Ant Surveillance & Detection Research

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THE UNIVERSITY OF AUCKLAND
NEW ZEALAND
Te Whare Wānanga o Tāmaki Makaurau

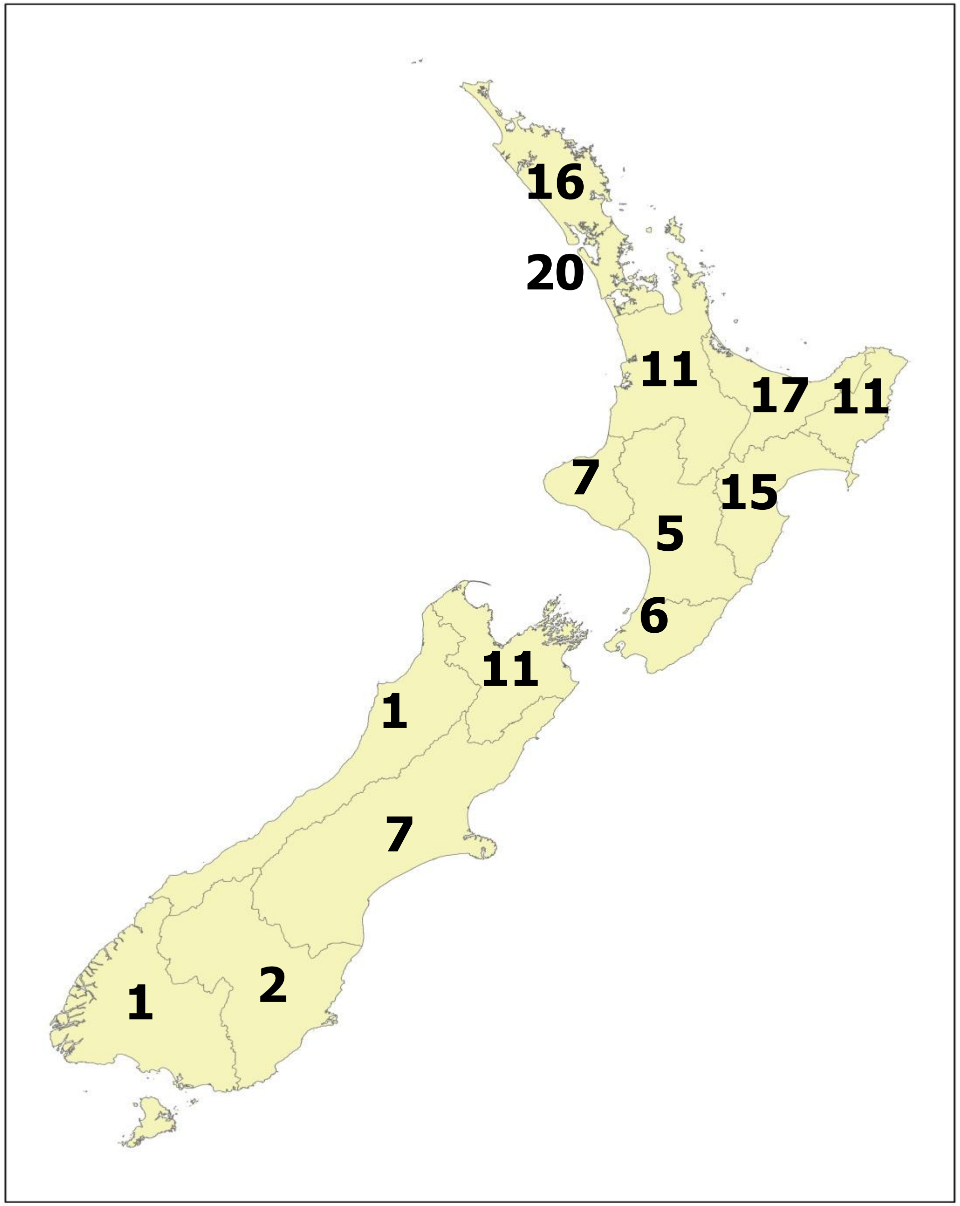
cbb
CENTRE FOR BIODIVERSITY AND BIOSECURITY

Manaaki Whenua
Landcare Research

Exotic ants in NZ

29 exotic ant species
already in NZ

Argentine + Darwin's ants =
only species managed …
(for the moment)



Argentine ant (*Linepithema humile*)

