

Biodiversity outcomes of pest management in New Zealand

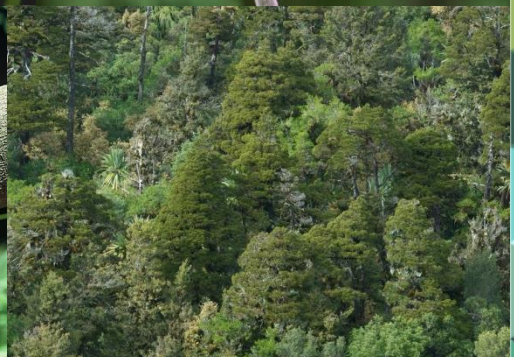
Rachelle Binny

Sanctuaries NZ Workshop

17 August 2016



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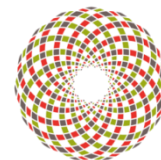
Ecosystem responses to pest control in NZ

- 2 yr Postdoctoral project
- Andrea Byrom, Roger Pech, John Innes (Landcare Research), Alex James (University of Canterbury)
- Project aims:
 - Compare the impacts of mammalian pest control on NZ's native biodiversity, across different control regimes
 - Carry out national-scale analyses and modelling of biodiversity outcome and pest monitoring data (published and unpublished)
 - Measure community- and ecosystem-level outcomes
 - Compile data from marine islands, mainland islands, sanctuaries (fenced and unfenced), and regions where large-scale aerial or ground-based control is conducted



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National
SCIENCE
Challenges



Te Pūnaha Matatini
Data ■ Knowledge ■ Insight

Possum-focused pest control in NZ

- Extensive pest control targeting possums to limit TB threat to livestock by reducing TB prevalence and containing spread
- Conducted by OSPRI (under the TBfree NZ programme)
- Likely to benefit native biodiversity but benefits haven't been formally assessed
- Also control by DOC, local authorities and landowners



Biodiversity outcomes from possum-focused pest control in New Zealand

- Byrom AE, Innes J & Binny RN (2016). A review of biodiversity outcomes from possum-focused pest control in New Zealand. *Wildlife Research*, **43**, 228-253.
- Objectives:
 - Describe New Zealand's major pest control "regimes"
 - Find published biodiversity outcome literature
 - Preliminary look at outcomes (much unpublished data still out there)
 - Start to quantify effects of control (meta-analysis)

Aerial vs. ground operations

- OSPRI:
 - Aerial 1080 approx. 0.5 million ha annually, return time 4-6 years
 - Ground control 3.5-4 million ha annually
- DOC:
 - Aerial 1080 approx. 0.135 million ha annually, return time 2-7 years
 - Diverse objectives
- Total area under sustained control in NZ = approx. 10 million ha



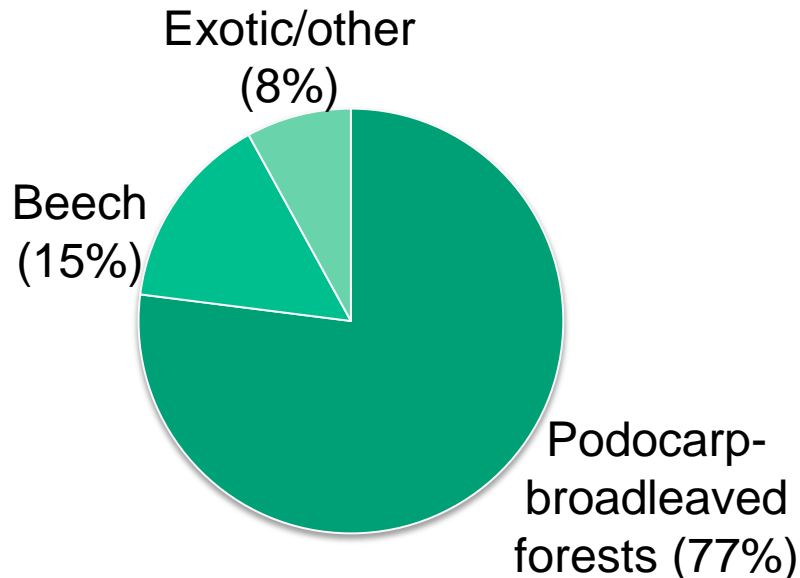
Regime	Outcome objective	Sites	Mammals targeted	Mammal control objective	Control method	Agency
1	Ecosystem restoration – maximise indigenous dominance	Marine and lacustrine islands, ring-fenced sanctuaries	All (up to 14 species)	Eradicate all species	Aerial or ground application of brodifacoum, plus follow-up trapping, hunting, poisoning.	DOC, community groups
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 (2-3 years) aerial poisoning with 1080, and/or sustained (usually annual) ground poisoning and trapping	DOC, community groups, regional, district and city councils
3	Threatened and valued indigenous species recovery	Forests, shrublands, tussocklands	One or several of: stoats, possums, ship rats, cats, ferrets, hedgehogs, Norway rats and mice	Sustained (sometimes seasonal) or pulsed low numbers of target taxa	Aerial 1080 poisoning in most years (beech) or each 2-3 years (non-beech), and/or sustained (usually annual) ground poisoning and trapping	DOC, community groups, regional, district and city councils
4	Maintain or improve canopy health, pasture growth and other biodiversity values	Forest and pastoral landscapes	Possums, sometimes also ship rats and stoats	Sustained or pulsed low numbers of target taxa	Aerial 1080 poisoning each 5-7 years, plus diverse ground poisoning and trapping	DOC, regional councils
5	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	OSPRI
6	Increase grassland production	Private farms	Rabbits	Sustained low rabbit numbers	Aerial 1080 poisoning and shooting	Farmers

