



Of bitterns, bats and bellbirds: recent research on mammalian predators and predator control in wetlands, alpine habitats and forests

Colin O'Donnell

Biodiversity Group, Department of Conservation
codonnell@doc.govt.nz



Outline

- Understanding predator impacts
 - Freshwater wetlands
 - Alpine areas
- Managing predators and measuring outcomes
 - First results from wetland trapping trials
 - First results from alpine trapping trials
 - 15 years of managing bats
 - 20 years of integrated pest control in forests – Landsborough

Large number of threatened and at risk species in wetlands

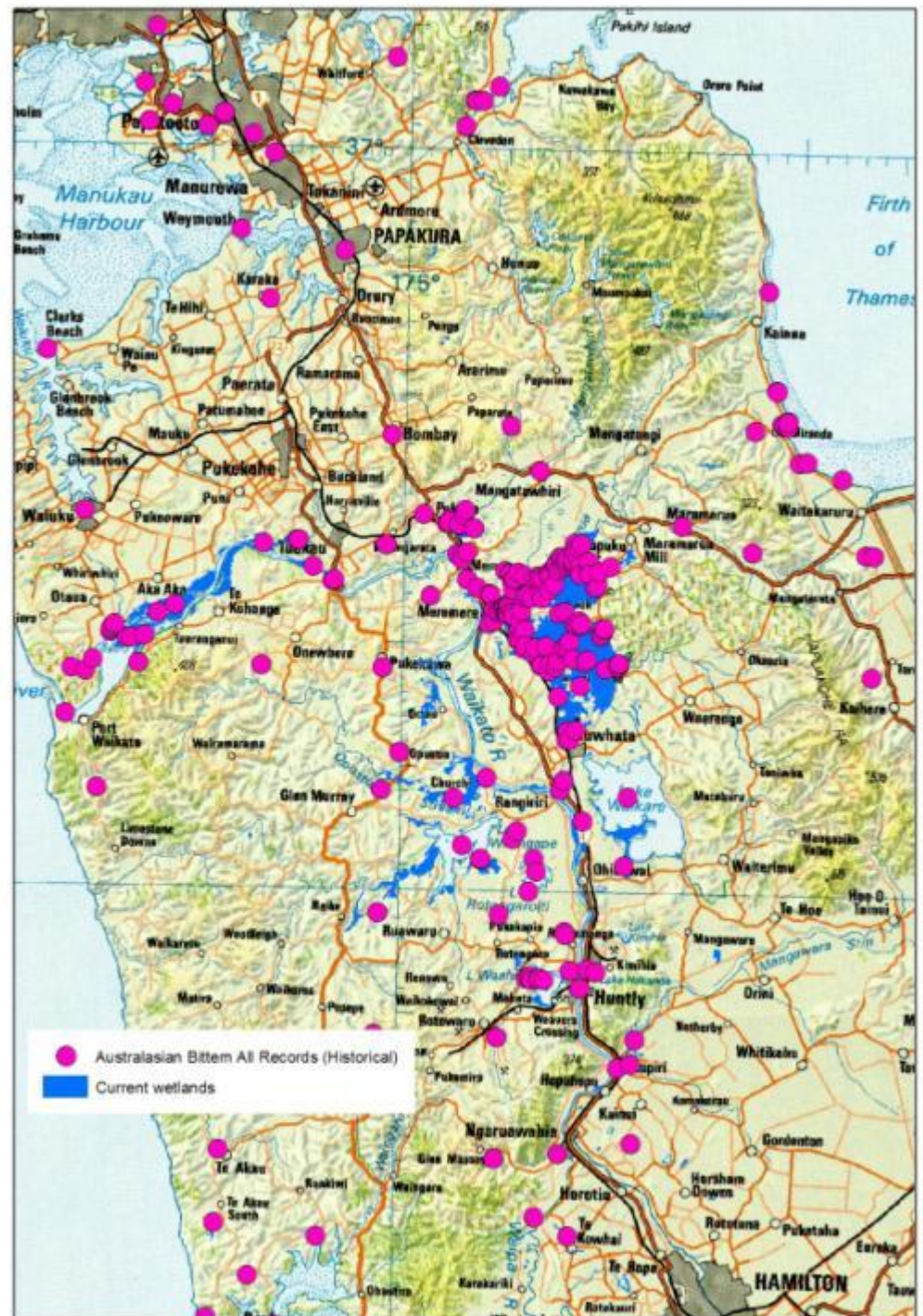


>80 bird species

>15 threatened bird species

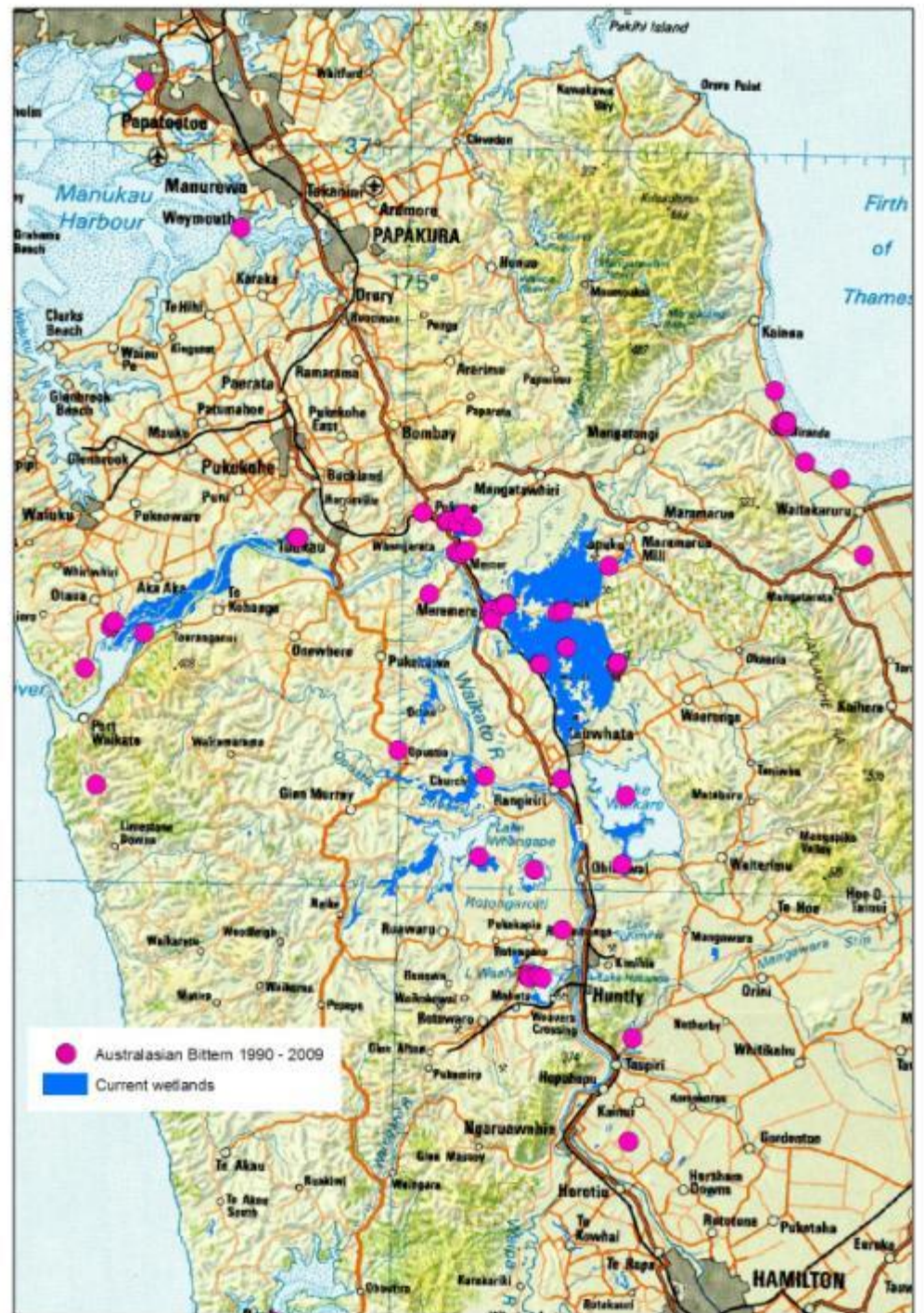
Australasian Bittern

all records



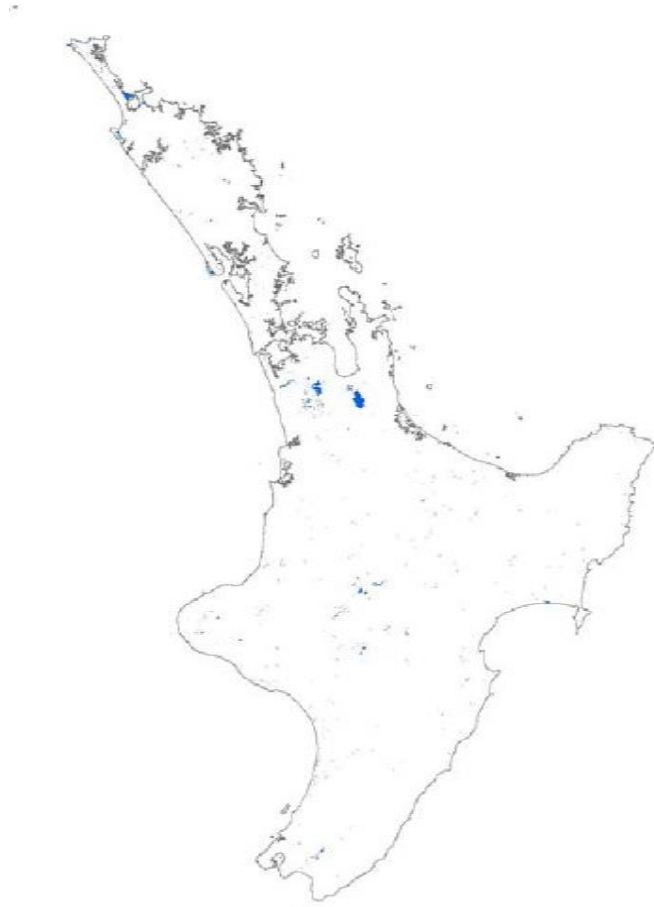
Australasian Bittern

records since 1990

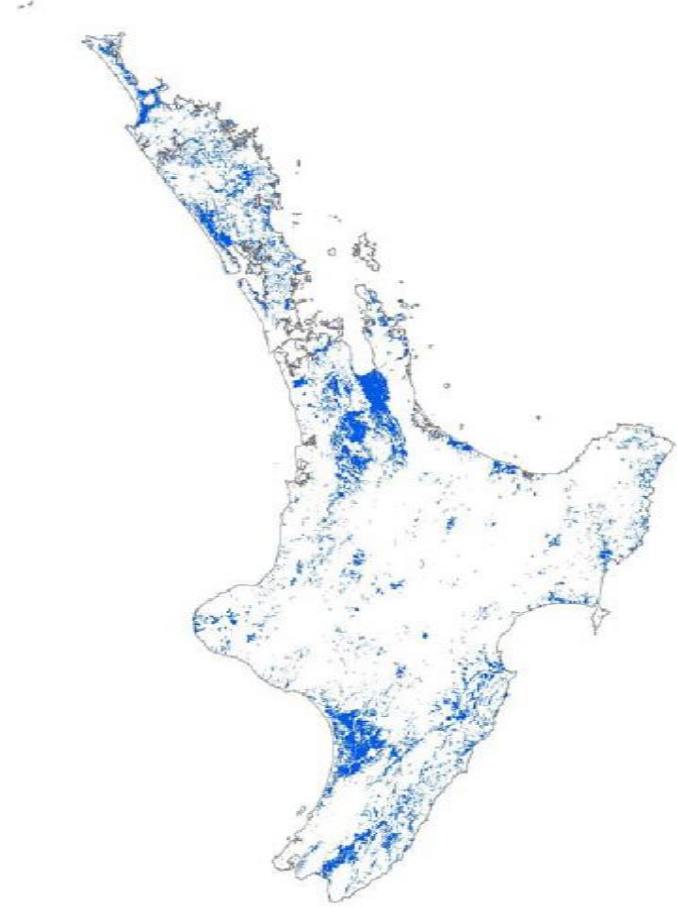


Why threatened?

