

Are managers using appropriate risk assessments to prioritise pest management programmes?

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Biosecurity in NZ

NZ is one of the most invaded areas on earth...

- >330 plant species = environmental weeds
- >2000 species introduced invertebrates
- More species arriving all the time
(invertebrates, microbes)

When/Where is risk assessed?

Environmental Protection Authority

= pre-border deliberate introductions

Should this organism be introduced to NZ?

Ministry for Primary Industries (formerly MAF)

= border incursions

Should we (& can we) eradicate this organism that has arrived in NZ?

Councils/Unitary Authorities/Dept. Conservation

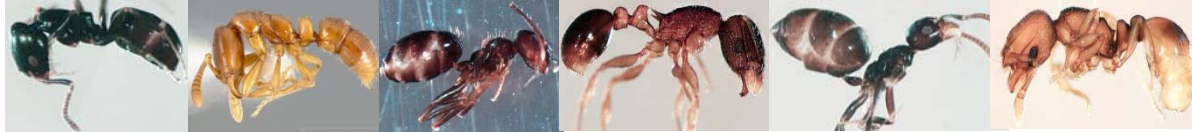
= post border pest management

Is this organism a risk to our region? (SDMs)



Post border risk assessment

Getting beyond “likely establishment” in NZ?



Ants as a model:

- 29 exotic species in NZ (11 native)
- Lots of interceptions/incursions
- Large impacts across all sectors
 - people, economy, environment

What do postborder managers need to assess?

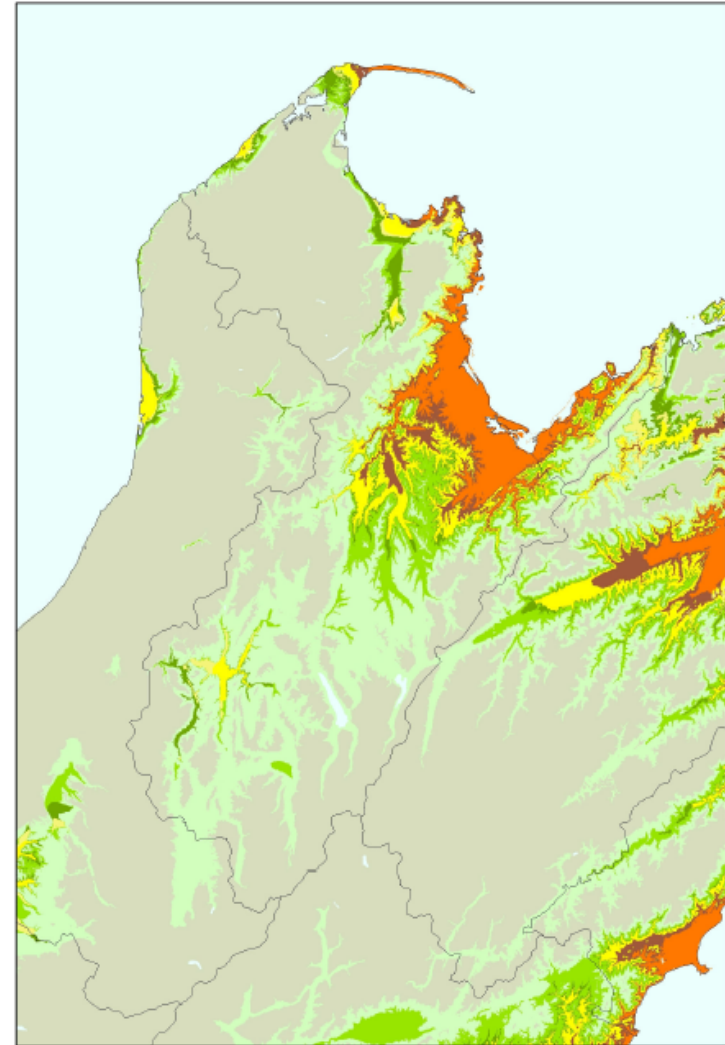
Spatial risk assessment

Does 'species A' pose a risk to my region?