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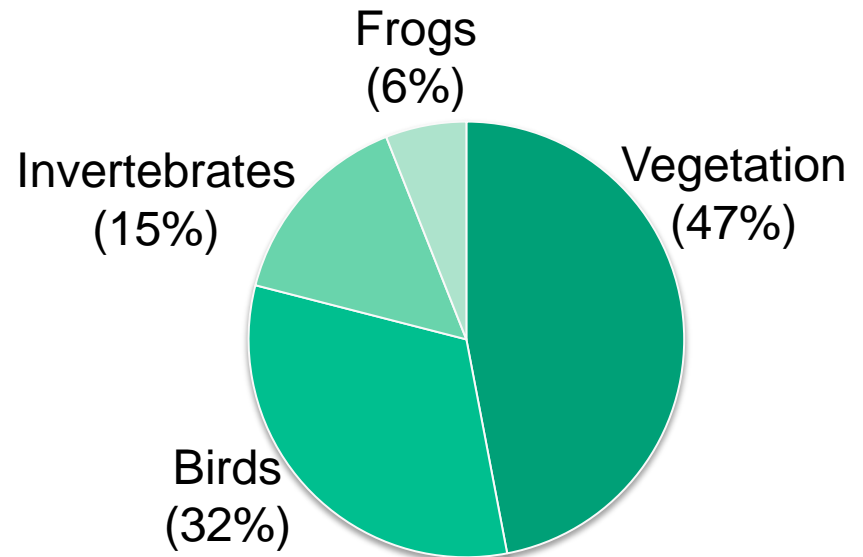
Reviewing the literature

- 47 accounts (4 accounts by OSPRI, 30 others, 13 unknown), 1990-2014
- 60% aerial, 40% ground
- 51% replicated fully or partially in space or time
- 85% compared treatment vs. non-treatment

Ecosystem bias



Taxonomic bias





Vegetation

- Mean study time 6.2 yrs, max 25 yrs
- 17/20 (85%) studies reported increased canopy cover, reduced tree mortality, or reduced browse of susceptible species (e.g. mistletoes, kohekohe, kāmahi)
- Patchy browse and other environmental drivers: no simple relationship between possum density and browse damage
- 3 ground control studies on fruitfall: increased flowering success and fruit production (e.g. Hīnau, nikau palm)





Invertebrates

- 7 studies, monitoring up to 6 years
- Diverse, complex invertebrate communities
- 2/7 studies: Wētā population high for 2 years after control, then declined as rats increase
- Otherwise no coherent changes



Frogs

- 3 studies (ground control): mean 2.2yrs, max 4 yrs
- 2/3 studies: intensive possum and rat control increased frogs
- No long-term studies of frog responses to aerial 1080





