Mice alone and their biodiversity impacts: a 5-year experiment at Maungatautari

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LANDCARE RESEARCH
MANAAKI WHENUA

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Invasive house mouse


Neil Fitzgerald

Mus musculus

Invasive worldwide

NZ's smallest exotic mammal ~20 g

Flexible omnivore

- Eats seeds, insects, lizards, eggs and chicks

Fast-breeding; food limited

Prey or competitor of larger mammals

When other mammals are present:

- Usually scarce and inconspicuous
- Impacts difficult to assess

Mice ‘alone’ without other mammals

Mesopredator release

Cats and mustelids removed, mice ↑ (Central Otago)

Norbury et al 2013 Ecol Applications

Competitor release

Possums and ship rats removed, mice ↑ (North Island forests)

Ruscoe et al 2011 Ecol Lett

Impacts on islands: lizards, invertebrates, birds

Sub Antarctic islands

Mana Island

Biol Invasions (2009) 11:1743–1754
DOI 10.1007/s10530-008-9401-4

INVASIVE RODENTS ON ISLANDS

Review of impacts of the introduced house mouse on islands in the Southern Ocean: are mice equivalent to rats?

Andrea Angel · Ross M. Wanless · John Cooper

Gough, Marion, Farallon and Selvagem Grande Islands

SEABIRD IMPACT ONLY CONFIRMED WHERE MICE ARE THE ONLY MAMMAL

Mice alone – Mana Island (217 ha)

1986 Cattle removed; pasture increased
1989 Mice eradicated
1993 Cook Strait giant wētā ↑
McGregor's skinks ↑, common and goldstripe gecko ↑

Newman 1994 NZJ Zool

Mice in fenced biodiversity sanctuaries

Predator fence excludes most mammals

Mice often reinvade – small, lightweight, good climbers

Or may not be completely eradicated

Can reach high density in absence of other mammals

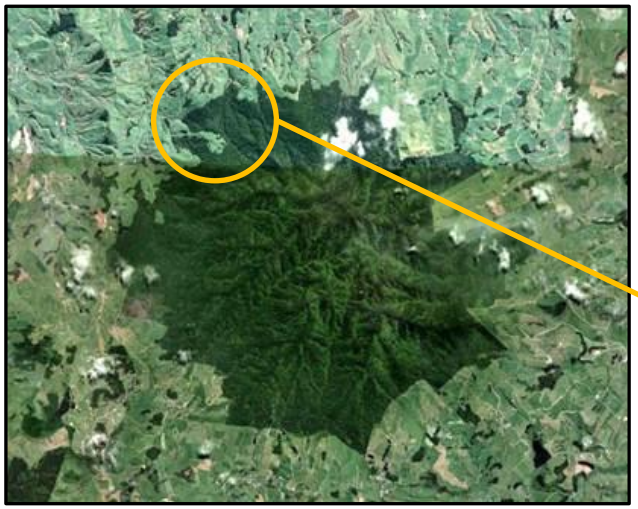
e.g. up to 160 per hectare at Tawharanui in rank grass

Goldwater et al 2012 Aust Ecol

➔ Do mice matter?