- large, multi-queened colonies
- highly abundant
- generalist diet

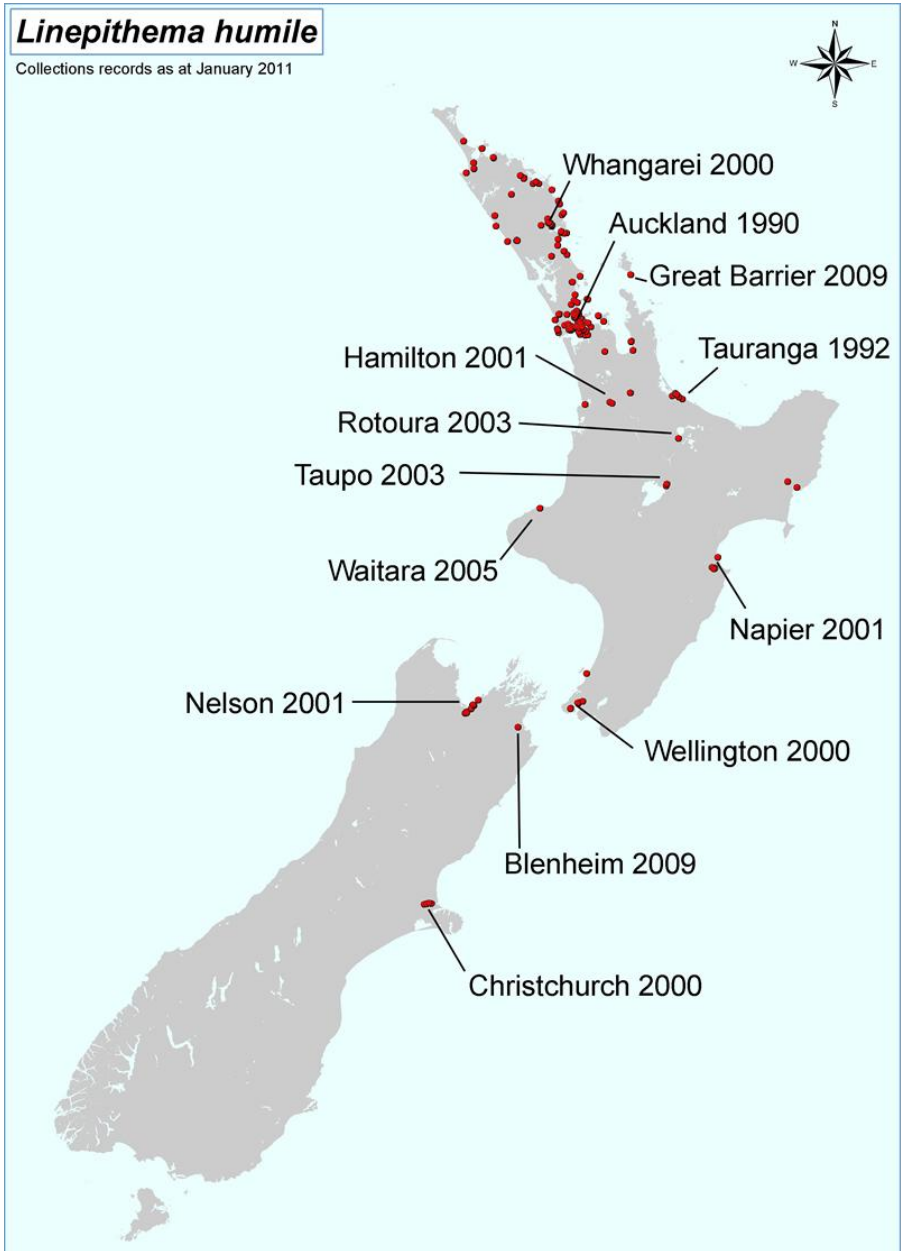
- effective at monopolising food resources
- numerically & behaviourally dominant ant species
- dispersal is by budding (approx. 150m/yr)
  - OR by human-mediated dispersal (10-72km/yr)

http://argentineants.landcareresearch.co.nz/

Human-mediated dispersal

Photos: Donna Watchman (EBOP)

Distribution in New Zealand



Most RCs/TLAs are undertaking surveillance or control for Argentine ants…

Ward et al 2005 *Sociobiology* 25,401-407

Why ants?

- Social insects = most invasive & damaging group of invertebrates

- High reproductive rates & broad niche flexibility

- NZ lacks a dominant social insect fauna
  - no biotic resistance to invasion
  - ecosystems evolved without their dominance

Stanley et al. 2012 *Biodiversity & Conservation 21*, 2653-2669
Stanley et al 2012 *Arthropod-Plant Interactions* 7: 59-67






Why are ants difficult to detect?