Current extent



Historic extent



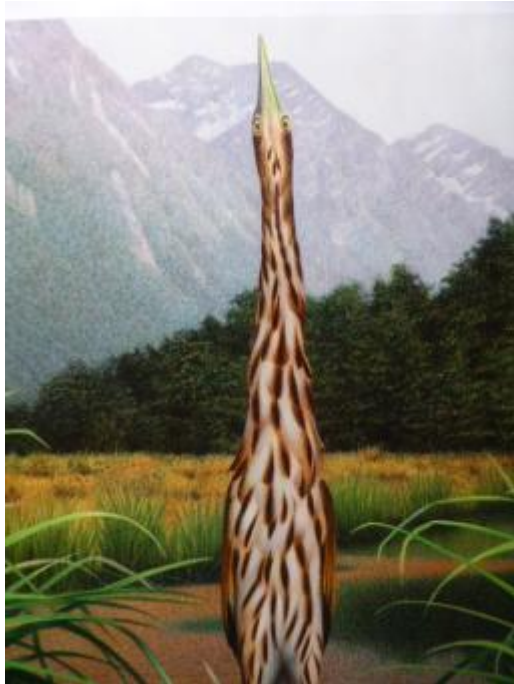
- 90% of wetlands lost (Ausseil et al. 2011) - therefore probable >90% decline in specialist swamp birds?

Role of predation?



Extinctions related to predation

- Predation linked to loss of 11 of 14 extinct birds that would have inhabited wetlands
- Largely based on speculation (kiore, dogs, cats and pigs all mentioned)



NZ little bittern



Scarlett's duck

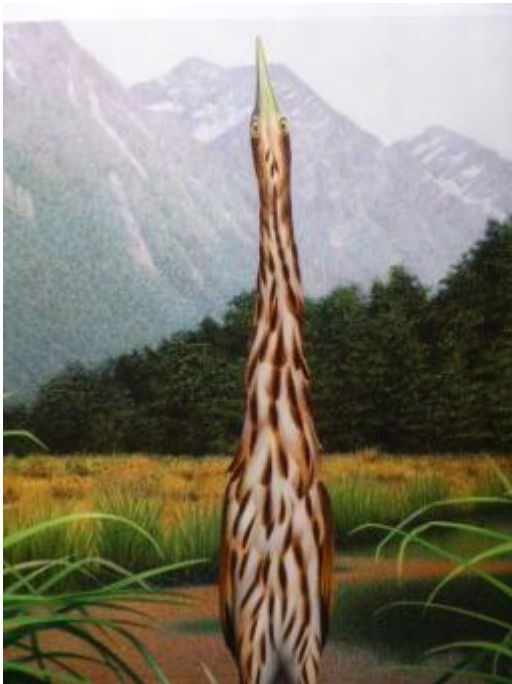


Hutton's rail

From: Tennyson & Martinson 2006

Disappearance from areas without wetland loss

- NZ little bittern - “its final disappearance coinciding with the arrival of Norway rats, feral cats, ship rats and mustelids (Oliver 1955)



Auckland Is rail

Lost from 525 Km² Auckland Island “cats and pigs” (Falla 1967)

Impact of mammalian predators

Species	Cat	Stoat	Ferret	Weasel	Rat	Dog	Unknown	Sources
Bittern	X							PC Taylor, P Langlands pers. comm.
Brown teal	X				X	X		Hayes & Williams 1982; Holdaway 1999; Parrish & Williams 2001; Barker & Williams 2002
Marsh crake	X					X	X	Hamilton 1885; Fleming 1939; Bryant 1942; Oliver 1955; Sefton 1958; Sefton & Devitt 1962; Westerskov 1970; Kaufmann & Lavers 1987
Spotless crake	X	X	X		X		X	Hamilton 1885, Pycroft 1898; Whitlock 1914; de Ravin 1975; Ogle & Cheyne 1980; St Paul 1977; Kaufmann & Lavers 1987
Banded rail	X	X	X	X	X	X	X	Oliver 1955; Guthrie-Smith 1921; Elliott 1983; Marchant & Higgins 1993; Parker & Brunton 2004
Fernbird	X	X			X	X	X	Stead 1948; Guthrie-Smith 1914; Oliver 1955; Bell 1976, 1978; Elliott 1978; Barlow & Moeed 1980; Fitzgerald & Veitch 1985; Kater 1999; Parker 2002
Pukeko					X		X	Carroll 1969; Craig 1980; Marchant & Higgins 1993
“Rails”	X		X			X	X	Buller 1874; Moncrieff 1938; Roser & Lavers (1976)
Waterfowl	X		X		X		X	Williams 1975; Roser & Lavers (1976); Langlands 1990; Marchant & Higgins 1990; Langham 1990; Stokes 1991; Morgan (2002)

Impact of mammalian predators

Species	Cat	Stoat	Ferret	Weasel	Rat	Dog	Unknown	Sources
Bittern	X							PC Taylor, P Langlands pers. comm.
Brown teal	X				X	X		Hayes & Williams 1982; Holdaway 1999; Parrish & Williams 2001; Barker & Williams 2002
Marsh crake	X					X	X	Hamilton 1885; Fleming 1939; Bryant 1942; Oliver 1955; Sefton 1958; Sefton & Devitt 1962; Westerskov 1970; Kaufmann & Lavers 1987
Spotless crake	X	X	X		X		X	Hamilton 1885, Pycroft 1898; Whitlock 1914; Le Ravin 1975; Ogle & Cheyne 1980; St Paul 1977; Kaufmann & Lavers 1987
Banded rail	X	X	X	X	X	X	X	Oliver 1955; Guthrie-Smith 1921; Elliott 1983; Marchant & Higgins 1993; Parker & Brunton 2004
Fernbird	X	X			X	X	X	Stead 1948; Guthrie-Smith 1914; Oliver 1955; Bell 1976, 1978; Elliott 1978; Barlow & Moeed 1990; Fitzgerald & Veitch 1985; Kater 1999; Parker 2002
Pukeko					X		X	Carroll 1969; Craig 1980; Marchant & Higgins 1993
“Rails”	X		X			X	X	Bullock 1874; Moncrieff 1938; Roser & Lavers (1976)
Waterfowl	X		X		X		X	Williams 1975; Roser & Lavers (1976); Langlands 1990; Marchant & Higgins 1990; Langham 1990; Stokes 1991; Morgan (2002)

Impact of mammalian predators

Species	Cat	Stoat	Ferret	Weasel	Rat	Dog	Unknown	Sources
Bittern	X							PC Taylor, P Langlands pers. comm.
Brown teal	X				X	X		Hayes & Williams 1982; Holdaway 1999; Parrish & Williams 2001; Barker & Williams 2002
Marsh crake	X					X	X	Hamilton 1885; Fleming 1939; Bryant 1942; Oliver 1955; Sefton 1958; Sefton & Devitt 1962; Westerskov 1970; Kaufmann & Lavers 1987
Spotless crake	X	X	X		X		X	Hamilton 1885, Pycroft 1898; Whitlock 1914; de Ravin 1975; Ogle & Cheyne 1980; St Paul 1977; Kaufmann & Lavers 1987
Banded rail	X	X	X	X	X	X	X	Oliver 1955; Guthrie-Smith 1921; Elliott 1983; Marchant & Higgins 1993; Parker & Brunton 2004
Fernbird	X	X			X	X	X	Stead 1948; Guthrie-Smith 1914; Oliver 1955; Bell 1976, 1978; Elliott 1978; Barlow & Moeed 1980; Fitzgerald & Veitch 1985; Kater 1999; Parker 2002
Pukeko					X		X	Carroll 1969; Craig 1980; Marchant & Higgins 1993
“Rails”	X		X			X	X	Buller 1874; Moncrieff 1938; Roser & Lavers (1976)
Waterfowl	X		X		X		X	Williams 1975; Roser & Lavers (1976); Langlands 1990; Marchant & Higgins 1990; Langham 1990; Stokes 1991; Morgan (2002)

Impact of mammalian predators

Species	Cat	Stoat	Ferret	Weasel	Rat	Dog	Unknown	Sources
Bittern	X							PC Taylor, P Langlands pers. comm.
Brown teal	X				X	X		Hayes & Williams 1982; Holdaway 1999; Parrish & Williams 2001; Barker & Williams 2002
Marsh crake								Hamilton 1885; Fleming 1939; Bryant 1942; Oliver 1955; Witt 1962; Lavers 1987
Spotless crake	X	X	X		X		X	Hamilton 1885, Pycroft 1898; Whitlock 1914; de Ravin 1975; Ogle & Cheyne 1980; St Paul 1977; Kaufmann & Lavers 1987
Banded rail	X	X	X	X	X	X	X	Oliver 1955; Guthrie-Smith 1921; Elliott 1983; Marchant & Higgins 1993; Parker & Brunton 2004
Fernbird	X	X			X	X	X	Stead 1948; Guthrie-Smith 1914; Oliver 1955; Bell 1976, 1978; Elliott 1978; Barlow & Moeed 1980; Fitzgerald & Veitch 1985; Kater 1999; Parker 2002
Pukeko					X		X	Carroll 1969; Craig 1980; Marchant & Higgins 1993
“Rails”	X		X			X	X	Buller 1874; Moncrieff 1938; Roser & Lavers (1976)
Waterfowl	X		X		X		X	Williams 1975; Roser & Lavers (1976); Langlands 1990; Marchant & Higgins 1990; Langham 1990; Stokes 1991; Morgan (2002)

Exceptions possums, hedgehogs, pigs, mice

Impact of mammalian predators

Species	Cat	Stoat	Ferret	Weasel	Rat	Dog	Unknown	Sources
Bittern	X							PC Taylor, P Langlands pers. comm.
Brown teal	X				X	X		Hayes & Williams 1982; Holdaway 1999; Parrish & Williams 2001; Barker & Williams 2002
Marsh crake	X					X	X	Hamilton 1885; Fleming 1939; Bryant 1942; Oliver 1955; Sefton 1958; Sefton & Devitt 1962; Westerskov 1970; Kaufmann & Lavers 1987
Spotless crake	X	X	X		X		X	Hamilton 1885, Pycroft 1898; Whitlock 1914; de Ravin 1975; Ogle & Cheyne 1980; St Paul 1977; Kaufmann & Lavers 1987
Banded rail	X	X	X	X	X	X	X	Oliver 1955; Guthrie-Smith 1921; Elliott 1983; Marchant & Higgins 1993; Parker & Brunton 2004
Fernbird	X	X			X	X	X	Stead 1948; Guthrie-Smith 1914; Oliver 1955; Bell 1976, 1978; Elliott 1978; Barlow & Moeed 1980; Fitzgerald & Veitch 1985; Kater 1999; Parker 2002
Pukeko					X		X	Carroll 1969; Craig 1980; Marchant & Higgins 1993
“Rails”	X		X			X	X	Buller 1874; Moncrieff 1938; Roser & Lavers (1976)
Waterfowl	X		X		X		X	Williams 1975; Roser & Lavers (1976); Langlands 1990; Marchant & Higgins 1990; Langham 1990; Stokes 1991; Morgan (2002)

Impact of mammalian predators

Species	Cat	Stoat	Ferret	Weasel	Rat	Dog	Unknown	Sources
Bittern	X							PC Taylor, P Langlands pers. comm.
Brown teal	X				X	X		Hayes & Williams 1982; Holdaway 1999; Parrish & Williams 2001; Barker & Williams 2002
Marsh crake	X					X	X	Hamilton 1885; Fleming 1939; Bryant 1942; Oliver 1955; Sefton 1958; Sefton & Devitt 1962; Westerskov 1970; Kaufmann & Lavers 1987
Spotless crake	X	X	X		X		X	Hamilton 1885, Pycroft 1898; Whitlock 1914; de Ravin 1975; Ogle & Cheyne 1980; St Paul 1977; Kaufmann & Lavers 1987
Banded rail	X	X	X	X	X	X	X	Oliver 1955; Guthrie-Smith 1921; Elliott 1983; Marchant & Higgins 1993; Parker & Brunton 2004
Fernbird	X	X			X	X	X	Stead 1948; Guthrie-Smith 1914; Oliver 1955; Bell 1976, 1978; Elliott 1978; Barlow & Moeed 1980; Fitzgerald & Veitch 1985; Kater 1999; Parker 2002
Pukeko					X		X	Carroll 1969; Craig 1980; Marchant & Higgins 1993
“Rails”	X		X			X	X	Buller 1874; Moncrieff 1938; Roser & Lavers (1976)
Waterfowl	X		X		X		X	Williams 1975; Roser & Lavers (1976); Langlands 1990; Marchant & Higgins 1990; Langham 1990; Stokes 1991; Morgan (2002)