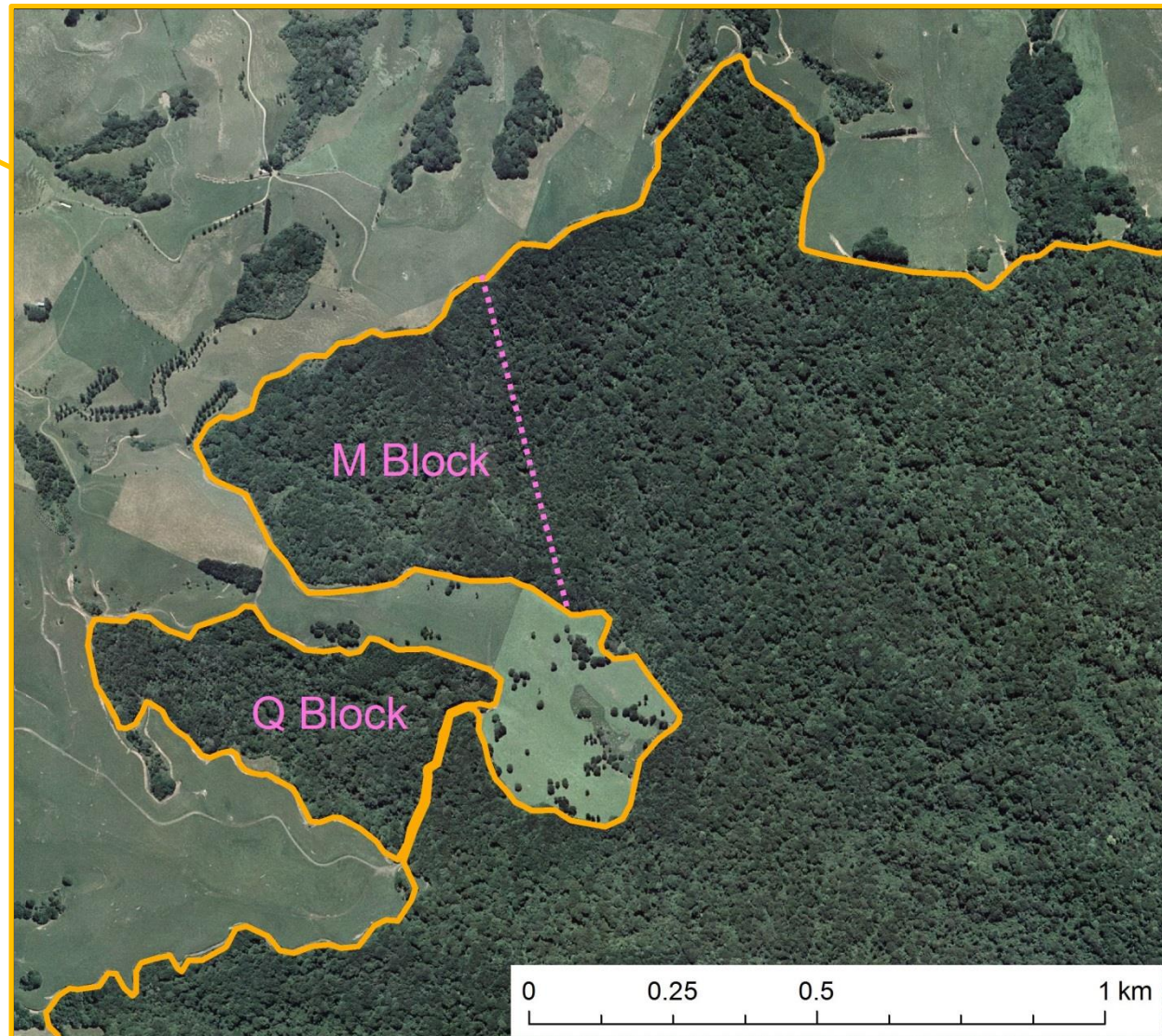
Are they ecologically important?

Mice alone at Maungatautari



3400 hectares

17 and 24 hectares



Live trapping

- Every 3 months
- 5 years 2011–2016

Treatment switch mid-way (2013)