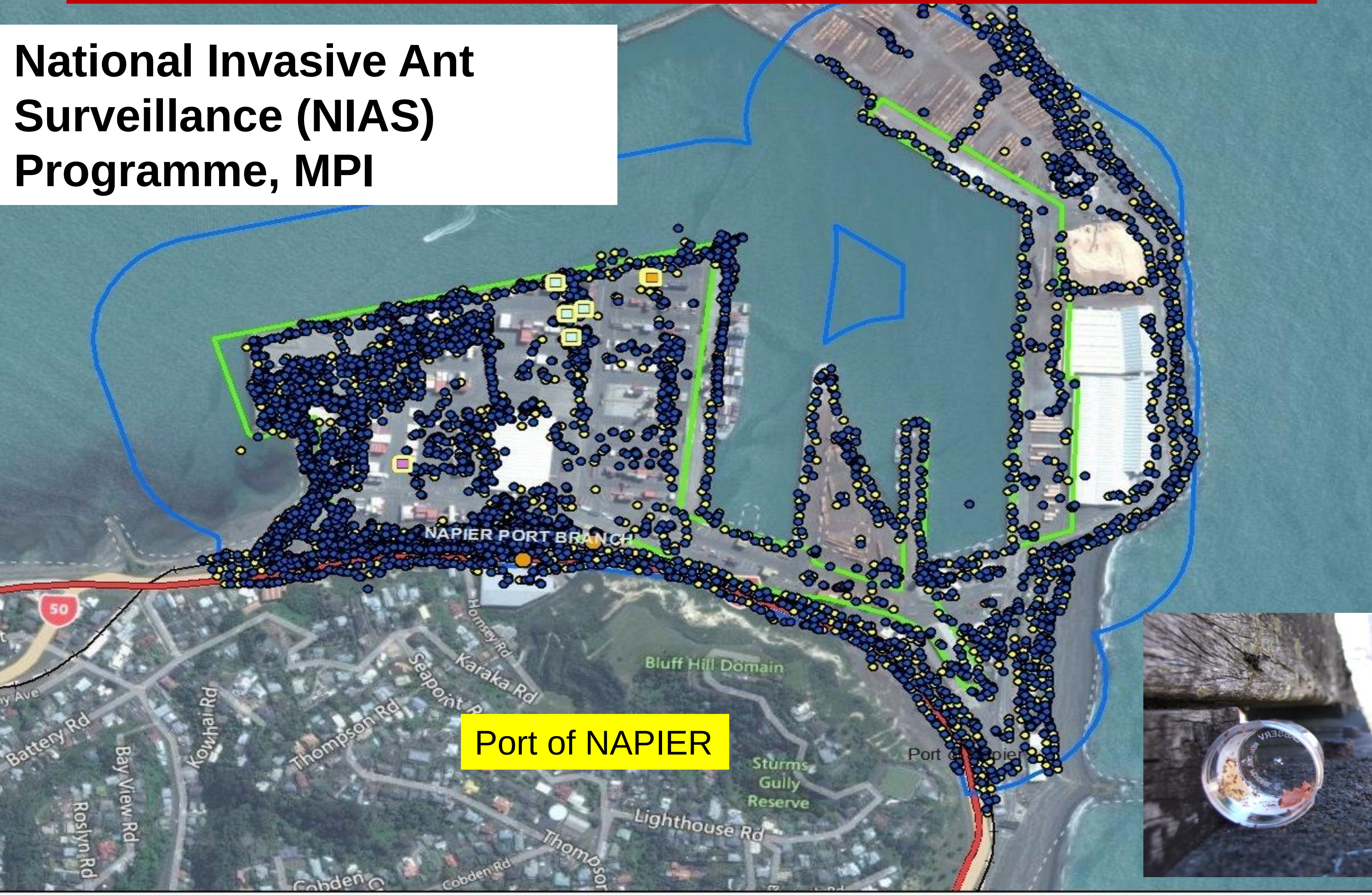
prime candidates for imperfect detection and false absences because of:

- small size (<1cm)
- variable foraging habits
- cryptic nature (queens or incipient colonies)



Border – ant detection

National Invasive Ant Surveillance (NIAS) Programme, MPI



Port of NAPIER

Issues…

- Monitoring involves pottles in a 3m x 3m grid
- Labour intensive – grid establishment + daily checks
- Baits = sensitive to temp/weather + ant activity
- Very high cost



Post-border management

90-99% reduction achieved when Xstinguish bait used

If we can find them, we can kill them…

BUT

No eradication achieved

= always left with a few, small nests

Eradication (rather than density threshold) is the aim because:

HMD = easily moved around

Auckland Council - eradication

Kawau Island
3.5ha
Spring baiting expt
Argentine ants

Research: improving detection devices for low density populations

Current tools/'detection devices':

- Baits (snapshot, but go anywhere)
- Pitfall traps (far more labour intensive)

What is optimal sampling using these devices?