Quantitative studies

Banded rail

- 18 of 21 (86%) nests preyed on by rats (Guthrie-Smith 1925)
- 4 active nests preyed on - Video footage of stoat eating egg and chicks (Parker & Brunton 2004)
- Two nests preyed on by cats, one by stoat; 9 of 38 eggs lost

(Elliott 1983)

Fernbird

- 73% of nests preyed on by mustelids (n = 22)

(Parker 2002)



Quantitative studies

Marsh and spotless crakes

- >50 cat-killed

At Pukepuke Lagoon

- 4 of 11 spotless crake clutches preyed on
- 1 of 2 marsh crake clutches preyed on

(Kaufmann & Lavers 1987)



Marsh crake (P. Langlands)



Recent cat killed marsh crake – Kaikoura 2013 (S Melville)



Mammalian predators in wetlands

- No comprehensive published studies
- Reviewed 20 predator control/sampling programmes in wetlands
 - Northland to Southland
- Almost all predator species present and commonly captured
- Still little known about ecology

Composition –Whangamarino wetland

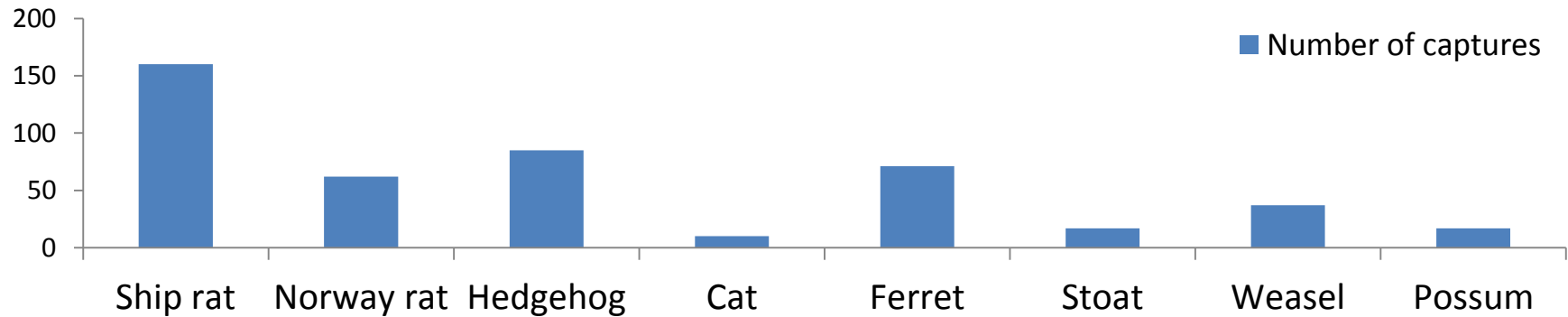
(Craig Gillies and Matt Brady)



Predator captures in wetlands

Whangamarino

(from February 2008, n = 466 predators, 14 months, 69 traps)



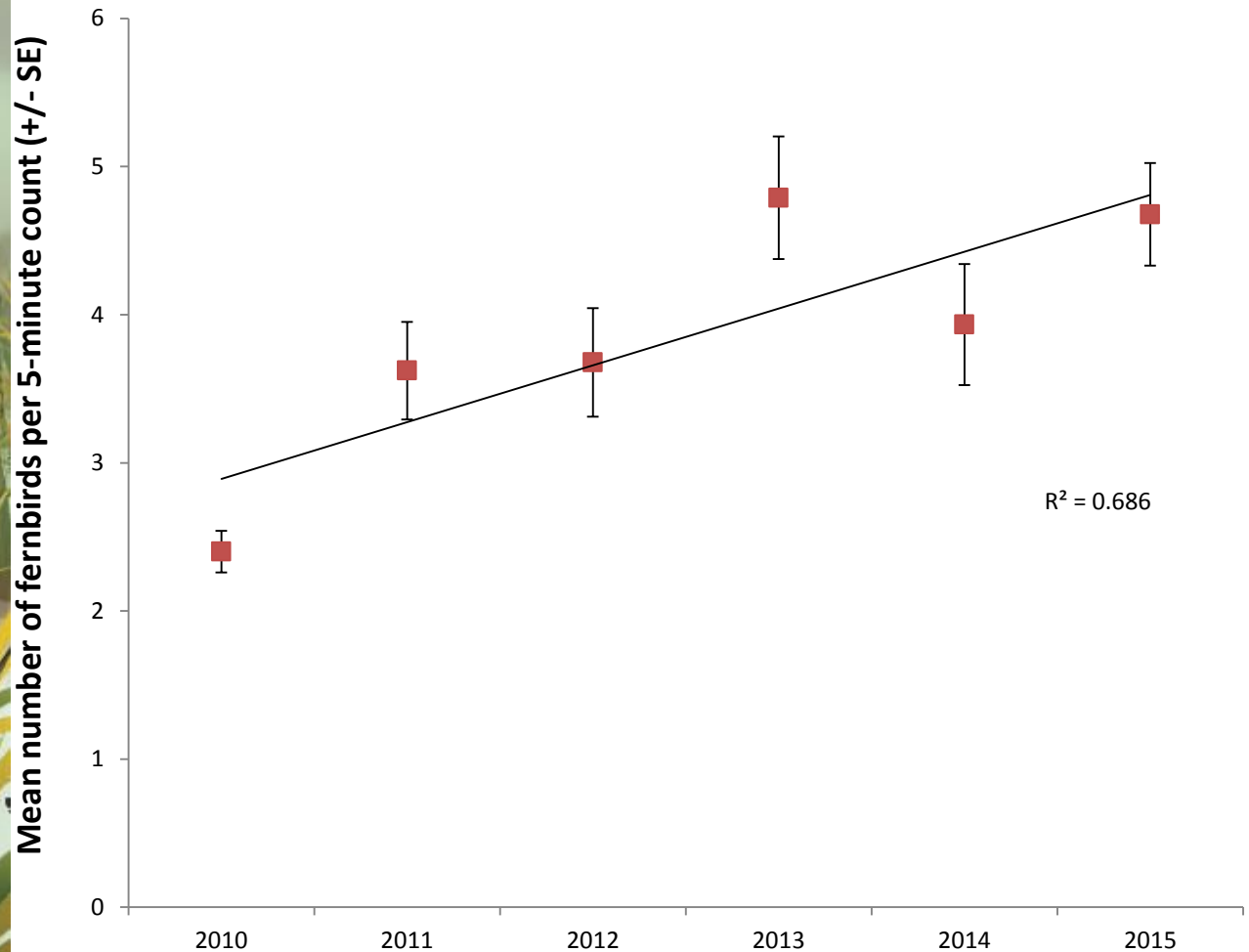
Conclusions: wetlands



- Difficult to disentangle predator impacts from habitat loss and degradation
- But numerous example of predation by the usual range of species – impacts likely but not quantified well
- All the usual predators are widespread and common in wetlands
- Most predators confirmed killing wetland birds
- Predator control in wetlands is warranted

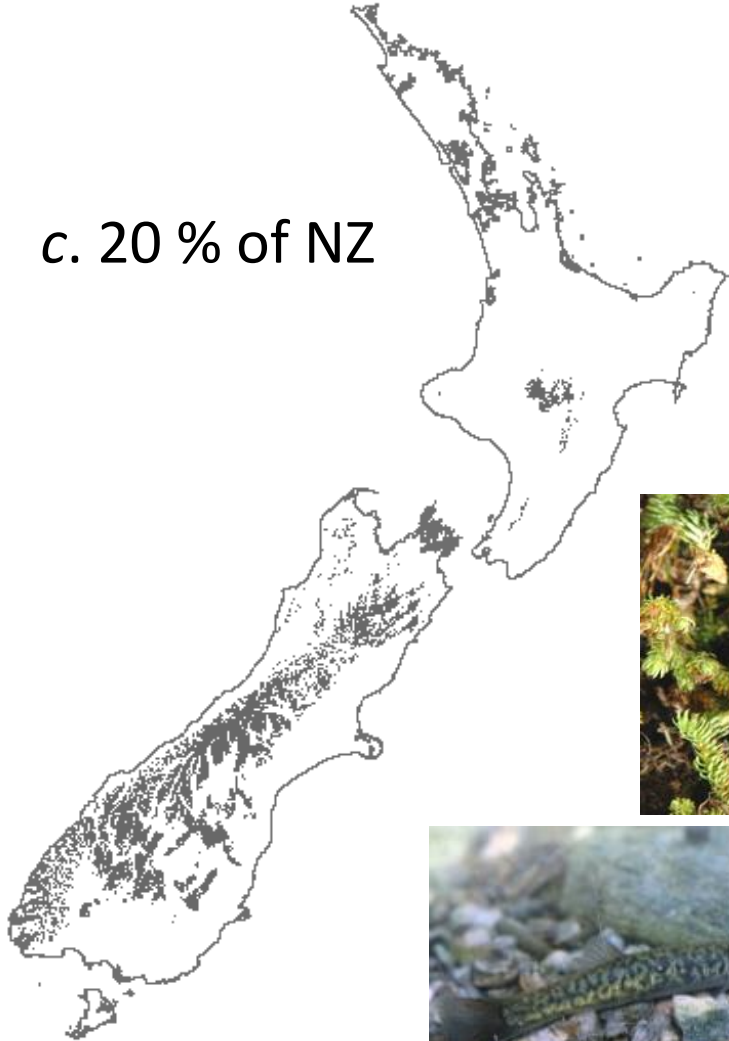
Can we make a difference?

Fernbirds – Tiwai, Southland



Alpine fauna diversity

c. 20 % of NZ





All the usual suspects !