Birds

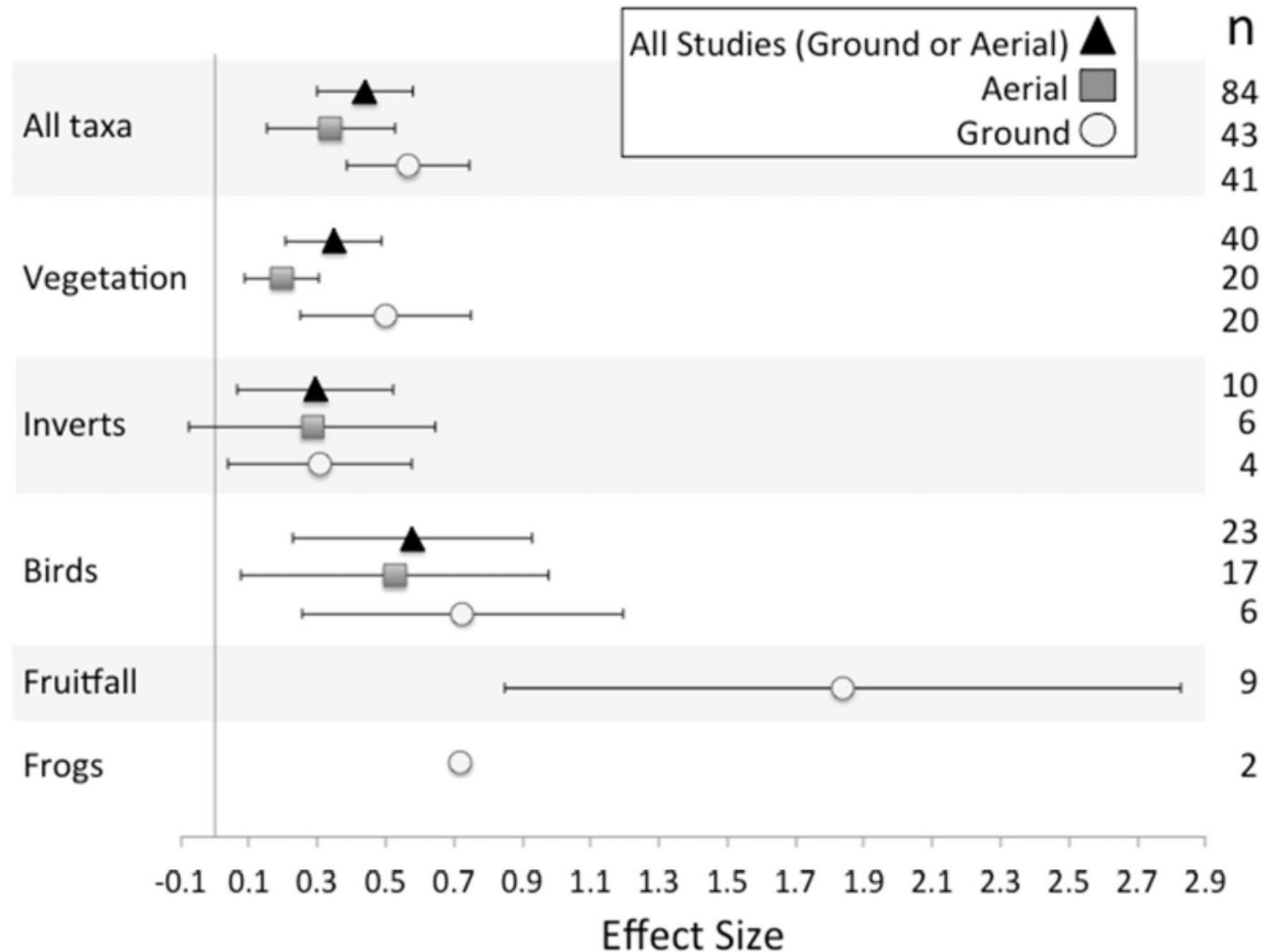
- 15 accounts: mean post-op study time 2.2 yrs (aerial) and 3.4 yrs (ground), max 14 yrs
- 9/11 studies reported increased nesting success following pest control
- 5/6 studies reported increase in adult bird abundance



Meta-analysis

- 84 response measures from 35 out of 47 studies
- “Effect size”: measures the effect on a native population of conducting pest control, relative to the effect of not conducting pest control.
- Effect size > 0 , positive response of native biota to pest control
- Effect size < 0 , negative response to pest control
- Effect size ≈ 0 , unaffected by pest control

Possum-focused pest control benefits native flora and fauna in NZ



Recommendations for future studies

- Standardised monitoring protocols and outcome measures for pests (e.g. Residual trap catch index) and native biota
- Non-treatment site (or pre-treatment data) for comparison
- Replicated studies
- Long-term studies