Stanley et al. 2008 *Sociobiology* 51, 461-472

Comparison of detection devices

Compare effectiveness of monitoring devices to find optimal device

DEVICE

- Pitfall trap with teflon
- Pitfall trap no teflon
- Pitfall trap with fish oil & no teflon
- Pitfall trap with teflon
- Baits put out for 3 hours

DURATION

- Pitfall trap out for 1 week
- Pitfall trap out for 2 weeks
- Pitfall trap out for 4 weeks
- Baits put out for 3 hours

- **Pitfall trapping consistently > baits**
- **Longer pitfall duration better**
- **Probability of detecting Arg ants x16 better with fish oil**
- **No difference with teflon**

Stanley et al. 2008 *Sociobiology* 51, 461-472

Comparison of detection devices

BUT:

- Pitfalls are labour intensive – digging in, sorting (& smell like rotten fish!)
- Can't put into concrete!!
- More vulnerable to vandalism (we lost heaps!)

WE NEED BAITS TOO:

BUT: visual search
p = 0.895
(urban reserves)

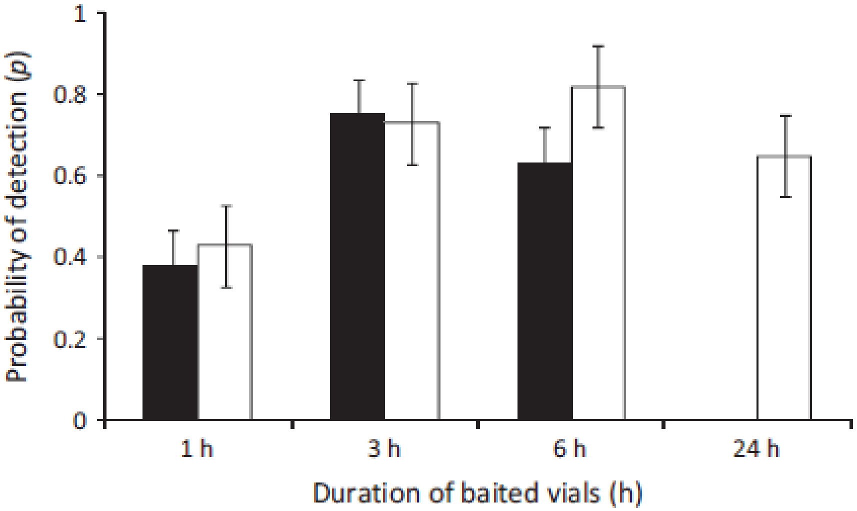
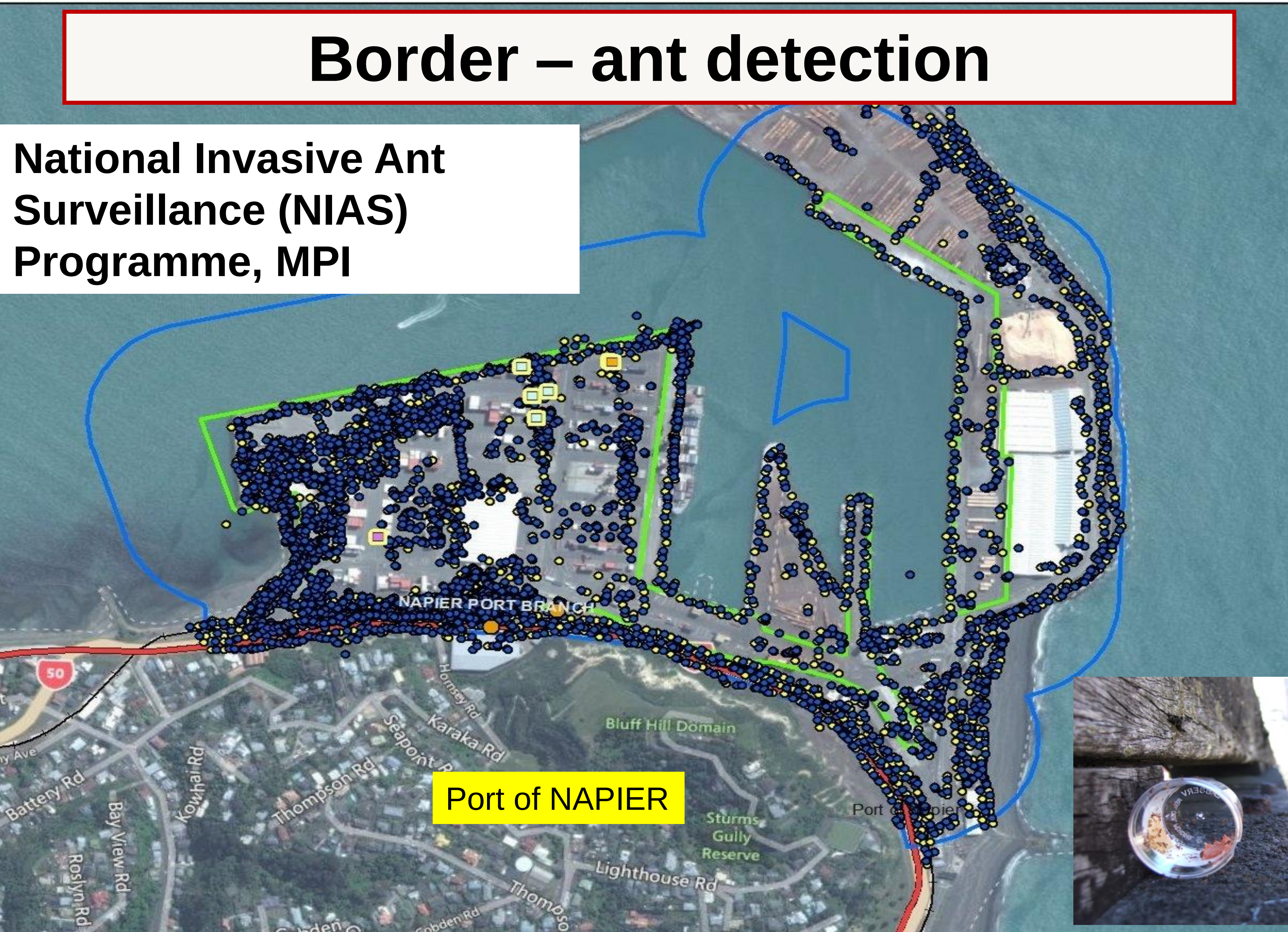