Photo: Don Geddes



Photo:Don Geddes



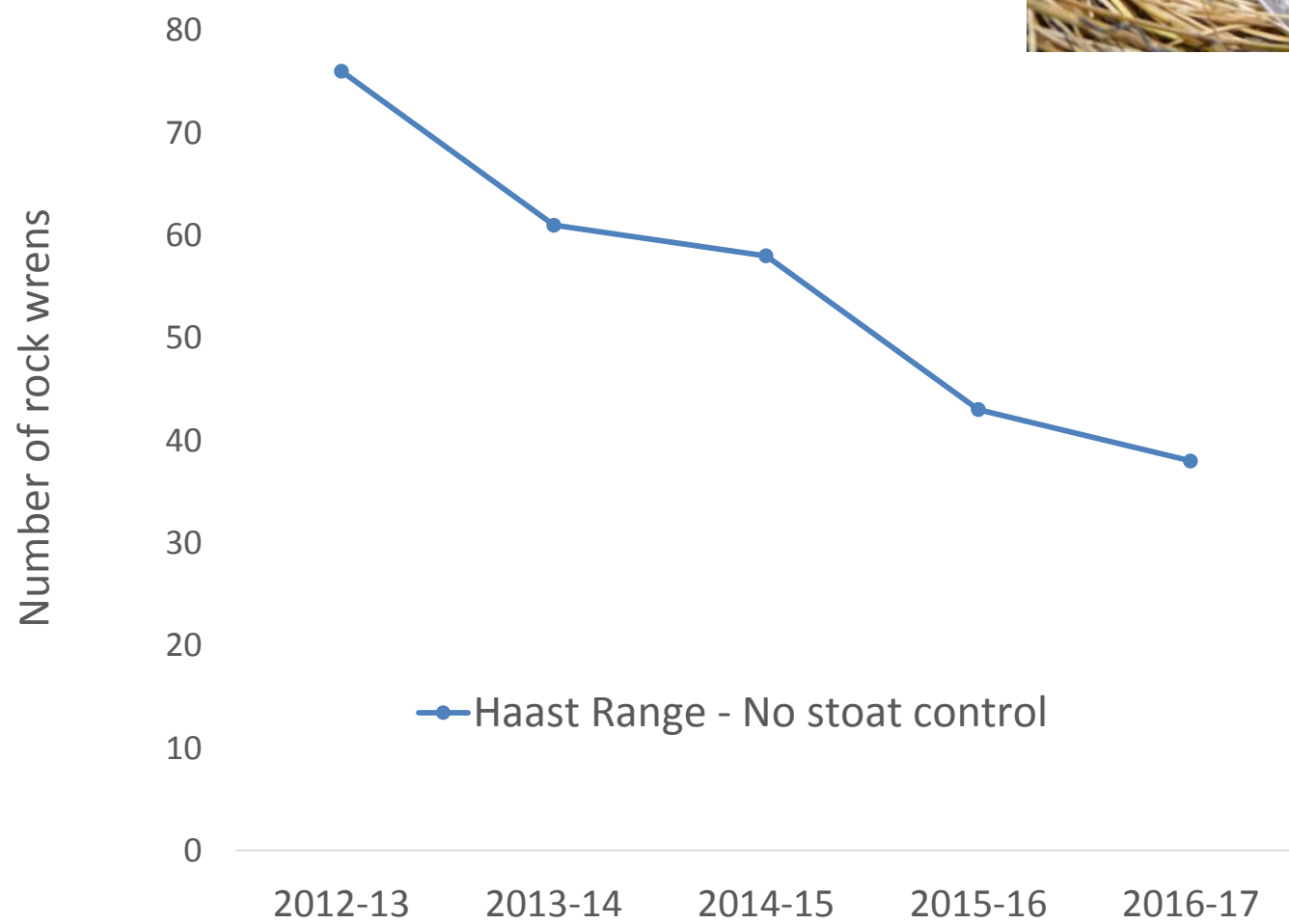
Nesting success: 0%

Site	Outcome	Cause	Total
Homer	Failed	Stoat*	9
	Failed	Unknown	5
Gertrude	Failed	Mouse	1
	Failed	Unknown	5
			20

* 5 on video; others adult remains, egg fragments, bands in nest

NOTE: very low levels of stoat tracking during monitoring





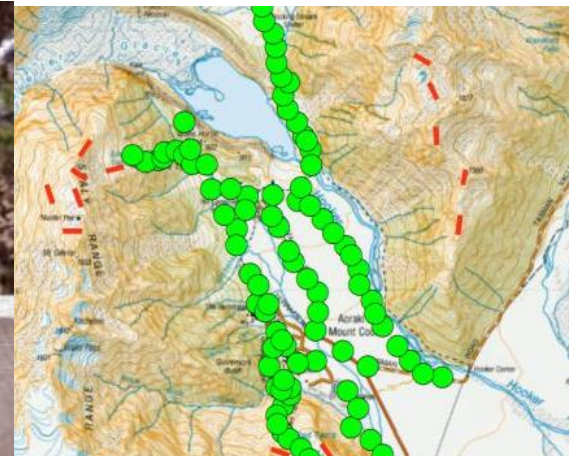
NZ Alpine Club

Friends of the Cobb

Routeburn-Dart Wildlife Trust

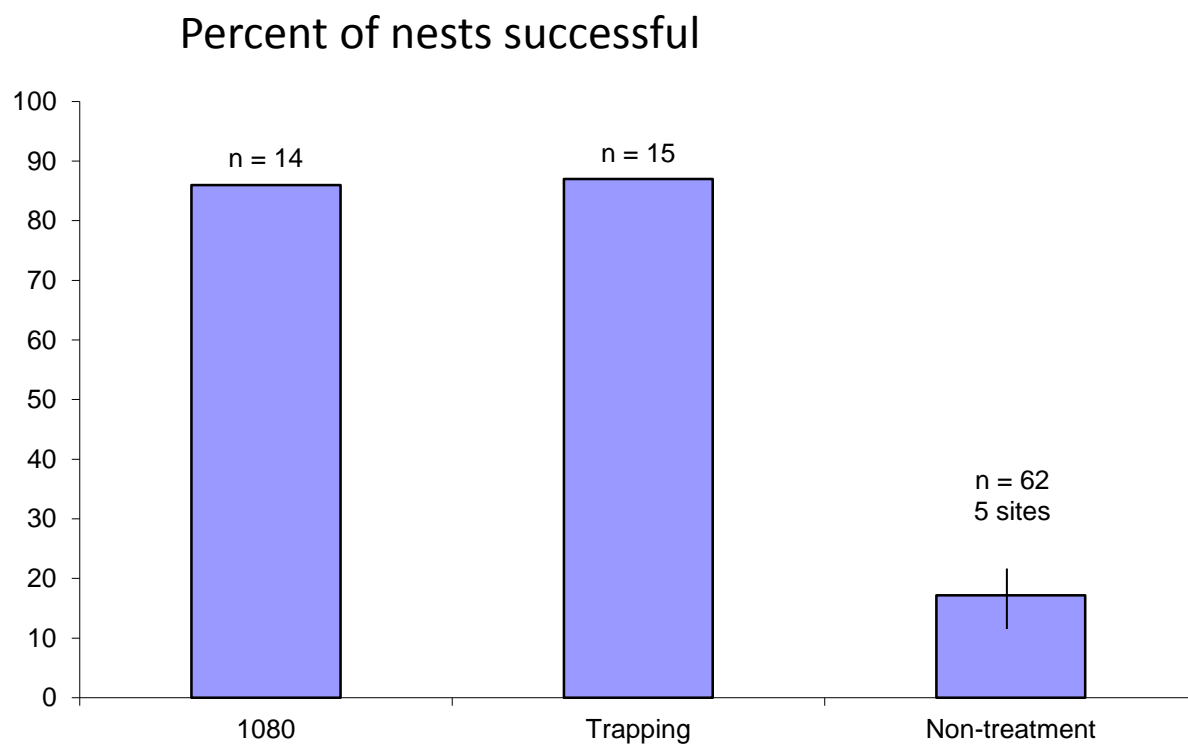
Aoraki Volunteers

Te Anau Tramping Club.....



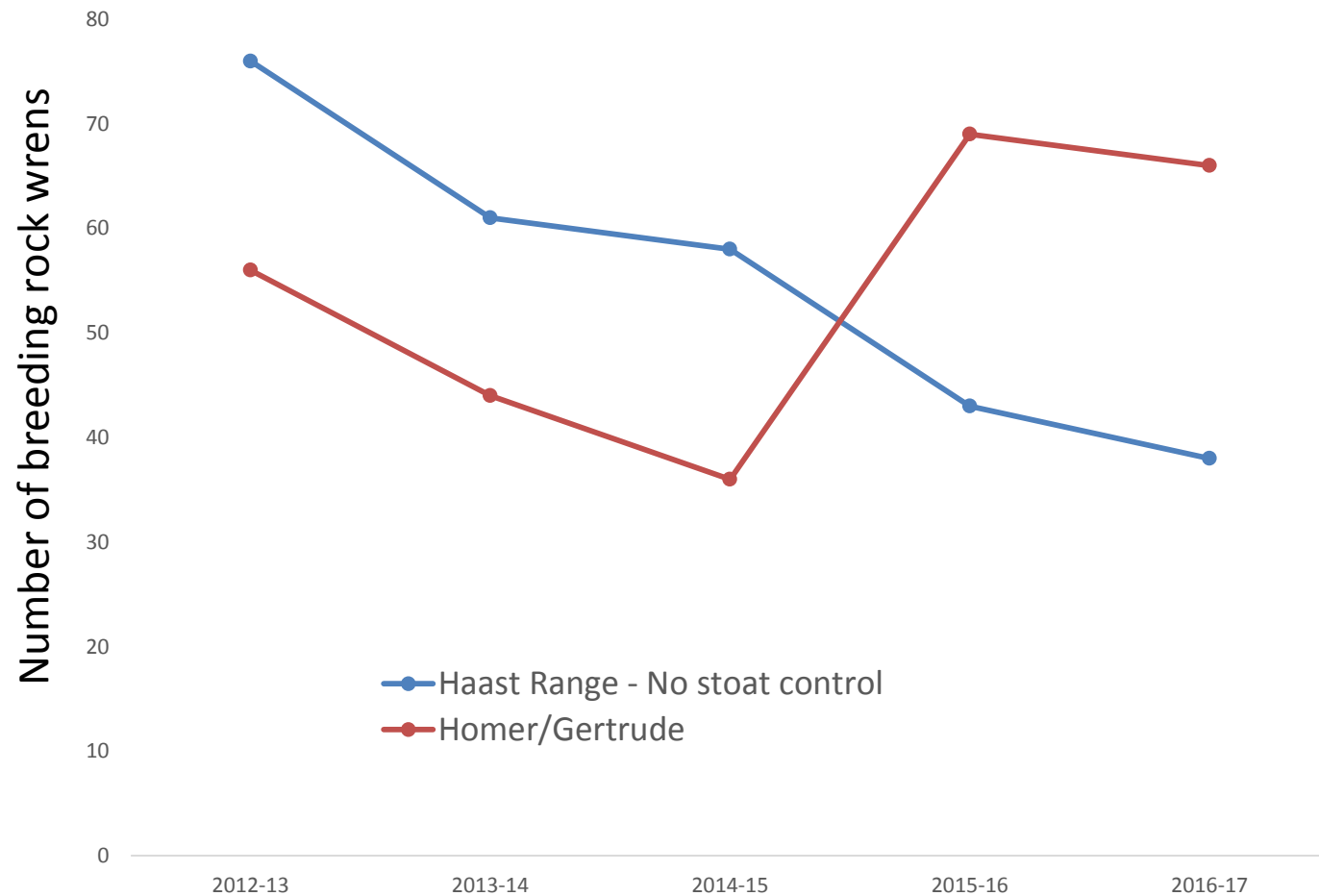


Response of rock wrens



Acknowledgements: Kerry Weston, Jo Monks, Tristan Rawlence, Anja McDonald, Jo Carpenter, Rebecca Jackson, David Webb, Jamie McAuley and many others

Homer trapping



New Zealand's depauperate bat fauna



Long-tailed bat

(Image: Rod Morris)



