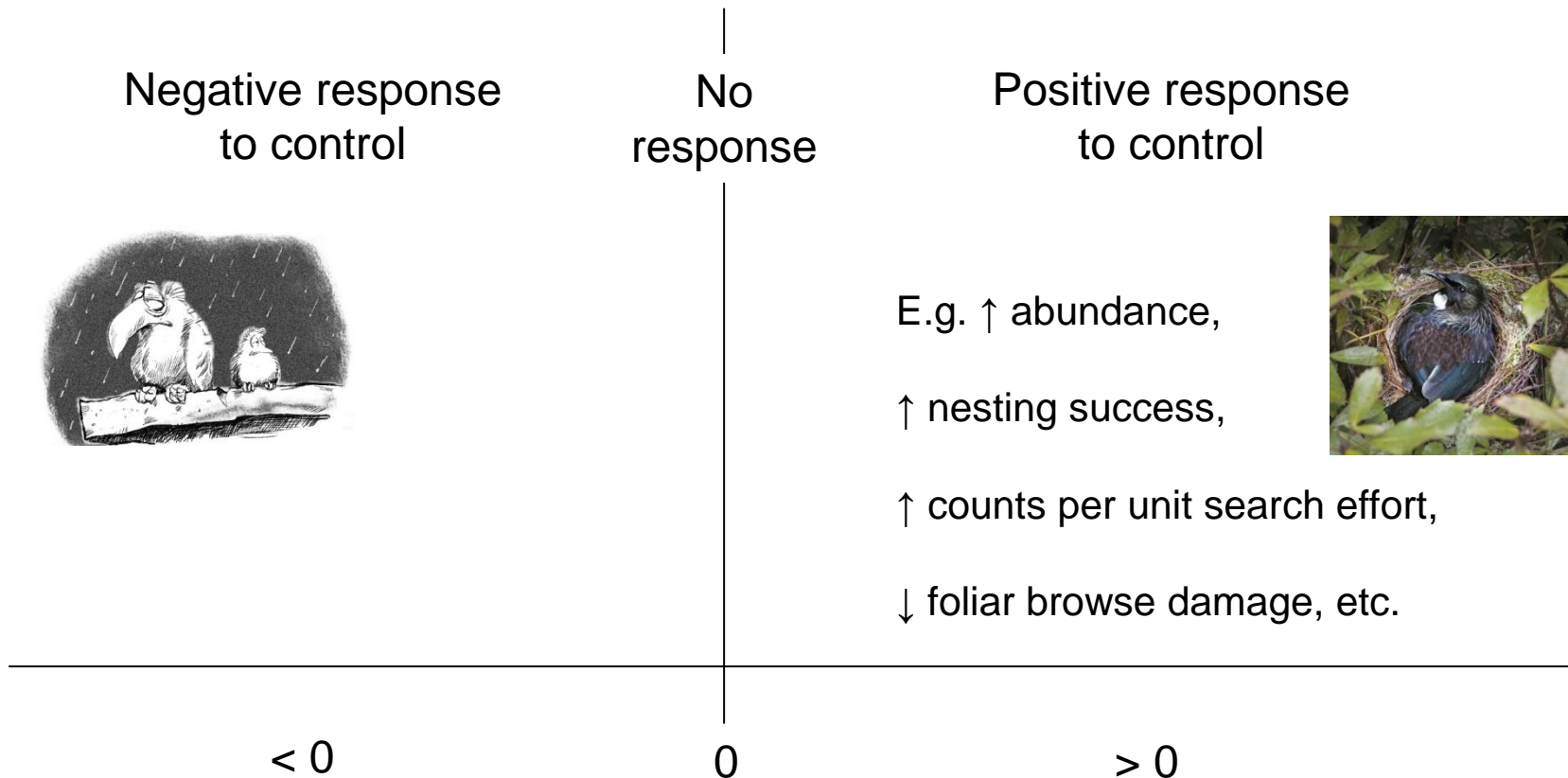
Room for improvement?