Fig. 1 Probability (±SE) of detecting Argentine ants for baited vials left for different durations (h) for April (black) and May (white).

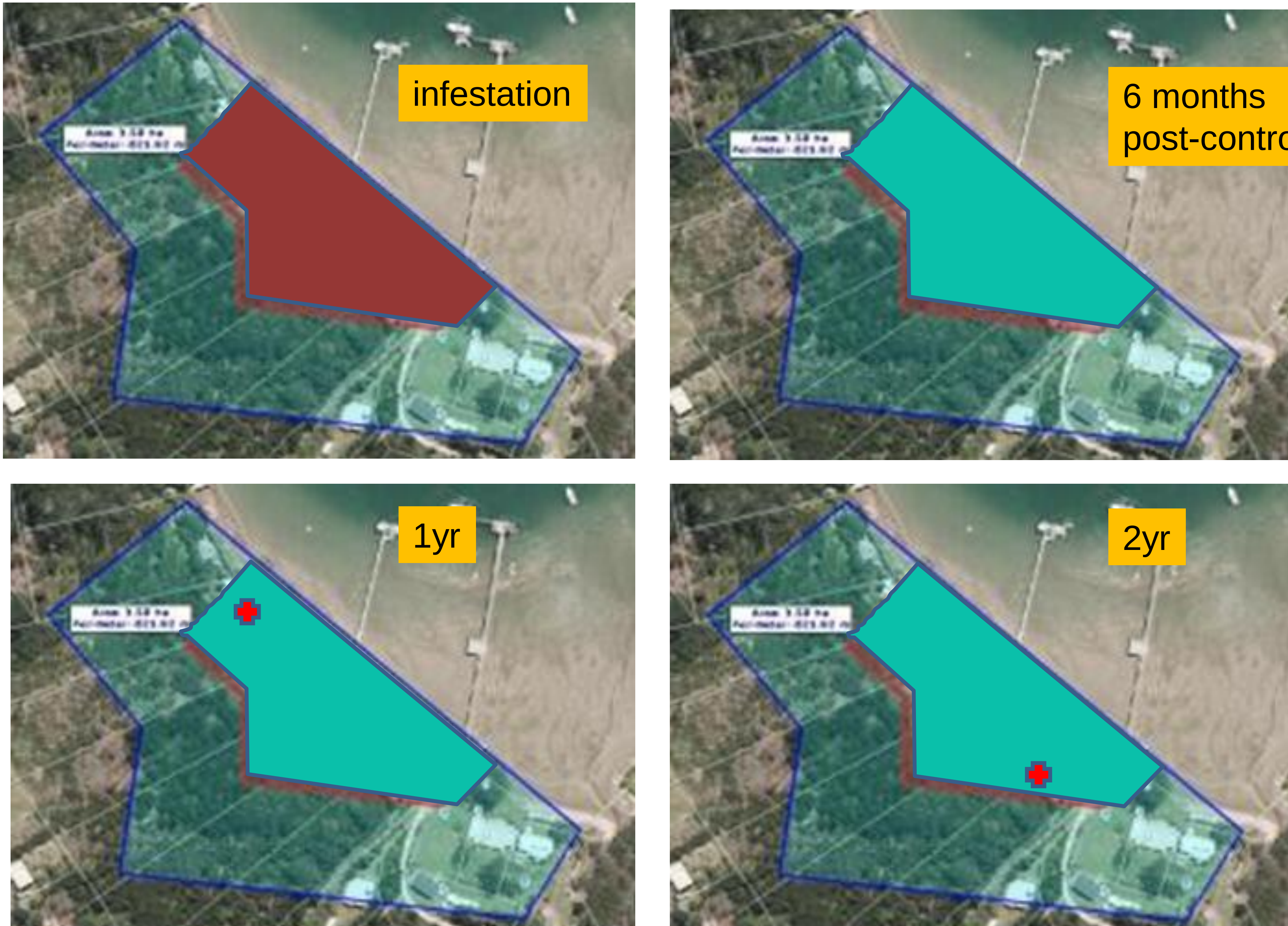
Ward & Stanley 2012 J Appl. Entomol. 137: 197-203