Where should I do surveillance?

SDM – risk areas

Is the scale fine enough?



Ward 2007

Spatial prioritisation of risk

Appendix 3. Risk categories obtained from the Telecom Northland Yellow Pages
Categories not listed are considered of negligible risk.

Risk	Category	Page
High	Bark products	67
	Garden and Horticultural Suppliers	251
	Fruit and Vegetable Wholesalers	235
	Packhouse-Flowers, Fruit and Vegetables	354
Medium	Lawn and Turf	316
	Tree Services	480
	Rubbish Bin Hire/Waste Disposal	412/499
	Scrap Metal Dealers	419
	Orchardists' Suppliers	351
	Landscape Contracting and Supplies	312
	Timber Merchants	468
	Hire-plants	279
	Garden Centres and Nurseries-Retail	249
	Holiday Parks and Camping Grounds	279
Low	Aero clubs	44
	Automotive Parts, Truck Parts	58/483
	Backpackers	65
	Boat Charter, Repairs	81/83
	Building Suppliers	103
	Bus Charters	105
	Caravan Rentals	117

- Zoom in spatially
- **Commodity associations**
- Prioritise surveillance resources

Spatial prioritisation of risk

- Zoom in spatially
- **High value conservation sites to be protected**
- Prioritise surveillance resources

Ranking	Site	Habitat	Visitors
High priority			
1	Pouto Peninsula	Wetland	H
2	Te Paki/North Cape	Sand/Forest	H
3	Ngunguru Sandspit/Whakariora	Sand	M
4	Ahipara Massif	Gumlands	M
5	Kaimaumau/Motutangi Wetlands	Wetland	M
6	Kokota Sandspit	Sand	L
7	Manganui River	Wetland	L
8	Maitahi Wetland	Wetland	L
9	Waipoua/Mataraua/Waima Forest complex	Forest	H
10	Bream Head	Forest	H
11	Puketi/Omahuta Forest	Forest	H
12	Utakura/Pukewharariki Forest	Forest	L
Medium priority			
13	Ngawha Geothermal Field	Geothermal	H
14	Waipu sandspit	Sand	H
15	Mangawhai Sandspit	Sand	H
16	Hikurangi Swamp	Wetland	H
17	Mimiwhangata	Wetland/Forest	H
18	Lake Ohia	Wetland	M
19	Maunganui Bluff	Forest	H
20	Trounson Forest	Forest	H
21	Cape Brett	Forest	H

Temporal prioritisation of risk

Don't have resources for wide-scale surveillance



	Year 1	Year 2	Year 3	Year 4
All High priority sites	✓	✓	✓	✓
Medium: sites 1-20	✓			✓
Medium: sites 21-40		✓		
Medium: sites 41-60			✓	

What's the risk of not doing surveillance every year?

Risk of 'non-detection'

Risk of not detecting an ant (that's present) during surveillance?

If 'presence' is missed,
what is the risk of
further spread?