Mouse impacts

- Invertebrates
- Other taxa

SECR spatially-explicit capture–recapture

Spatial parameters

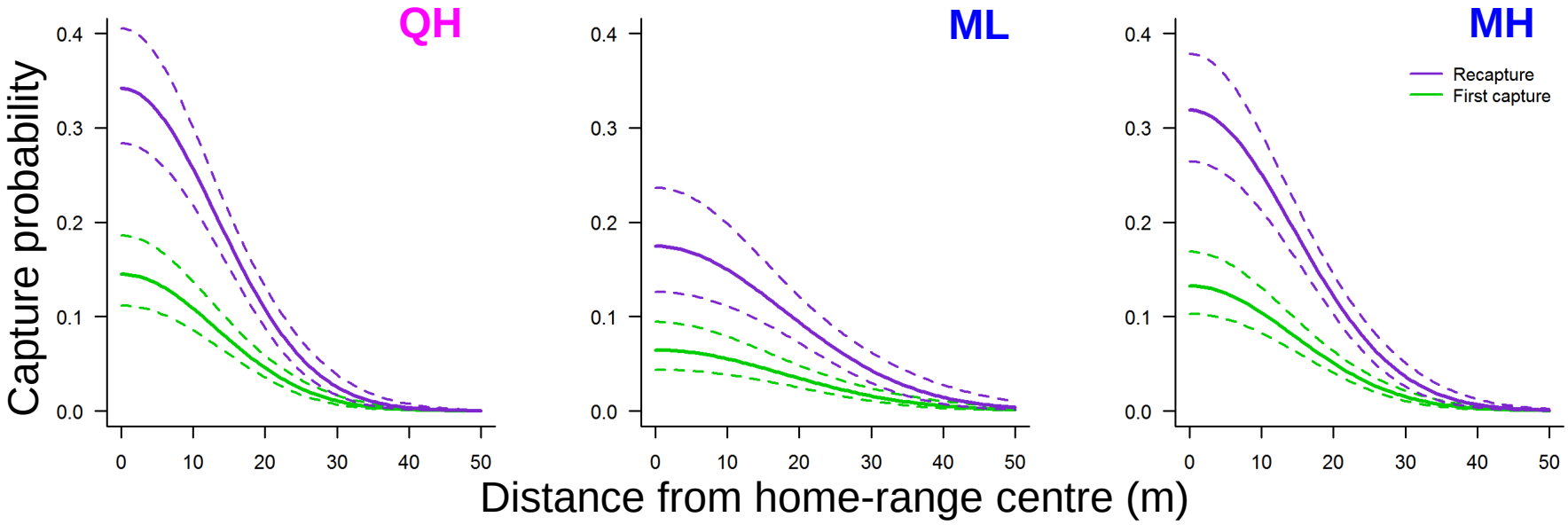
Probability of capture at home-range centre