Border – ant detection

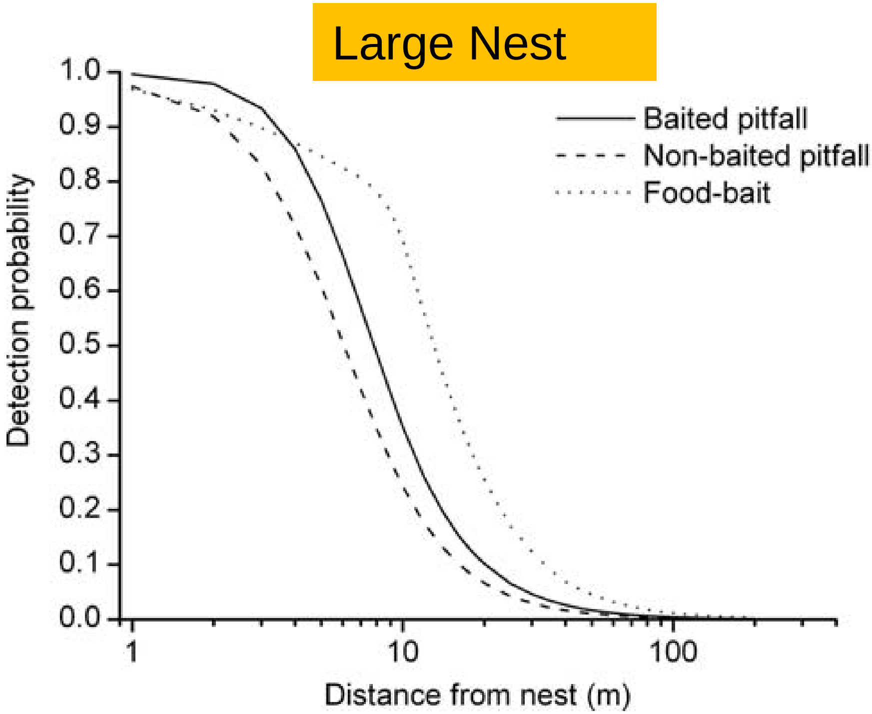
National Invasive Ant Surveillance (NIAS) Programme, MPI