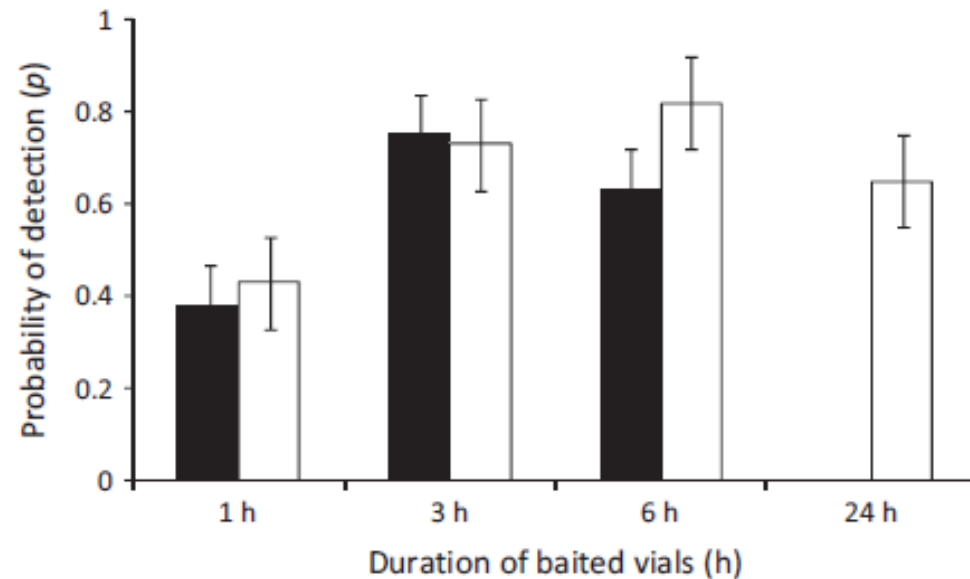


Fig. 1 Probability (\pm SE) of detecting Argentine ants for baited vials left for different durations (h) for April (black) and May (white).

WARD, D.F., STANLEY, M.C. 'Site occupancy and detection probability of Argentine ant populations' *Journal of Applied Entomology* 137:197-203, 2013

Two major risk assessment gaps...

1. Climate change – species establishment +/- spread

Pest managers don't take climate
change into account

*SHEPPARD, C.S, BURNS, B.R., STANLEY, M.C Predicting plant invasions under climate change:
are species distribution models validated by field trials?" Global Change Biology doi:
10.1111/gcb.12531, 2014*

2. Impact in native ecosystems

NZ's species/ecosystems are
unique & understudied
- How do we predict impact?



Impacts on native ecosystems

Environmental Protection Authority

= pre-border deliberate introductions

Should this organism be introduced to NZ?

Ministry for Primary Industries (formerly MAF)

= border incursions

Should we (& can we) eradicate this organism that has arrived in NZ?

Species let through?

OR

Incursion response
stood down?

- Easier to quantify (\$\$) risk to productive sector than risk to native environments – no info?
- Values: economy > kakapo > small plants > insects?

1. No info = low/nil impact

OR

2. Predictable but not valued?

Impacts: can we generalise?

Is each interaction unique

– or can we make some generalisations?

- Predictions of impact for single cases depend on knowledge of species-environment interactions (luxury approach)
- Predicting probability of an impact depends on knowledge of the class history of impact (insurance industry approach)

Ant Risk Assessment: prioritising species

Assessing the risk of invasive ants: a simple and flexible scorecard approach

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Based on the Australian/NZ Weed Risk Assessment – scorecard system

Table 1. Risk assessment scorecard for evaluating the threats of invasive ant species.

Category and Characters	Scoring		
	0	0.5	1
Impact on native environment			
Competitive advantage over other ants	Unlikely	Some species	Yes
Detrimental impacts on native invertebrates	Unlikely	Likely	Severe
Detrimental impacts on vertebrates	Unlikely	Possible	Yes
Harms indigenous flora	Unlikely	Possible	Yes