Home-range width

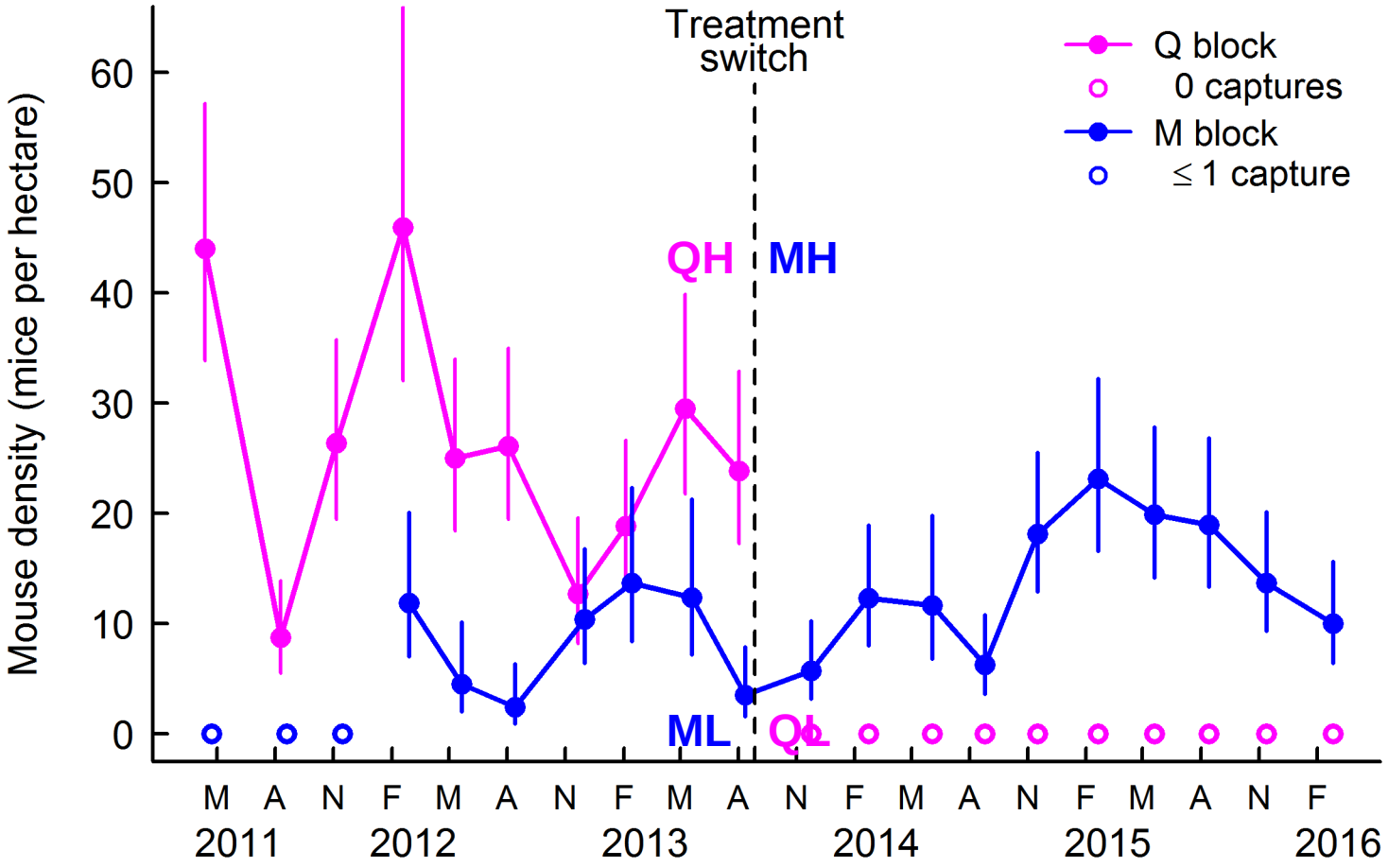
Efford 2004 Oikos

Best model:

Capture probability ~ weight + recapture + season + population

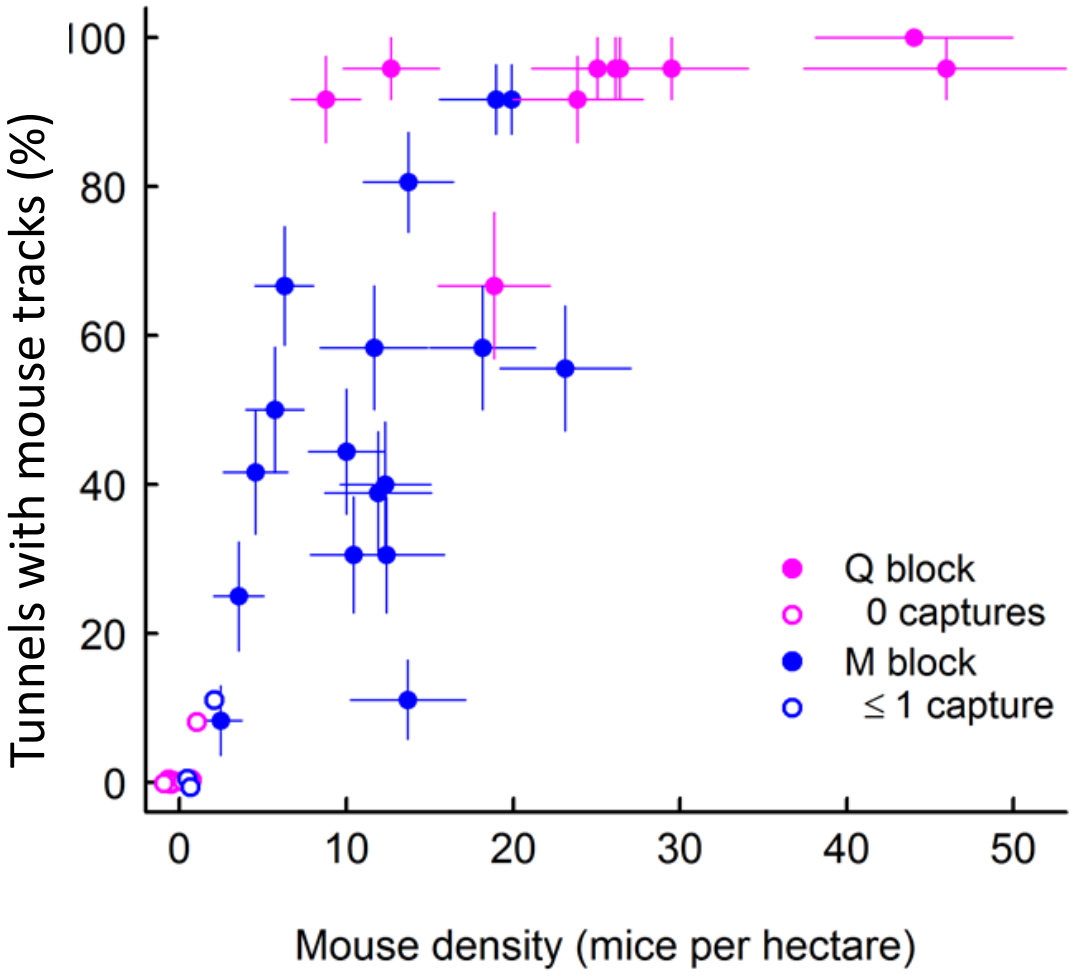


Population density of mice



Watts et al 2017 report; Wilson et al in prep

Mouse tracking rate vs density



Repeated measures of same two blocks

Relationship not statistically significant

But tracking vs number of mice caught is significant

Conclusions: mouse population dynamics

Highest population density similar to post-mast in beech forest and alpine tussock grassland

- Only moderate compared with islands and Tawharanui estimate

Food limitation may have prevented further population increase