Greater short-tailed bat



Lesser short-tailed bat

Lesser short-tailed bat

Northern short-tailed bat

Nationally endangered

Long-tailed bat

Nationally critical



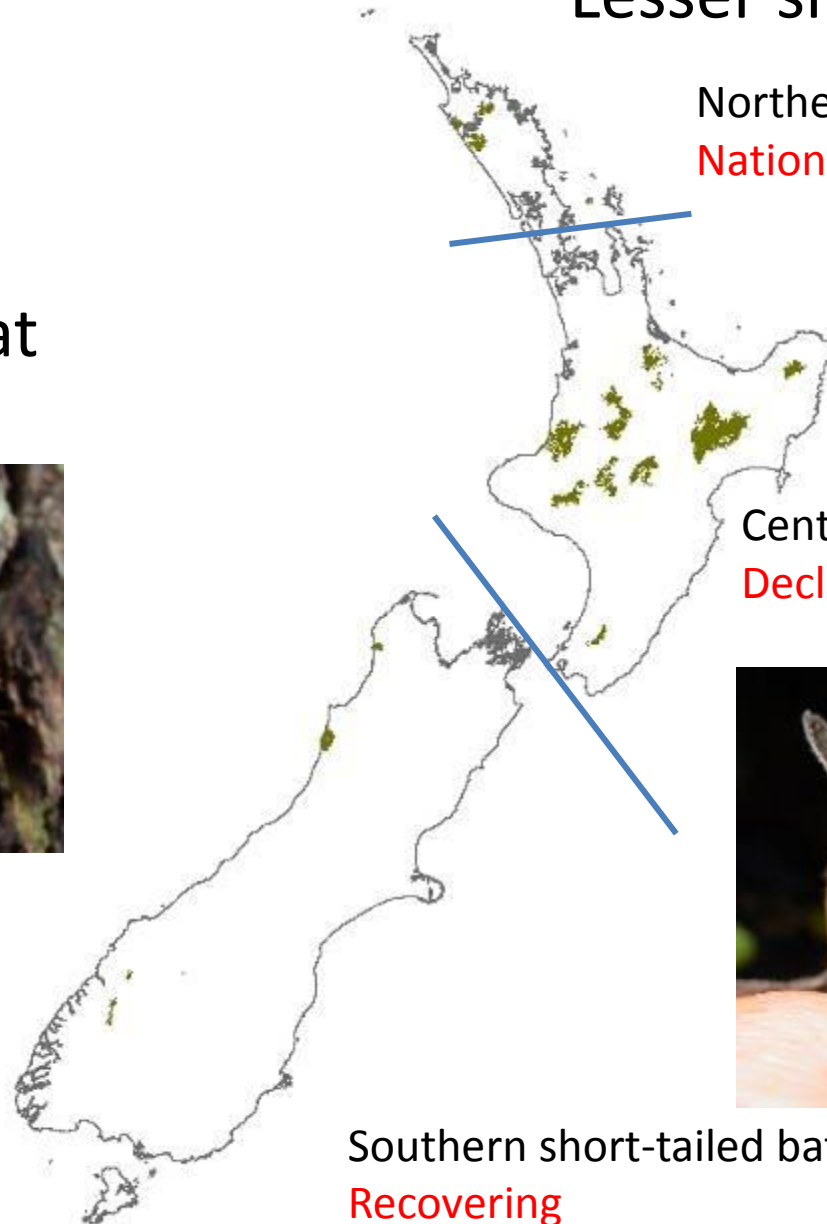
Central short-tailed bat

Declining



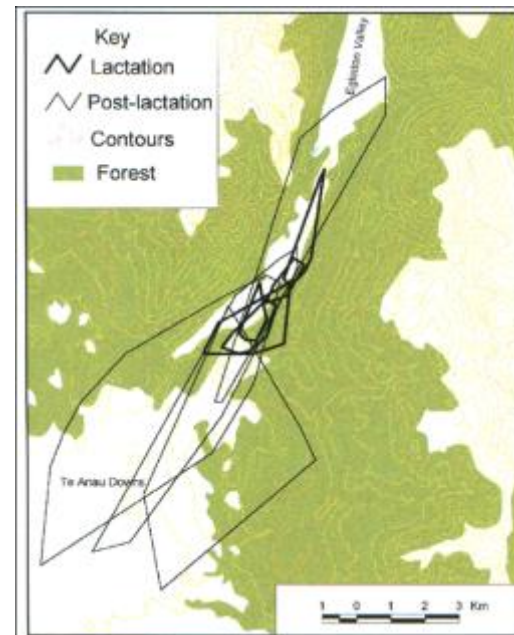
Southern short-tailed bat

Recovering



Some major findings

- Dependence on forest and old age-trees
- Poorly adapted to settlement
- Habitat loss and predators major threats
- Highly mobile and large home ranges (>100 km²)
- Our bats live a long time
- Fragmentation has isolated populations
- Maternity roosts have very specific conditions



Predators are a major issue

- Strong link between rat and mustelid irruptions and survival (Eglinton/central North Is)
- Possums (Geraldine)
- Cats (central North is/Geraldine)



>100 bats
killed in 7
days

Scrimgeour et
al. 2012
NZ J Zoology
39

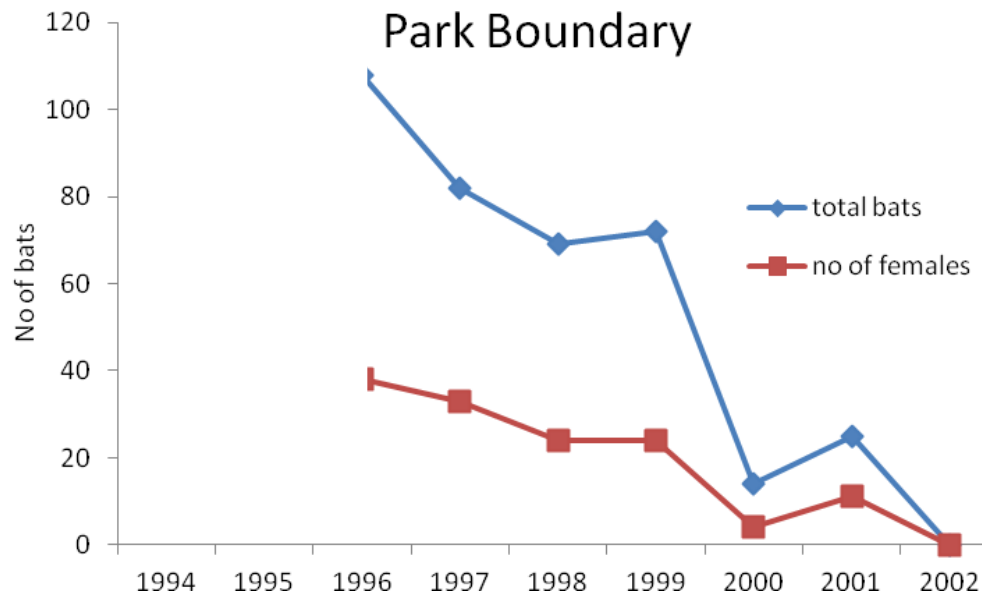


Research on predators

- Potential for secondary poisoning (1080, Pindone, Diphacinone)
- Predicting when and where to manage
 - Monitoring seedfall and rodents
- Predator control trials
 - Poisoning using bait station networks
- Developed “best practice”
 - Aerial control over areas >10,000 ha



Eglinton Valley results

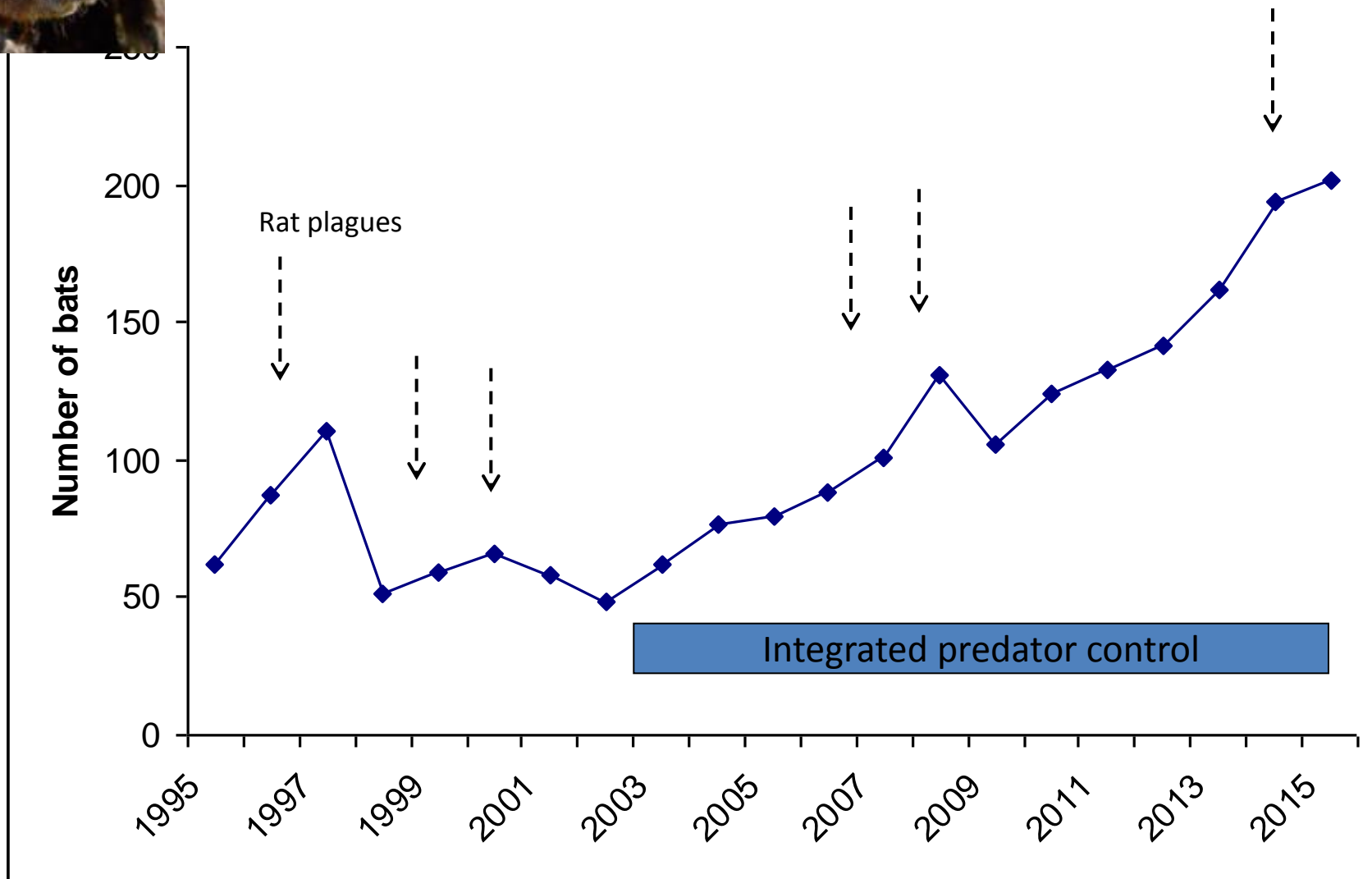


Non-treatment colony





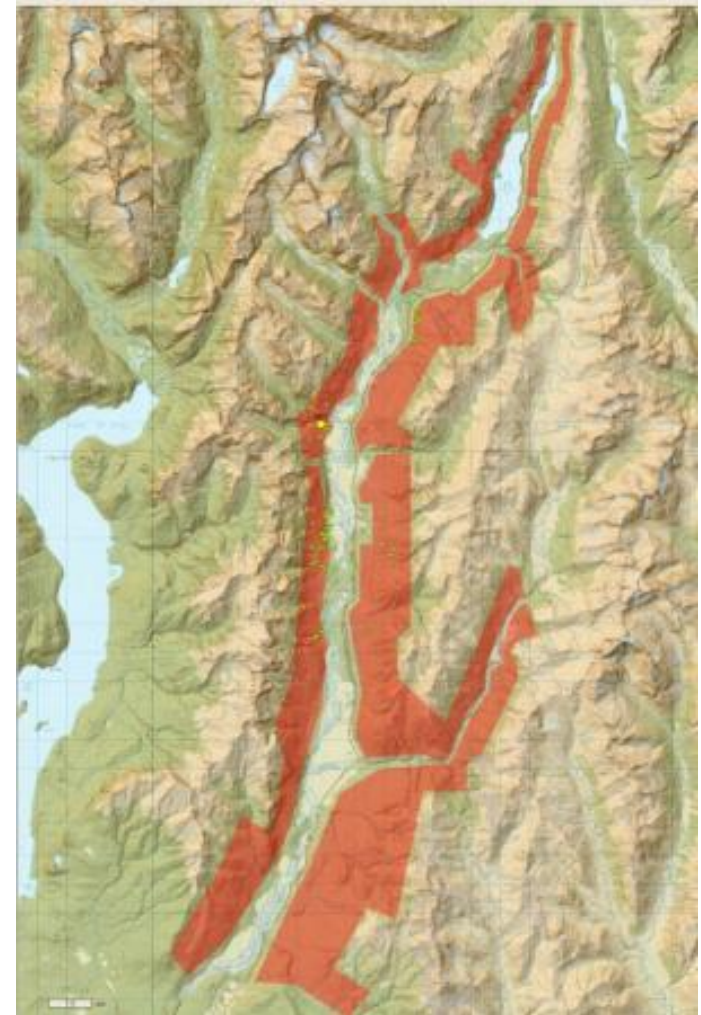
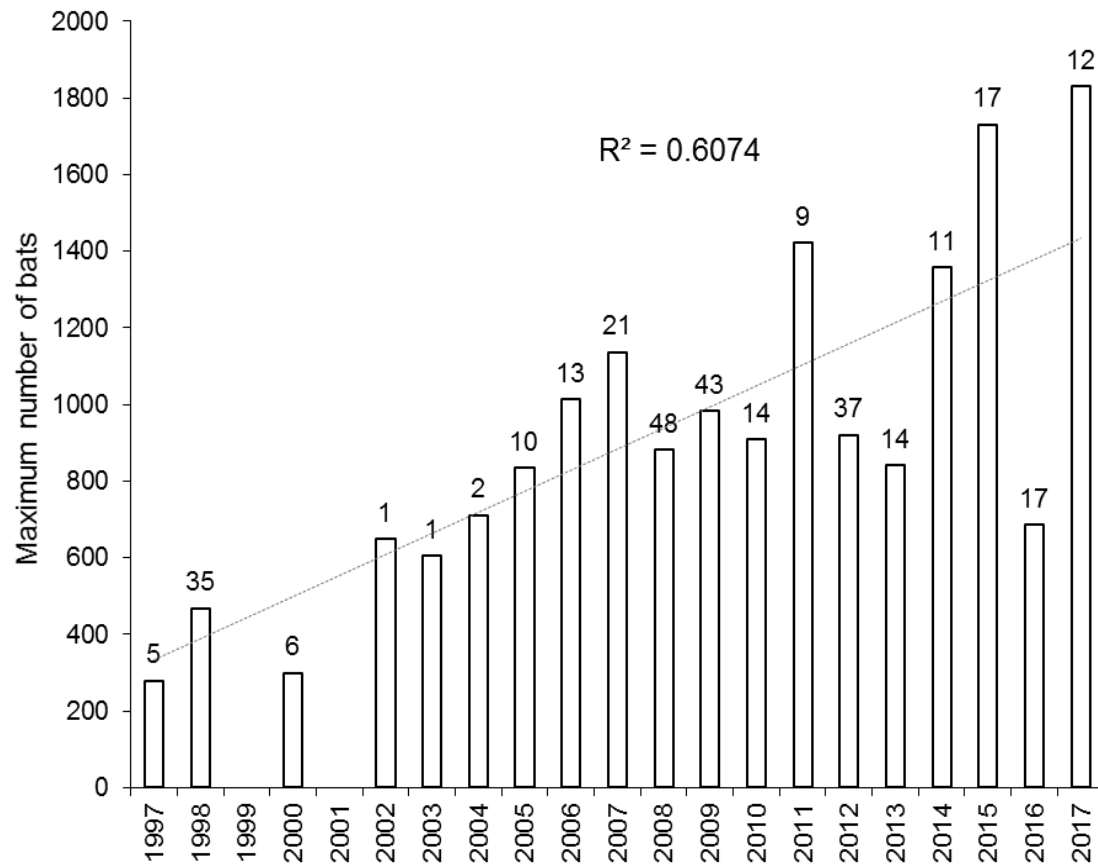
Number of long-tailed bats in Walker colony (MNA)