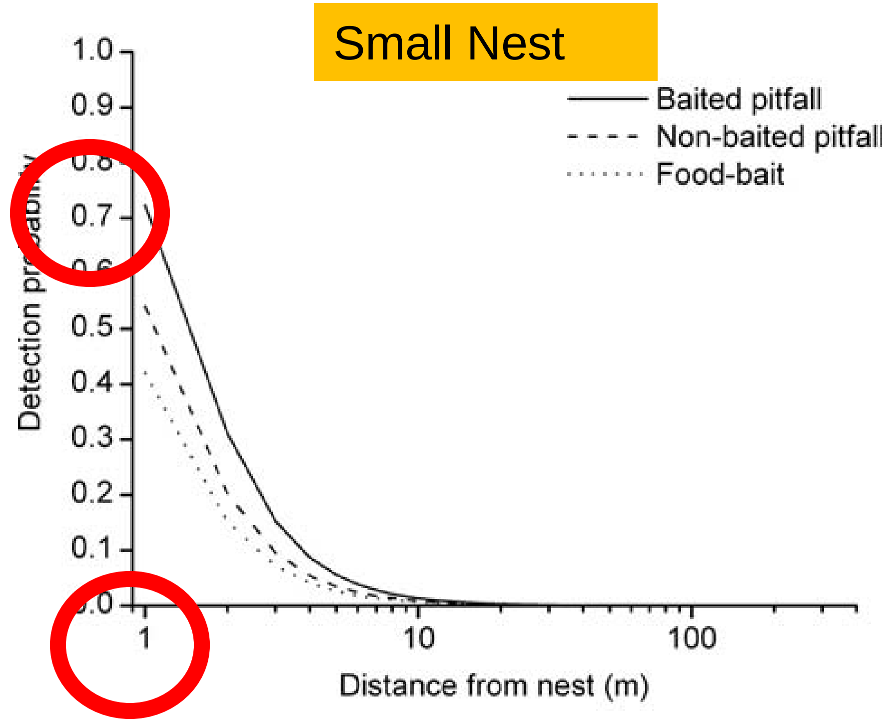


Surviving nests



Surviving nests (RIFA)





Stringer et al 2011. Environ Entomol.

World's first Argentine ant detector dog

Rhys Jones

Brian Shields

Manaaki Whenua Landcare Research

entecol

Auckland Council
Te Kaunihera o Tāmaki Makaurau

World's first Argentine ant detector dog

- Reacts only to Argentine ant scent
- Certified dog in the national Dogs for Conservation Programme
- Used in Treasure Islands Hauraki Gulf programme (AC/DOC)

Accuracy: detector dog

Efficacy tests: Trials with pottles differing in contents (no ants, 1 ant, 50 ants, other ant species, empty)

Trial	Detect Argentine ants	Incorrect detection (other spp.)
1	62%	20%
2	90%	0%
3	90%	0%

Ward, unpubl. data

Rhys is <1 yr old…to repeat in 2014…

What's next?

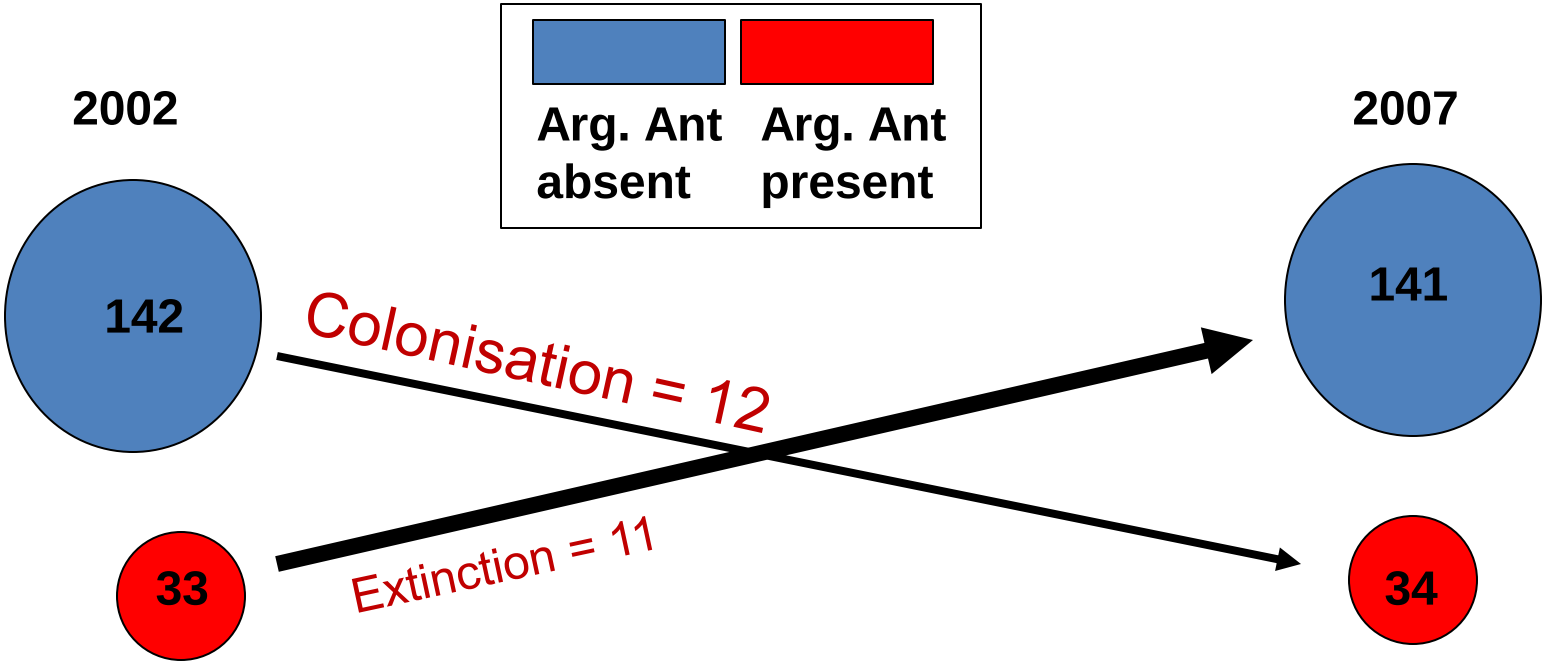
- **Improving use of detection devices** – less labour intensive
    - Putting ant detection into theoretical framework
    - Frequency of revisit
- '**Spring-baiting'** might reduce the chances of surviving pupae
    - paradigm shift for ant control
    - not based in summer – maximum activity/uptake
    - in spring – populations contract into fewer sites
- More dogs! – train to detect Darwin's ant
- Aerial baiting!