Ant Risk Assessment

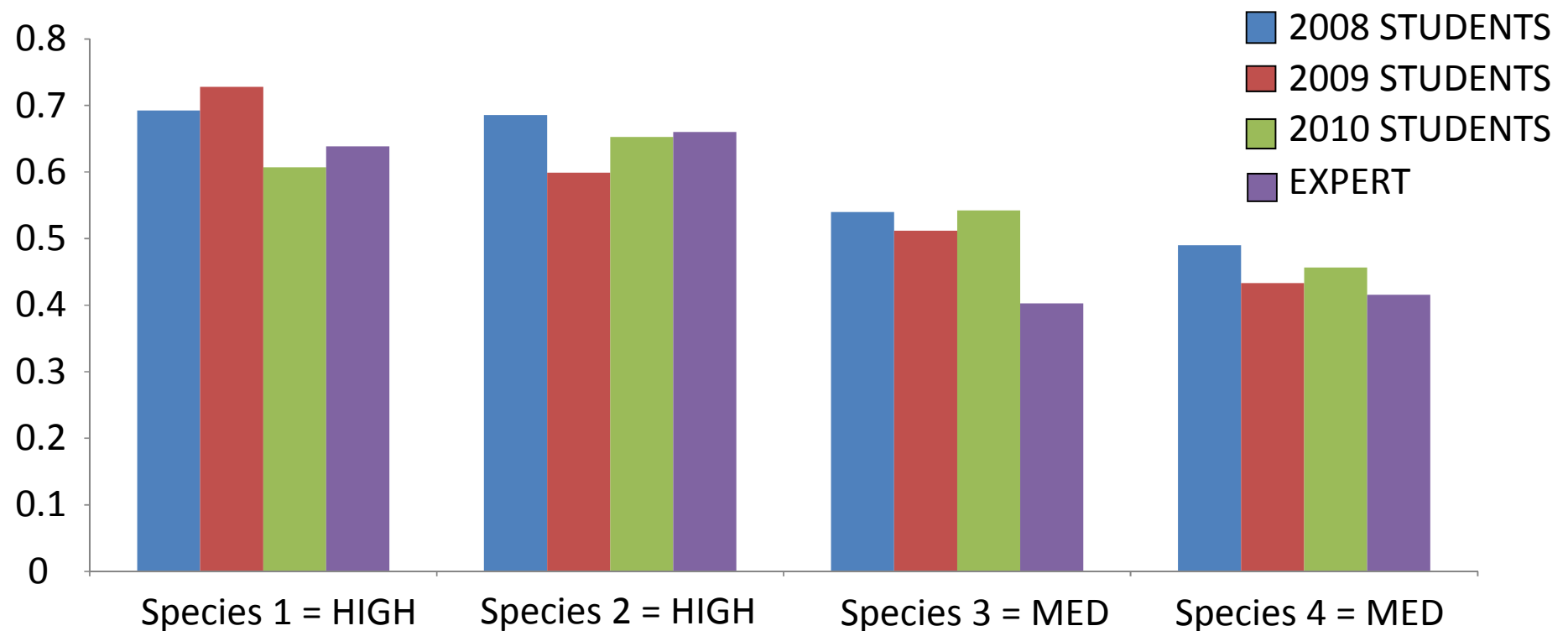
Table 2. An example of the rankings of some introduced ant species established in New Zealand. Rankings are based on a weighed percentage to stress the importance of establishment in natural environments and potential impact towards humans and the native environment. Only the 5 top and bottom ranked species are listed.

Weighting (%)	Risk Assessment Category							Total Score	100 Total Ranking
	10 Biological traits	5 Pathways	10 Difficulty in Containment	5 Establishment (urban)	20 Establishment (natural)	25 Pest status to humans	25 Impact native environment		
Species									
<i>Technomyrmex albipes</i>	0.9	1.0	0.5	1.0	0.8	0.6	0.5	5.2	67.3
<i>Linepithema humile</i>	1.0	0.8	0.0	1.0	0.5	0.6	0.9	4.8	66.5
<i>Doleromyrma darwiniana</i>	0.5	0.5	0.5	1.0	0.8	0.6	0.5	4.4	61.0
<i>Pheidole megacephala</i>	1.0	1.0	0.0	0.8	0.0	0.6	0.9	4.3	56.5
<i>Ochetellus glaber</i>	0.8	0.8	0.5	1.0	0.5	0.4	0.4	4.3	51.5

- Is the scoring system sensible?
- Are the weightings correct?
- Can 'non-experts' use it?

Ant Risk Assessment

Ant factsheets (developed + used by experts for the risk assessment)



Non-experts: correctly assign high or medium risk

Ant Risk Assessment

Can we validate the 'impact on native ecosystems' section?

Retrospective analysis:

Risk assessments outcomes
compared to actual impacts
(in field)

...using established ants

Can we make improvements
around predicting impact?



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Manatū Ahu Matua