- i.e. the supply of invertebrates as food for mice
- Capture probability also likely affected by food availability
- Next part of talk: Corinne Watts on Invertebrates

Mouse arboreality at Maungatautari

Jan-Feb 2015
Cat Kelly
MSc
Waikato Univ.

Photos: Morgan Warnock

Canopy: 0% tracking
(mean 9.2 m, n=60)

Subcanopy: 15% tracking
(mean 5.0 m, n=40)

Shrubs: 67% tracking
(mean 1.6 m, n=20)

Ground level: 93% tracking
(mean = 0 m, n=60)

Neil Fitzgerald

Known impacts of house mice on NZ fauna

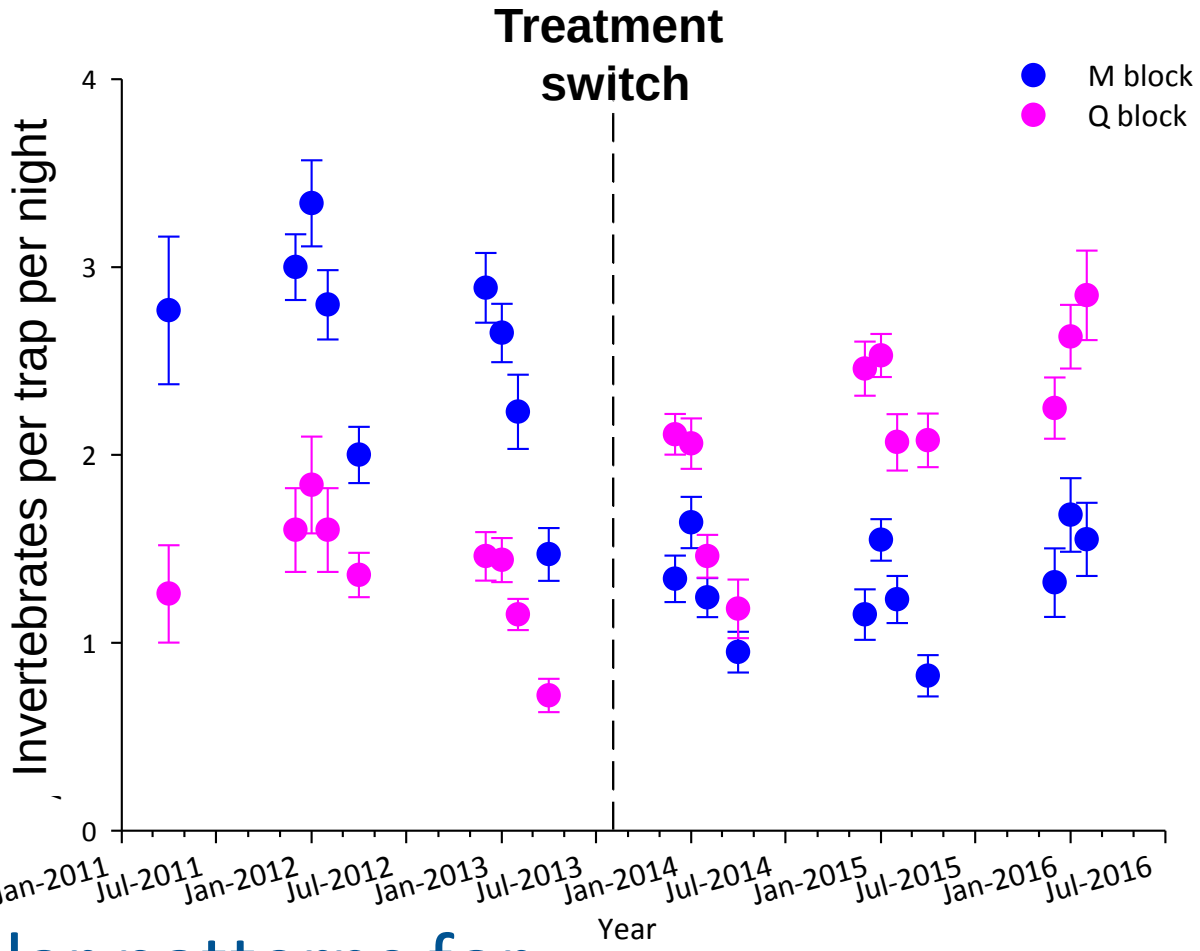
Invertebrates usually dominate mouse diet