Local distribution…a moving feast

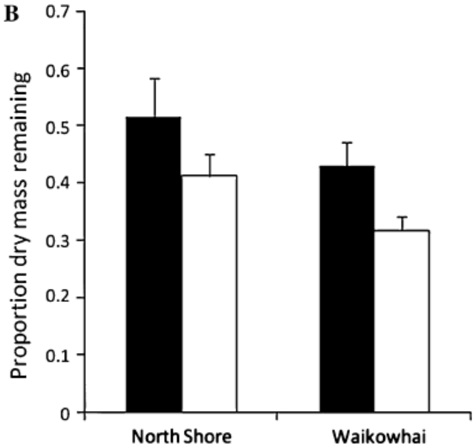
Survey of 175 sites in Auckland (hand-searching)

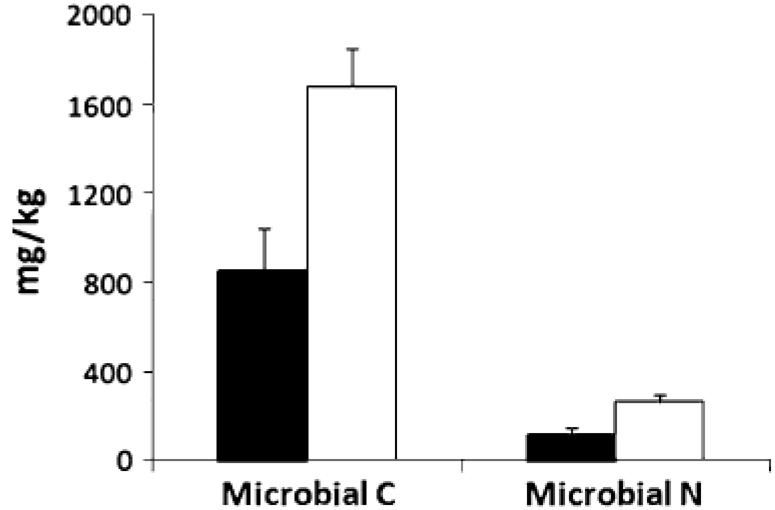
2002 survey = 33 sites had Argentine ants
2007 survey = 34 sites had Argentine ants

No change over 5yrs?



Impacts - ecosystems





Less litter breakdown at invaded sites

Significantly lower microbial biomass at invaded sites

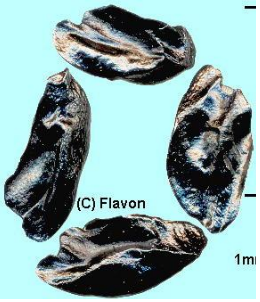
Significantly fewer amphipods at invaded sites
- ‘shredders’ of leaf litter

Richard Toft ©Entecol

Stanley et al. 2012 *Biodiversity & Conservation* 21, 2653-2669

Impacts – plant health/reproduction

- Farm Homoptera (aphids/scale insects)
- Facilitate weed invasion
  - remove herbivores & biocontrol agents
- Effects on pollination?
  - Increase fruit seed on invasive boneseed
  - Decrease weight & viability of flax (*Phormium*) seeds



Stanley et al 2012 *Arthropod-Plant Interactions* 7: 59-67
Paynter et al. 2012 *Biological Control* 63: 188–194