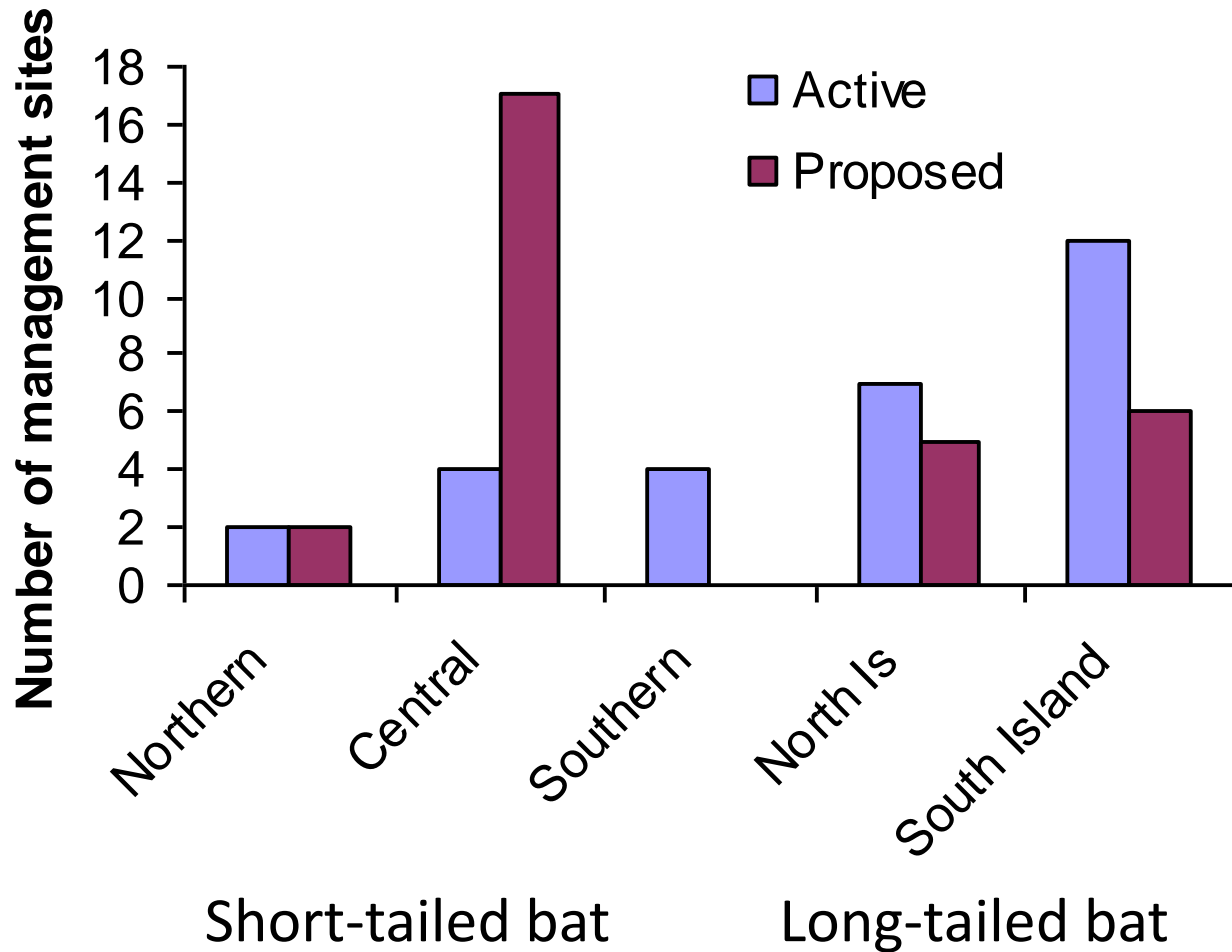
Short-tailed bats in Eglinton Valley

Predator control since 1998



Managed sites

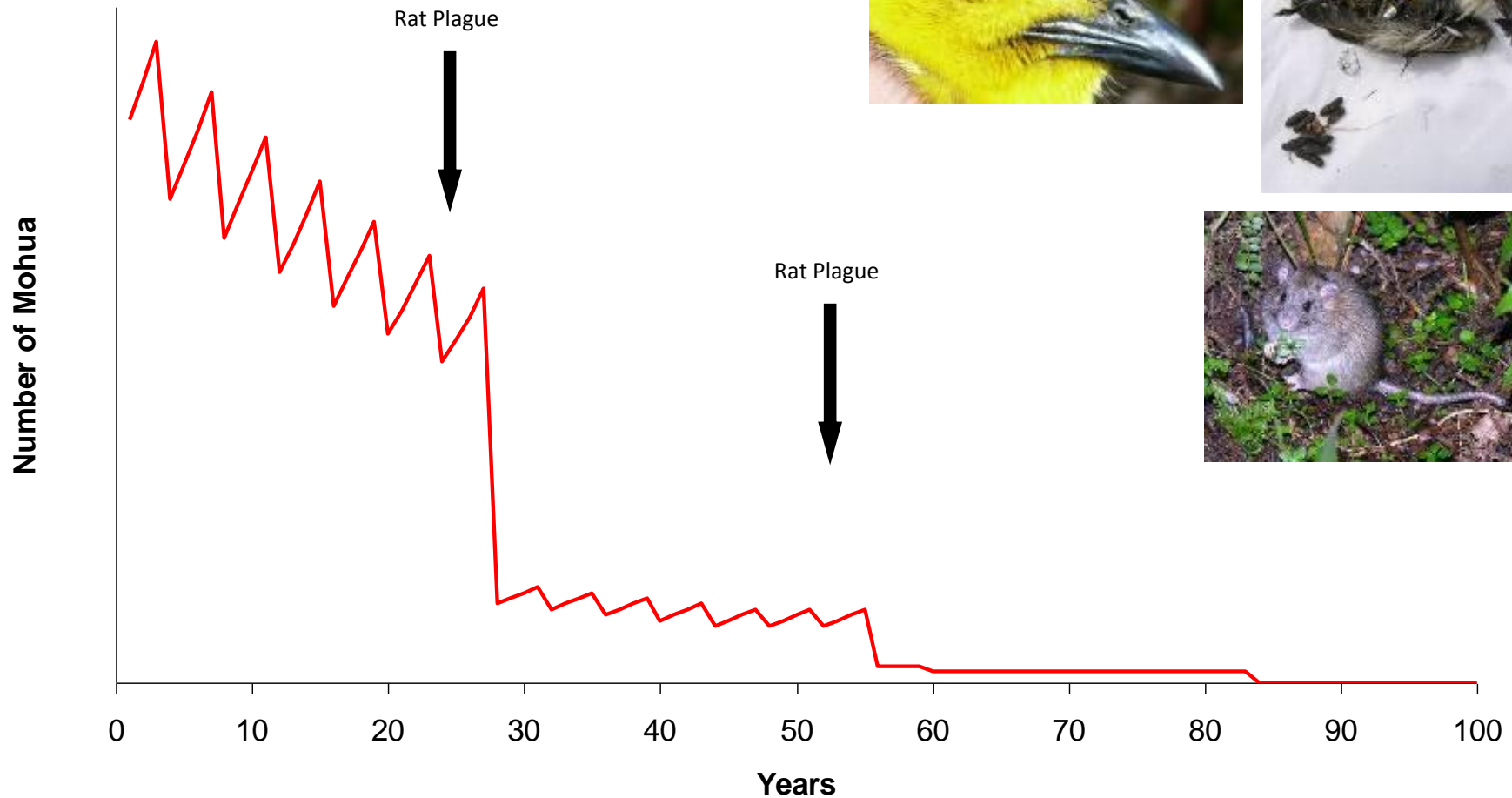
Active = 271,693 ha Proposed = 314,534 ha