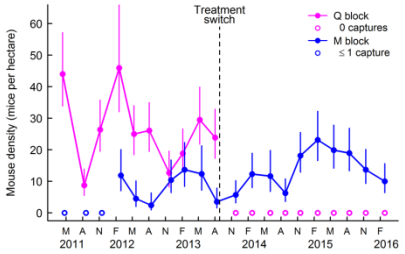
Caterpillars, spiders, beetles, weta, earthworms, cockroaches, centipedes, earwigs, amphipods (most 3–12 mm)

Predation occasionally observed on vertebrates

Lizards, small native bird eggs e.g., NZ robin, rock wren

Invertebrate abundance





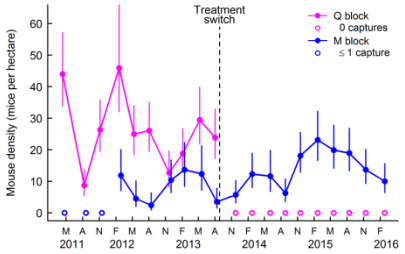
Similar patterns for:

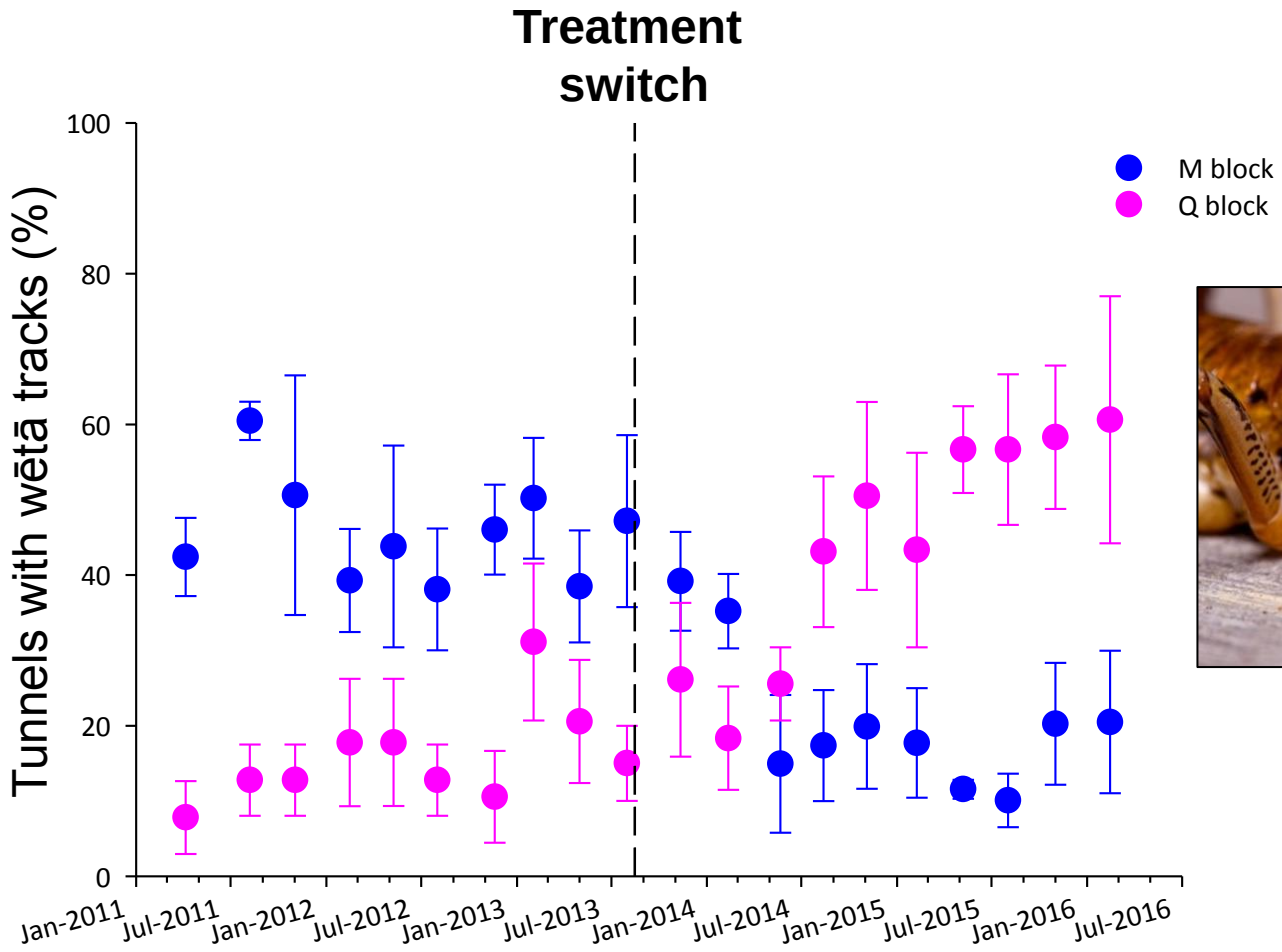
Beetles, spiders, weta, caterpillars

Leaf litter samples

Watts et al 2017 report

Adult Auckland tree wētā



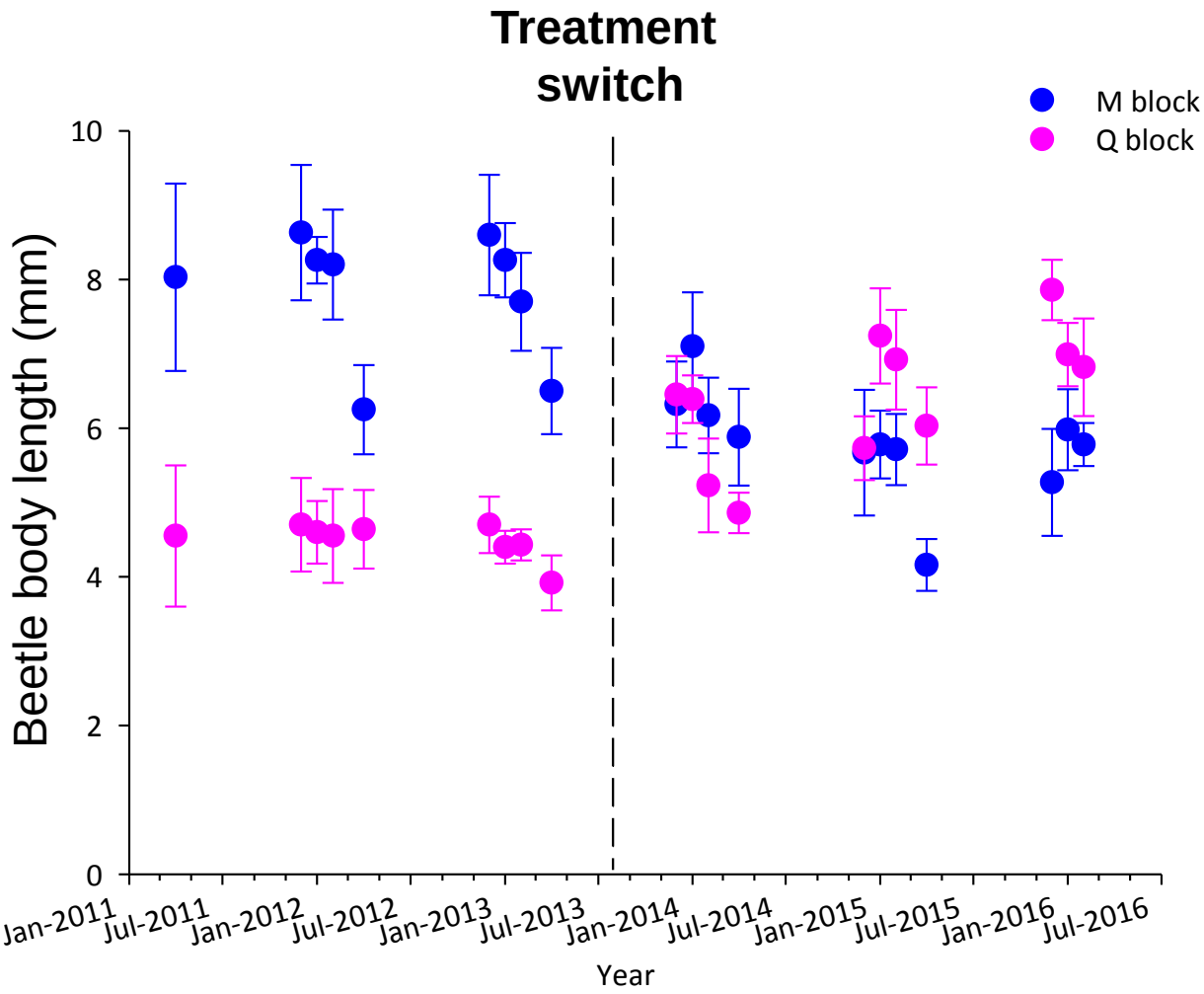


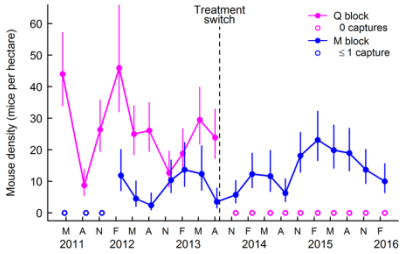
Inversely related to the tracking rates of mice

Other weta showed similar trends

Watts et al 2017 report

Beetle body size