- Standardised monitoring methods and measures ✓
- Data sharing & reuse: discoverability, accessibility, ownership
- Data management: cleaning, databases, maintenance, curation
- New models for combining diverse monitoring data at different spatial and temporal scales.

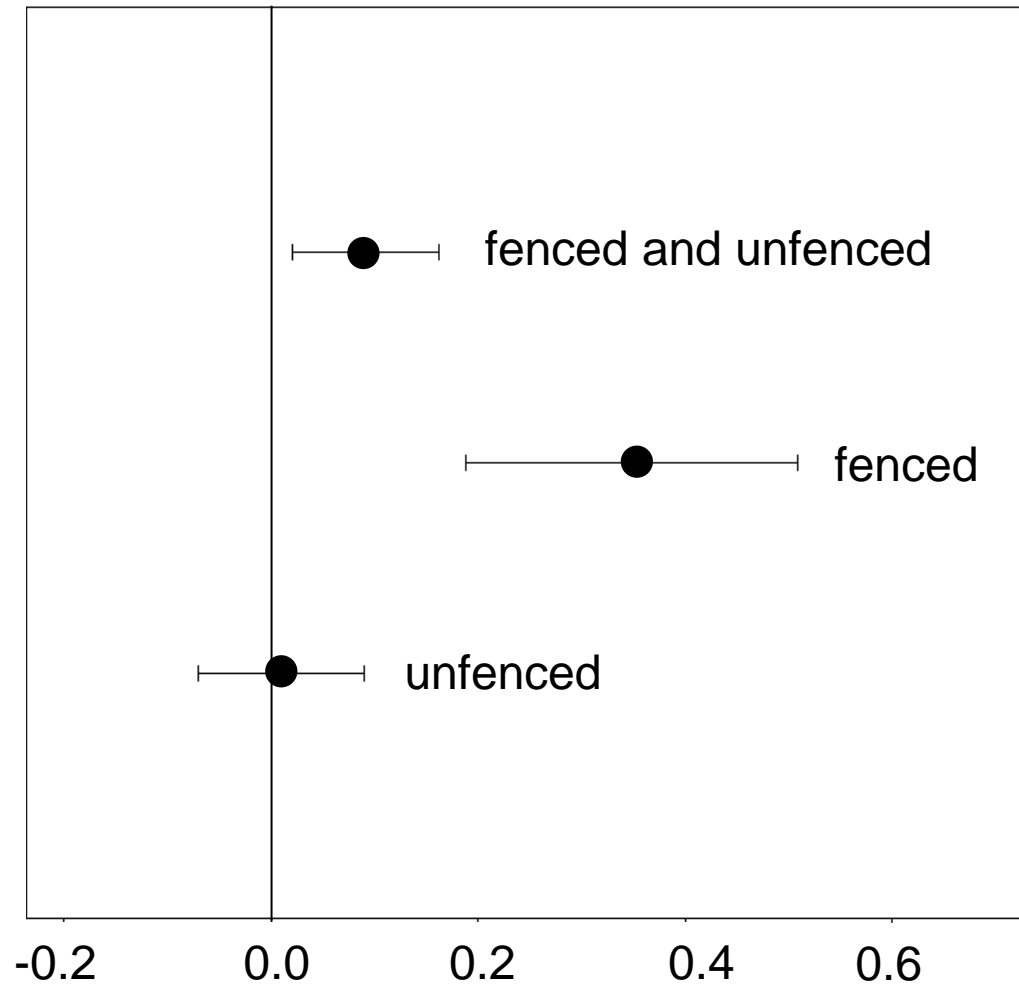


Combining biodiversity data: meta-analysis

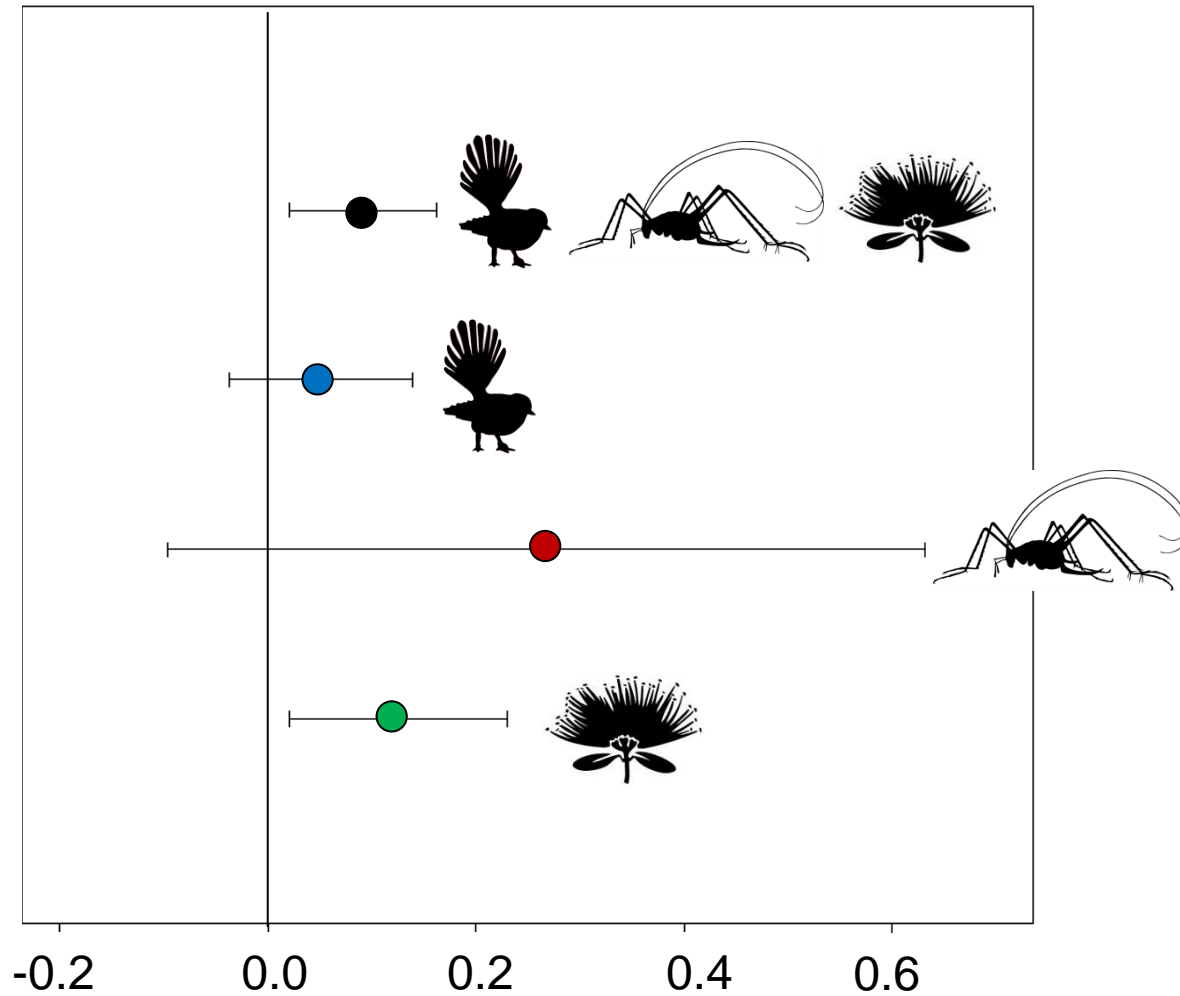
“Effect size”: measures the effect on a native population of conducting pest control, relative to the effect of not conducting pest control.