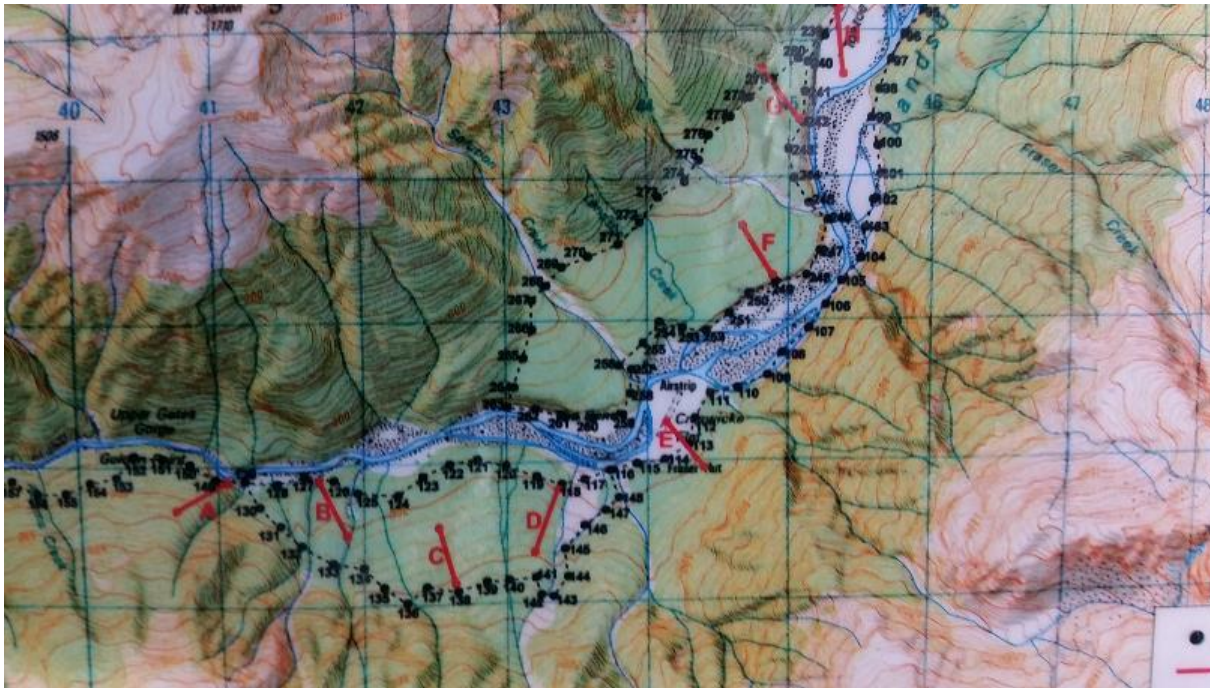
Landsborough Valley



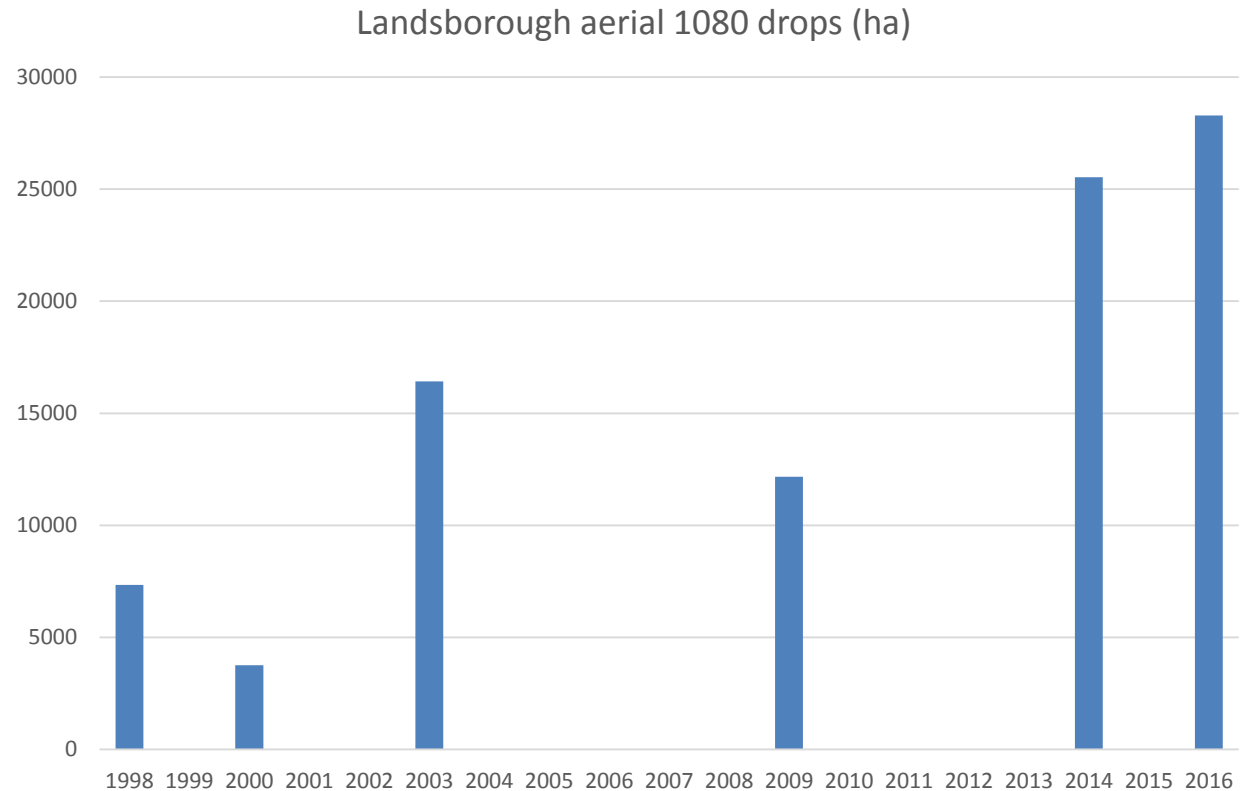
Mōhua population models



Stoat control since 1998

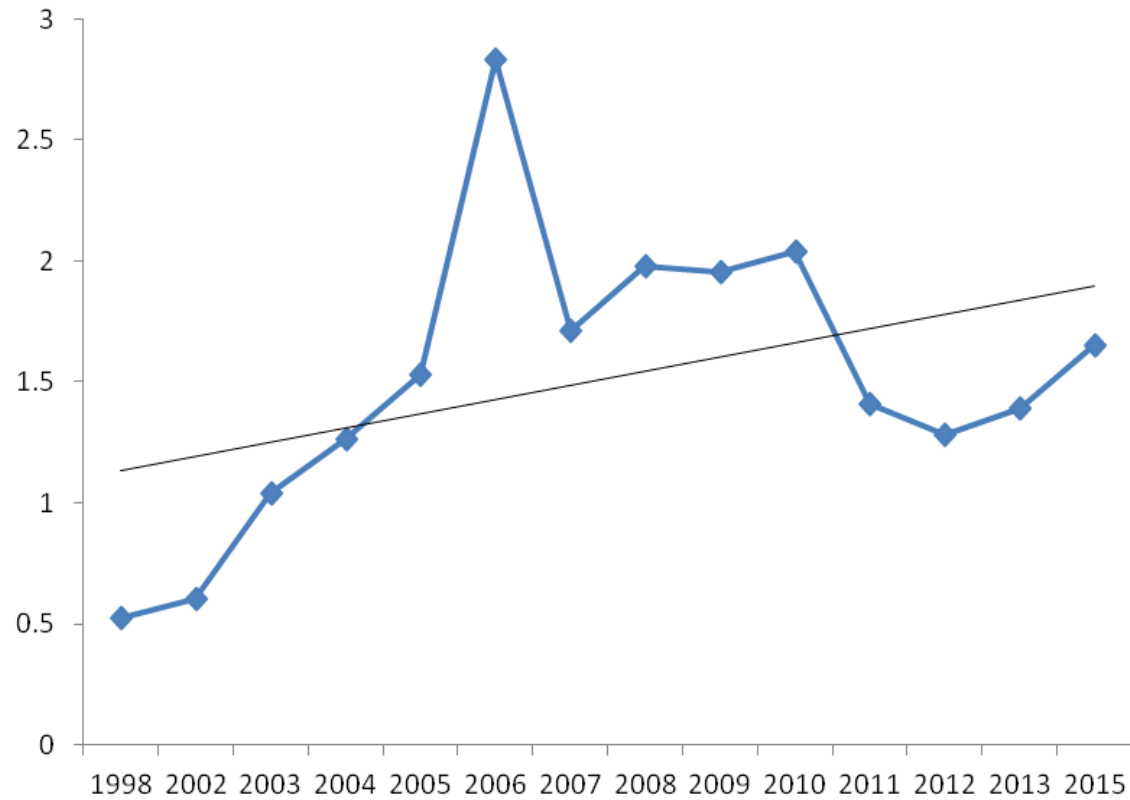


Possum and rat control - aerial 1080



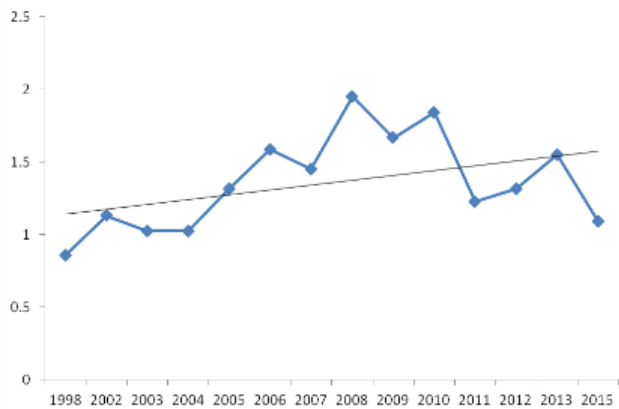
Landsborough mohua population trends

(mean/5-min count)

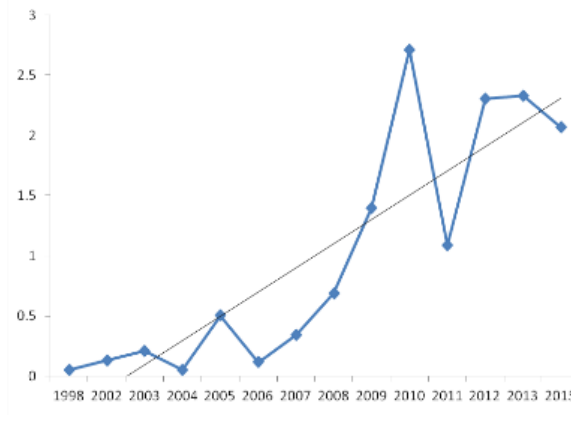




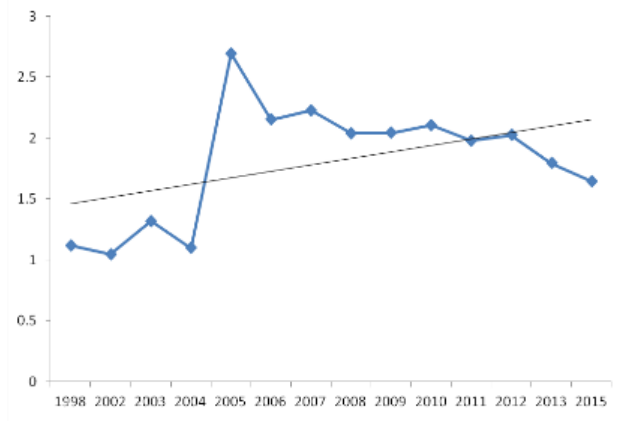
Landsborough brown creeper population trends (mean/5-min count)

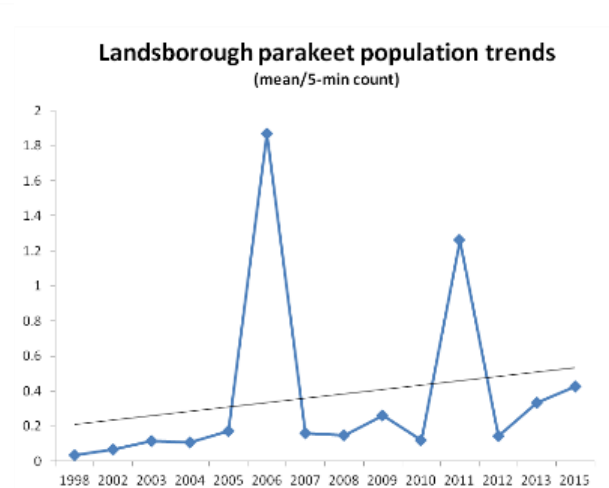
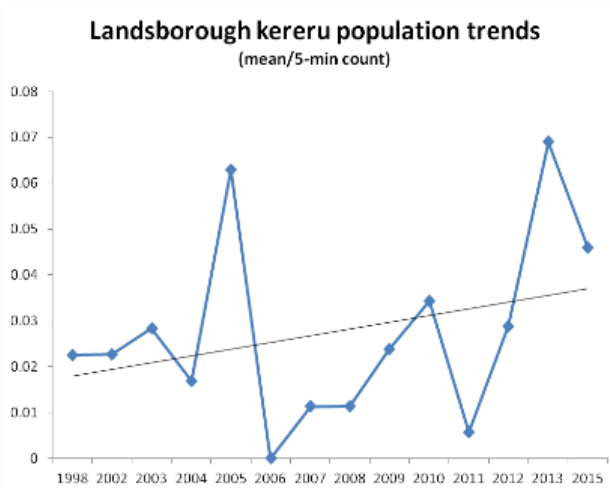
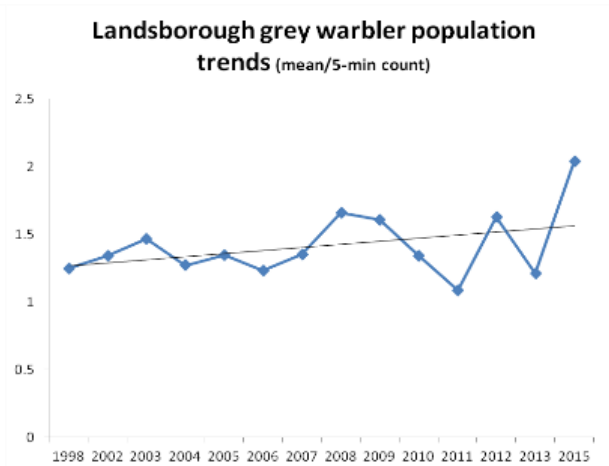
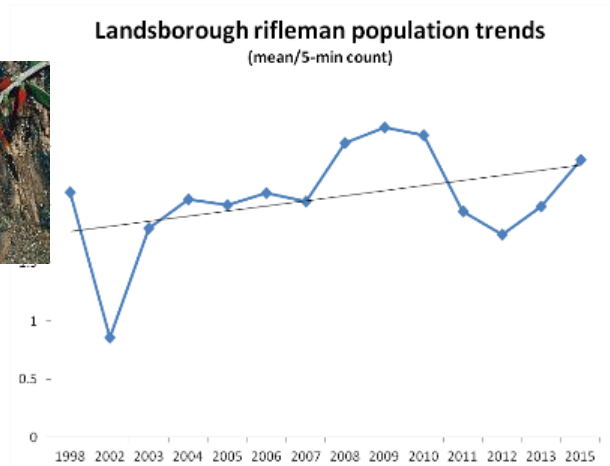