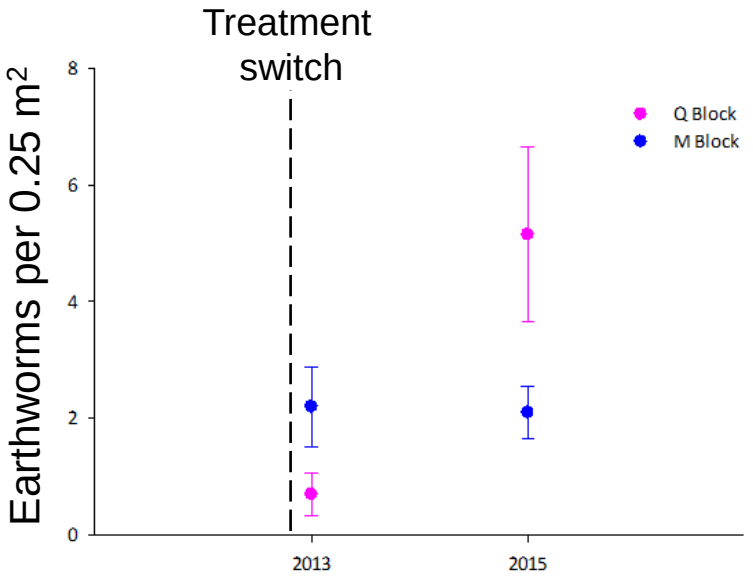


Weta body size showed similar trends

Watts et al 2017 report

Other taxa

Earthworm abundance/biomass
↑ after mice were eradicated



No detected impact on fungi, land snails, seedlings

Did not study lizards

Mice ate small (16 mm) bird eggs in artificial nests
and rarely ate larger (30 mm) eggs

Tried but failed to find enough natural nests

Watts et al 2017 report

Mice alone in fenced sanctuaries….

Halve invertebrate abundance & biomass

↓ food source for native predators

May affect ecosystem functioning ?

Climb trees and may eat bird eggs and chicks

May burrow out and let other small mammals in

May divert invading predators from native prey?

Mice likely to be serious annoyance species in PFNZ