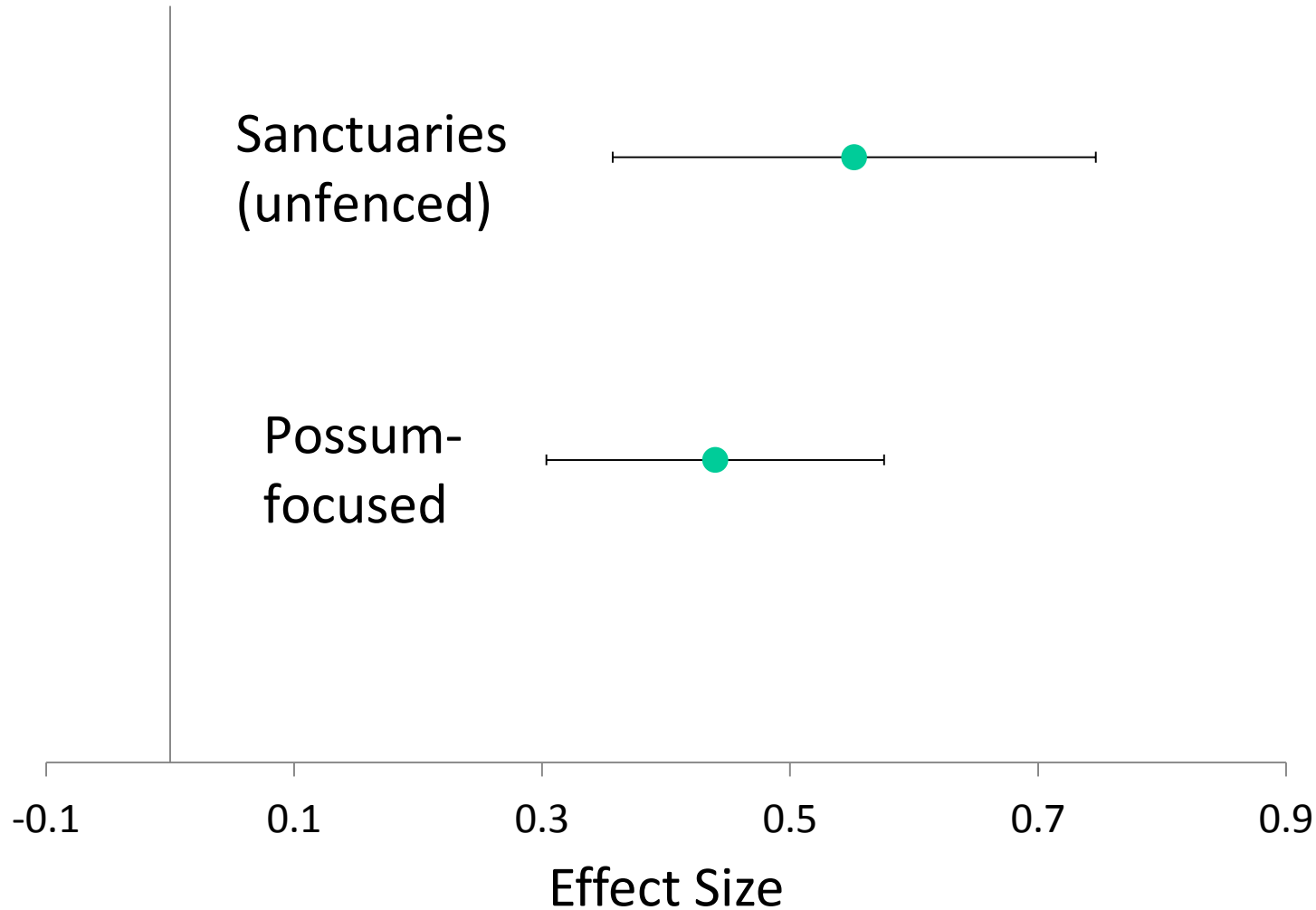
Summary

- Overall, results suggest pest control has benefits for native biodiversity
- Many studies report population-level outcomes. Community-level measures will give more insight into benefits for ecosystems as a whole
- Few published long-term studies of bats, frogs, lizards, seed/fruit production

What's next?...

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Sanctuaries: first look



Acknowledgements

- This work was funded by OSPRI (who manage the TBfree NZ programme) and MBIE
- Data/help: Karen Vincent, Alastair Fairweather, Graeme Elliott, Hugh Robertson, Josh Kemp, Jerome Guillotel (DOC), Murray Hudson, Phil Dawson, Paul Livingstone, Bruce Warburton (OSPRI), Robbie Price, Wendy Ruscoe, Peter Bellingham, Frank Cross (Landcare Research).