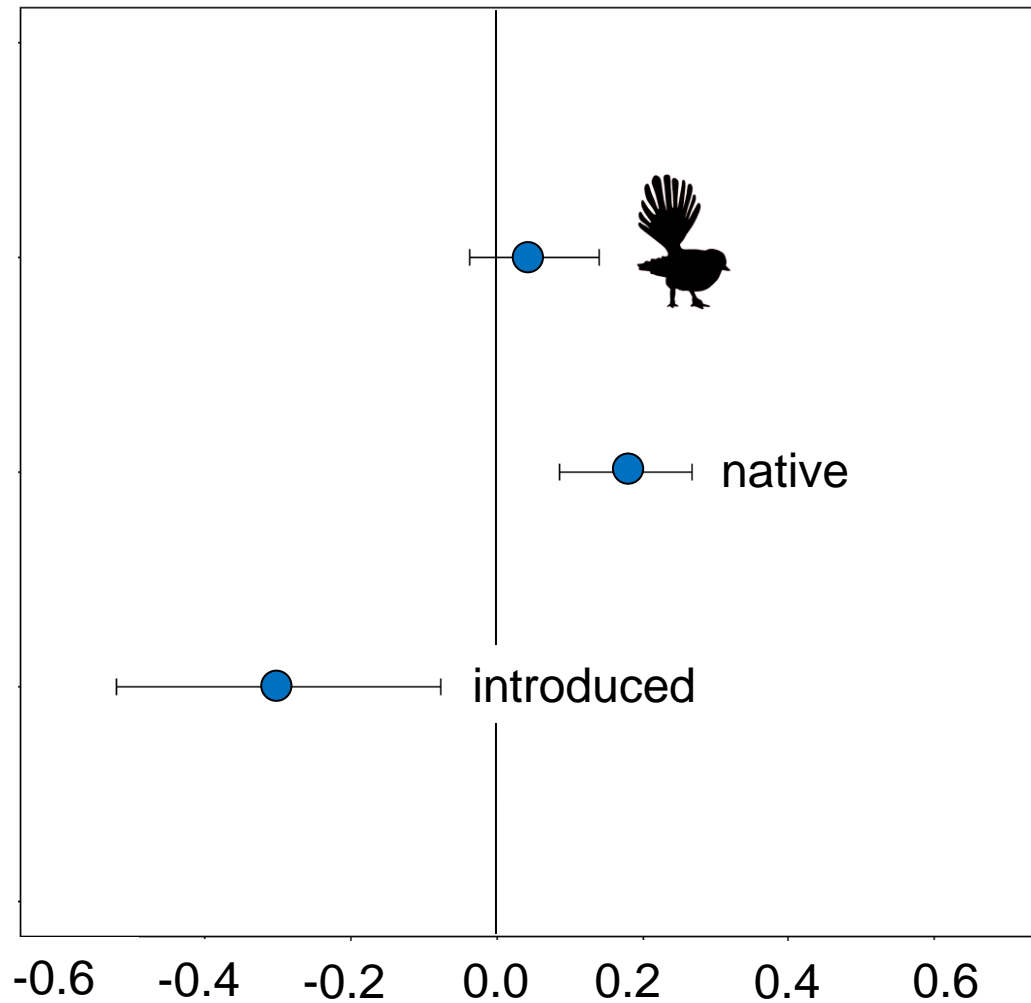
Major control regimes



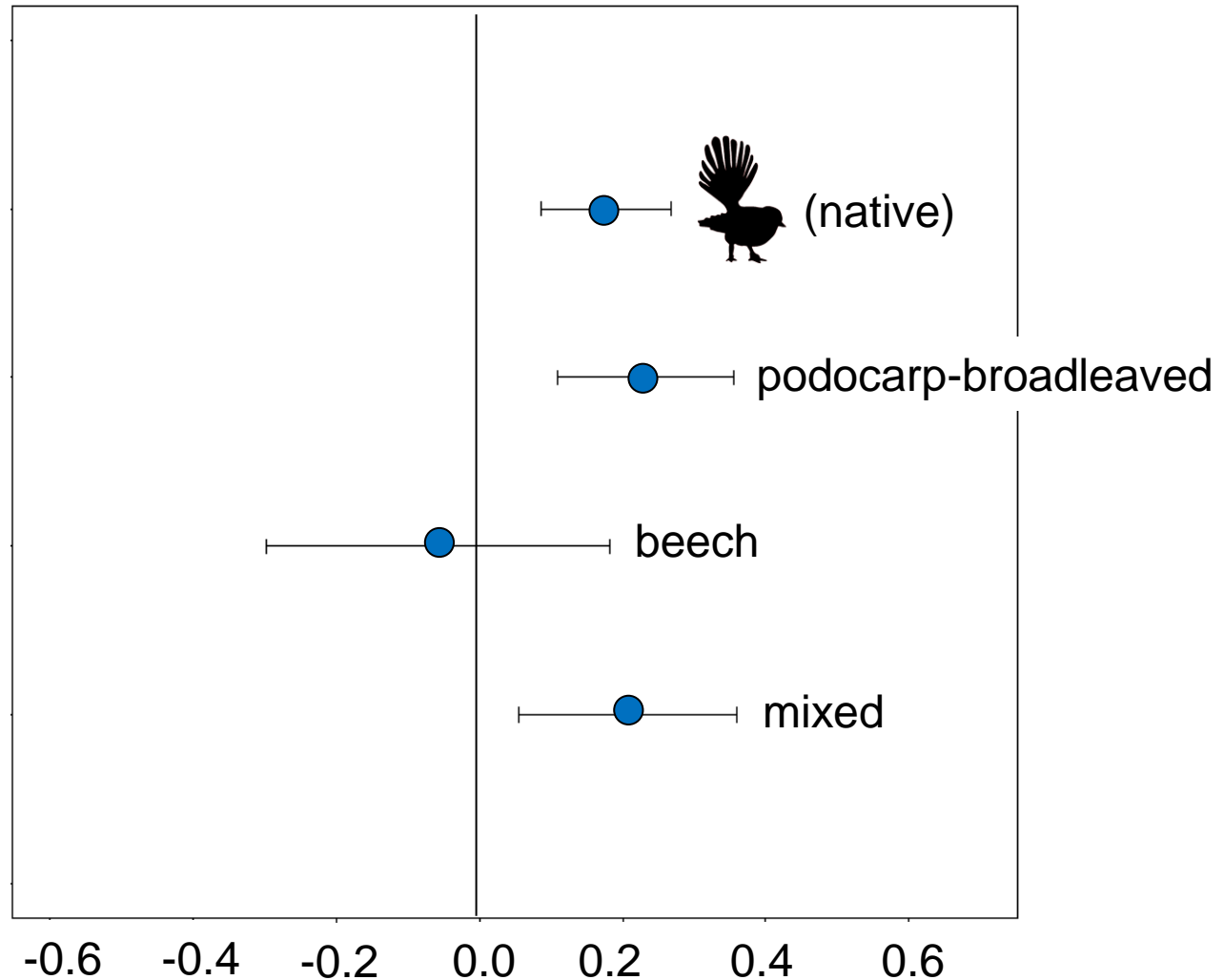
Taxonomic groups



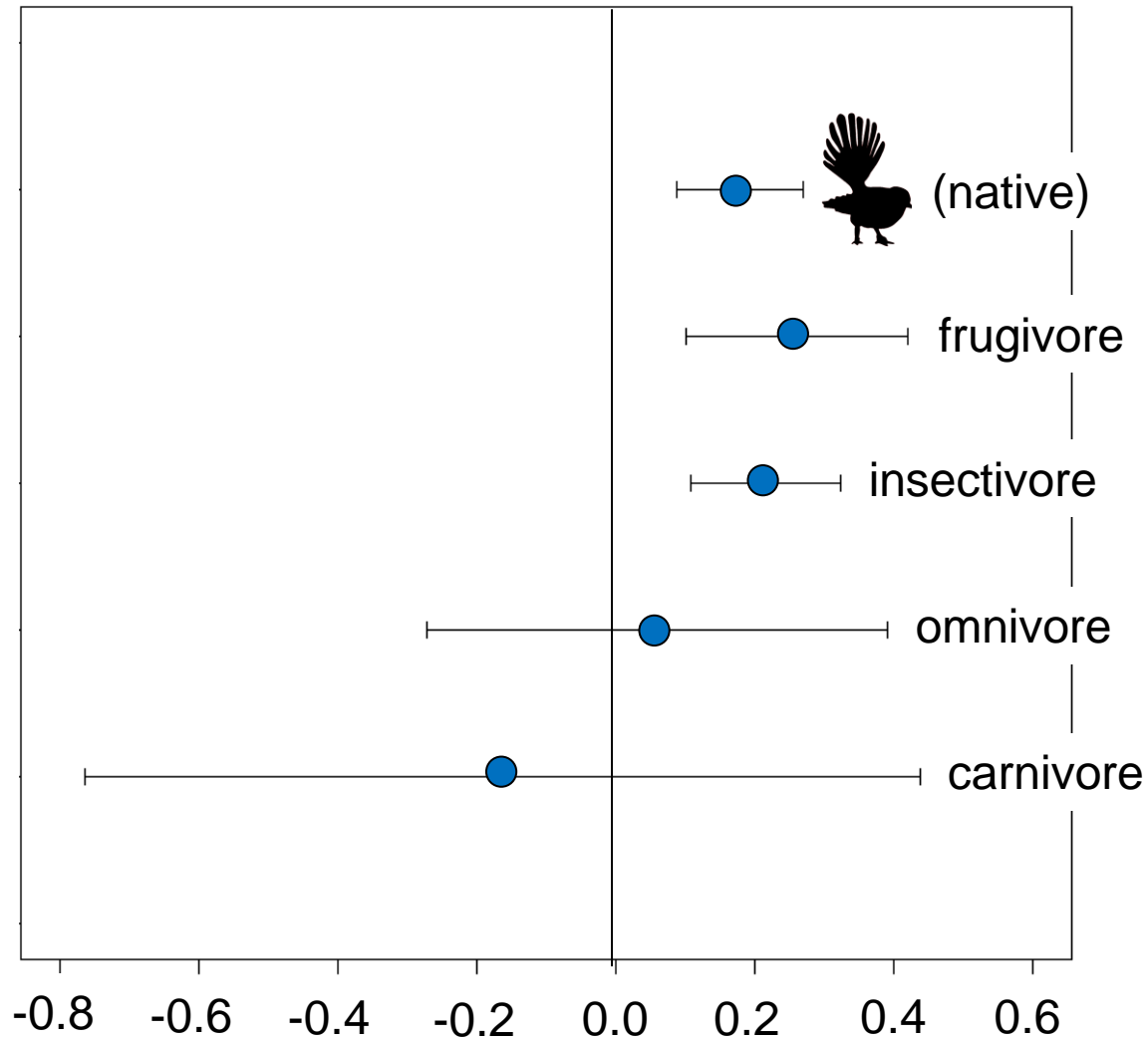
Bird endemism



Habitat for native birds

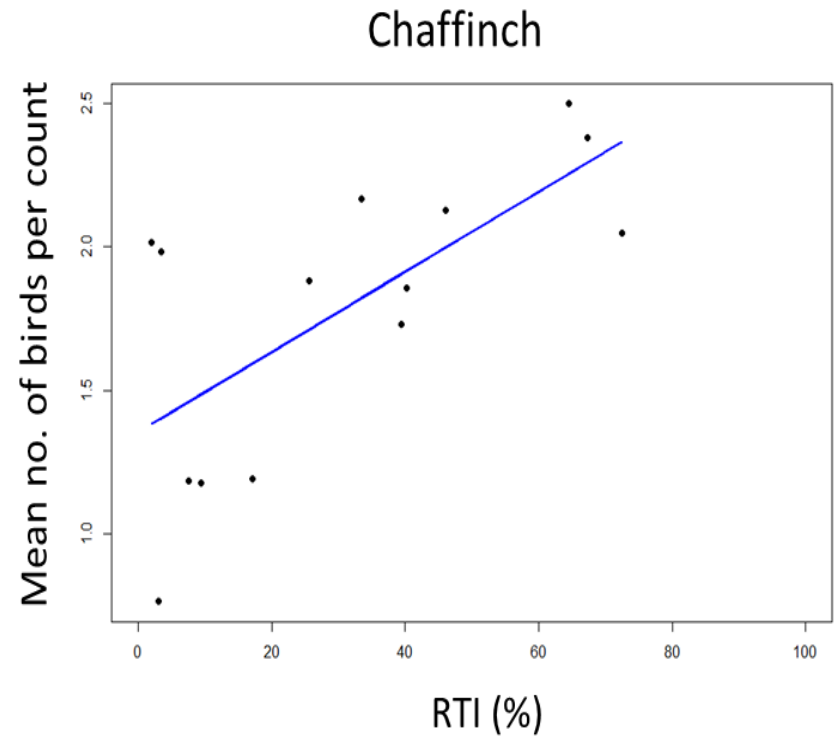
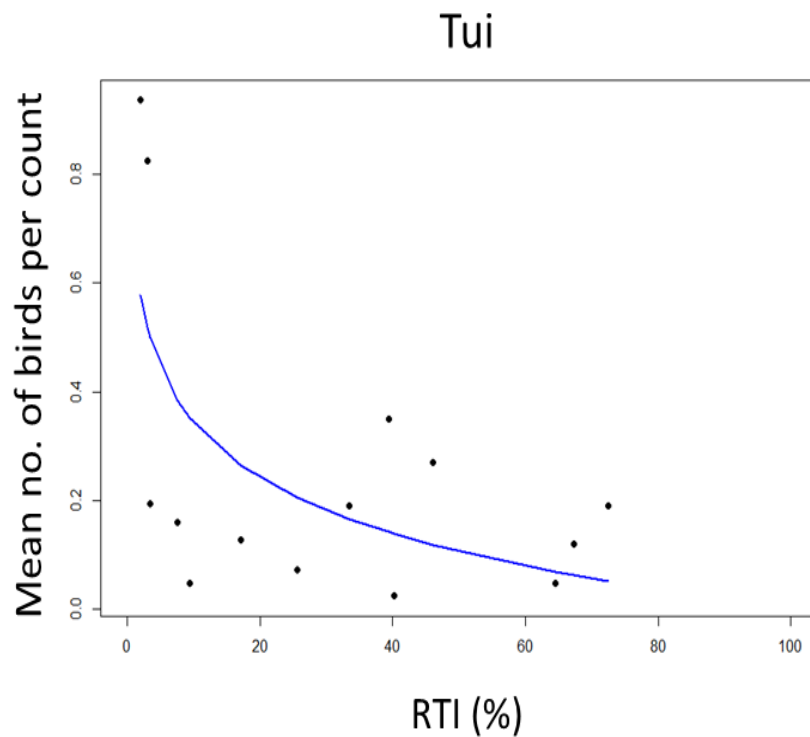


Primary guild for native birds



Future work

- Density-impact functions



Future work

- Compare community-level responses across different regimes by fitting a multi-species, multi-site hierarchical Bayesian model
- Aggregating large and heterogeneous data sets: challenges and recommendations



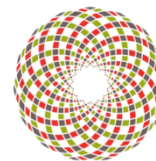
Acknowledgements

- DOC MI data: Craig Gillies and Oliver Gansell (Department of Conservation, Hamilton)
- **Sanctuaries data:** Ark in the Park, Bluff Hill, Bream Head Scenic Reserve, Bushy Point, East Taranaki Environment Trust, Forest Lifeforce Environment Trust, Glenfern Sanctuary, Halfmoon Bay Habitat Restoration Project, Kaipupu Point Wildlife Sanctuary, Mainland Island Restoration Project, Maungatautari, Orokonui, Pirongia, Pomona and Rona Islands, Puketi, Totara reserve, Wainuiomata Mainland Island, Windy Hill
- Neil Fitzgerald and Robbie Price (Landcare Research)



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Challenges



Te Pūnaha Matatini
Data ■ Knowledge ■ Insight