Landsborough tui population trends (mean/5-min count)



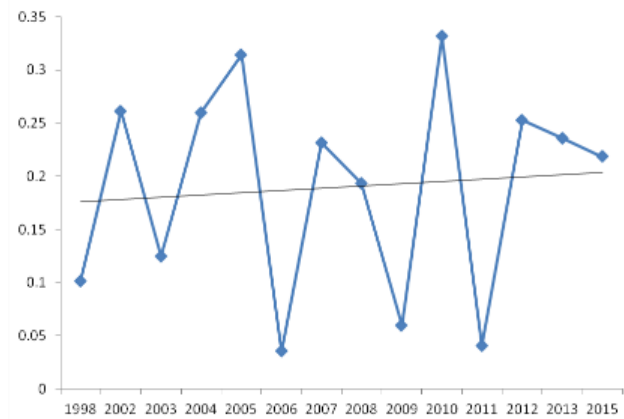
Landsborough bellbird population trends (mean/5-min count)



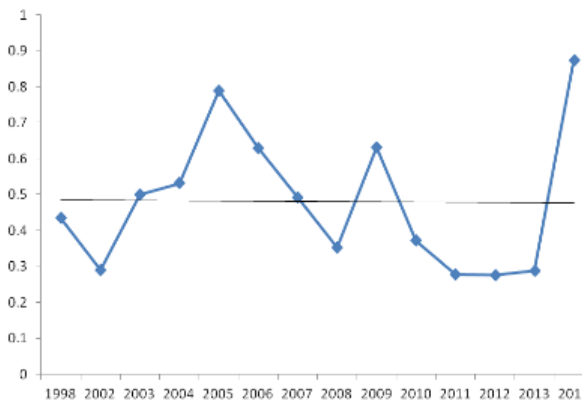




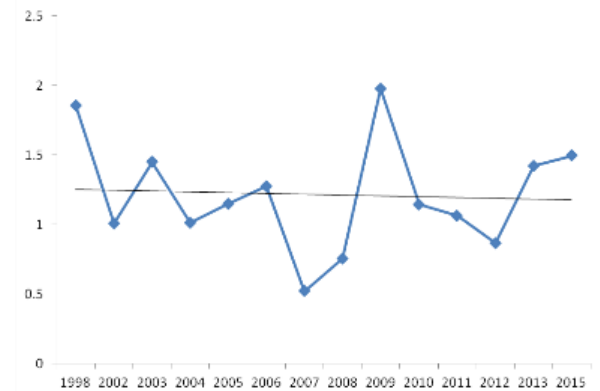
Landsborough kaka population trends
(mean/5-min count)



Landsborough fantail population trends
(mean/5-min count)



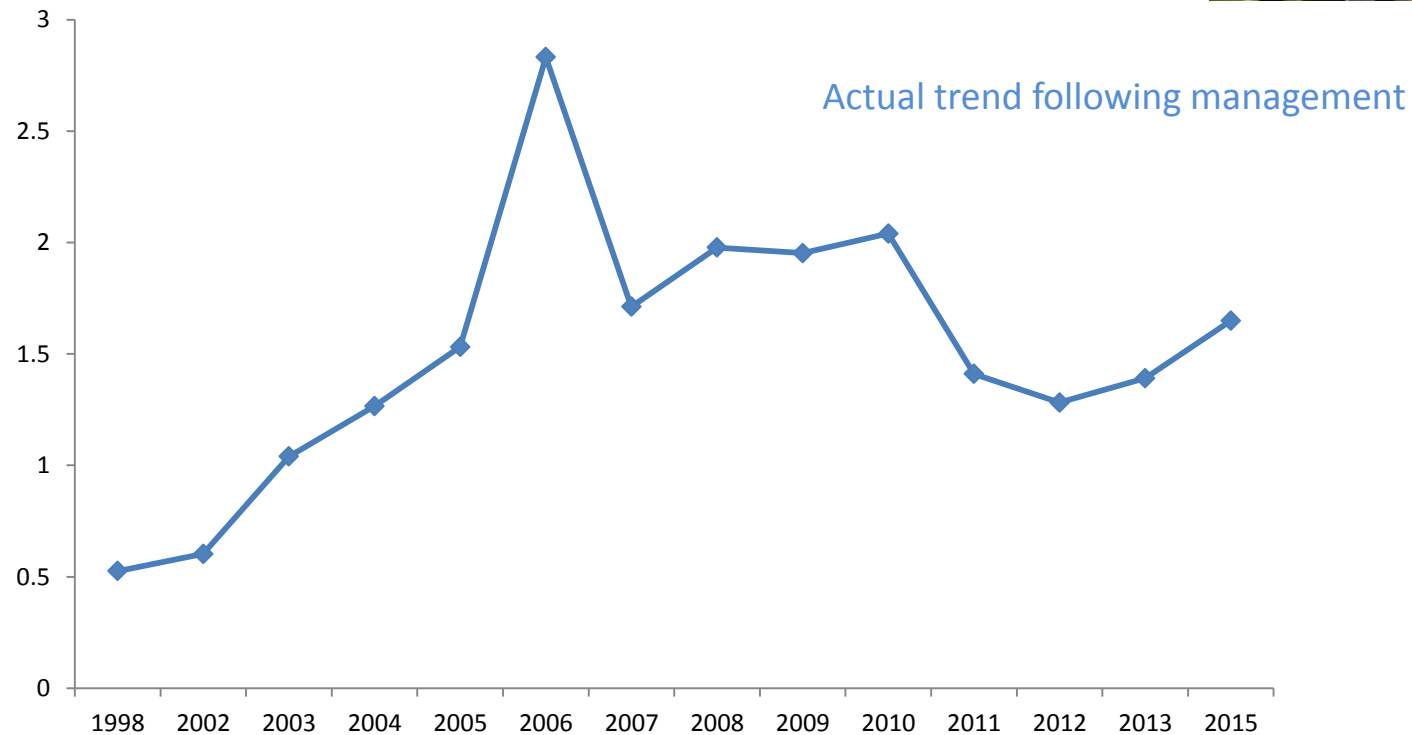
Landsborough tomtit population trends
(mean/5-min count)



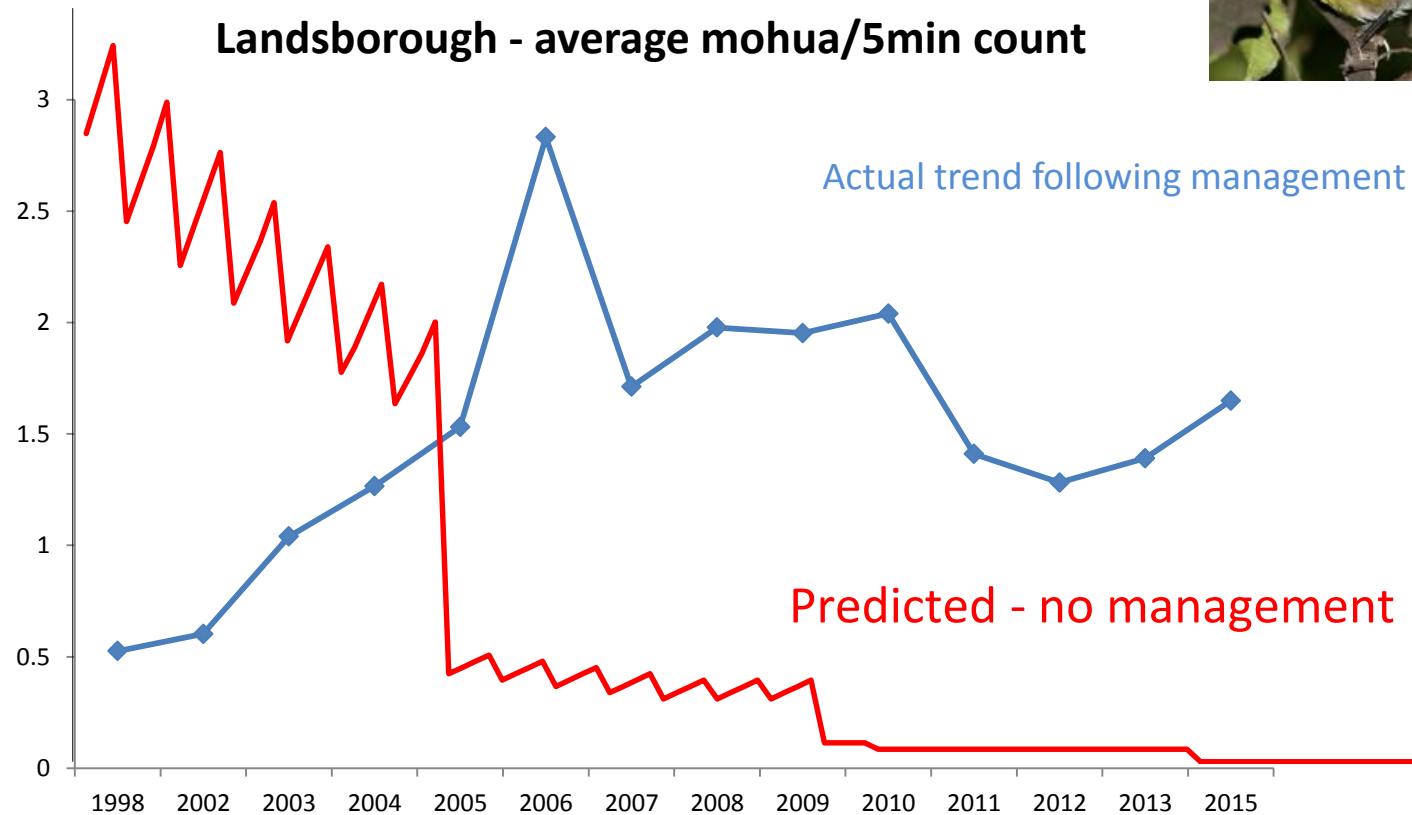
Conclusions: 14 to >300 mōhua



Landsborough - average mohua/5min count



Conclusions : 14 to >300 mōhua





Future questions

- Can the rate of recovery be improved with more effective management?
- Is it possible to reduce baseline predator numbers?
- Design more defensible boundaries?
- Will numbers continue to increase?
- What is the modern carrying capacity of the Landsborough?
- What other factors influence recovery?

Thank you

Arawai Kākāriki
wetland restoration programme



Department of
Conservation
Te Papa Atawhai

Acknowledgements

- Department of Conservation
- Huge number of people provided observations
- Jo Monks, Kay Clapperton, Kerry Weston
- Images: Craig Gillies, Don Geddes, Rod Morris, Peter Langlands, Andrea Stark (DOC wetlands poster)
- Publications: New Zealand Journal of Ecology (2015) 39: 19-33 and (2017) 41:1-22.