



Invasive ants and island conservation: the increasing need, management record, and future prospects

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Ants as alien species

>200 species distributed outside native range

5 are among 100 worst invasive species (IUCN)



Ecological impacts – Great Barrier Reef

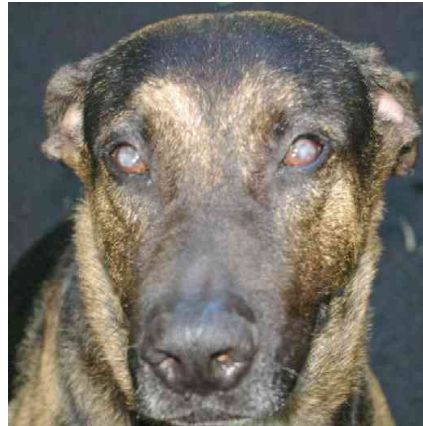


Tryon
Island

African big-headed ant and soft scale



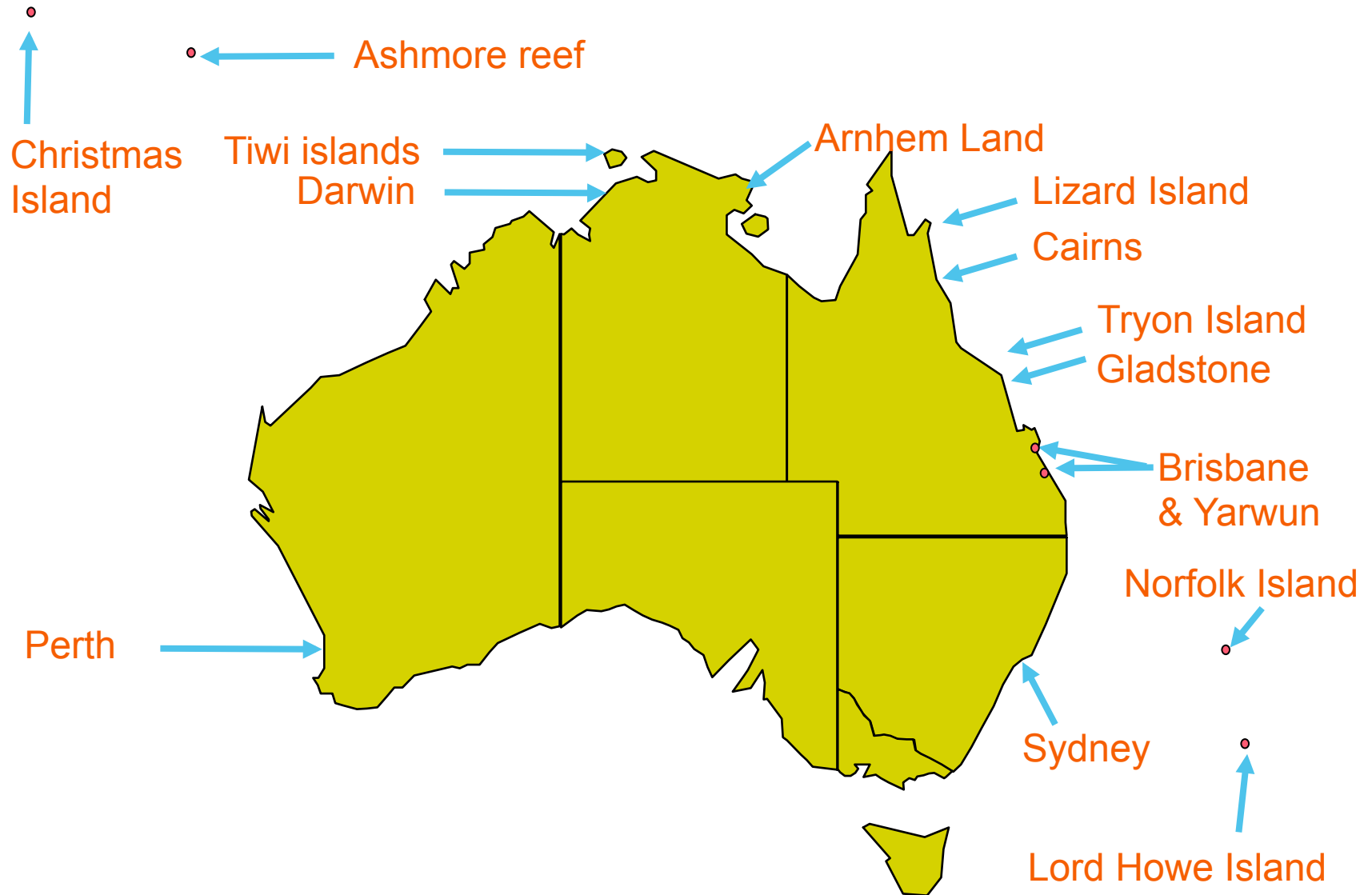
Social impacts



Agricultural impacts



Australian ant management programs



Australian response to invasive ants

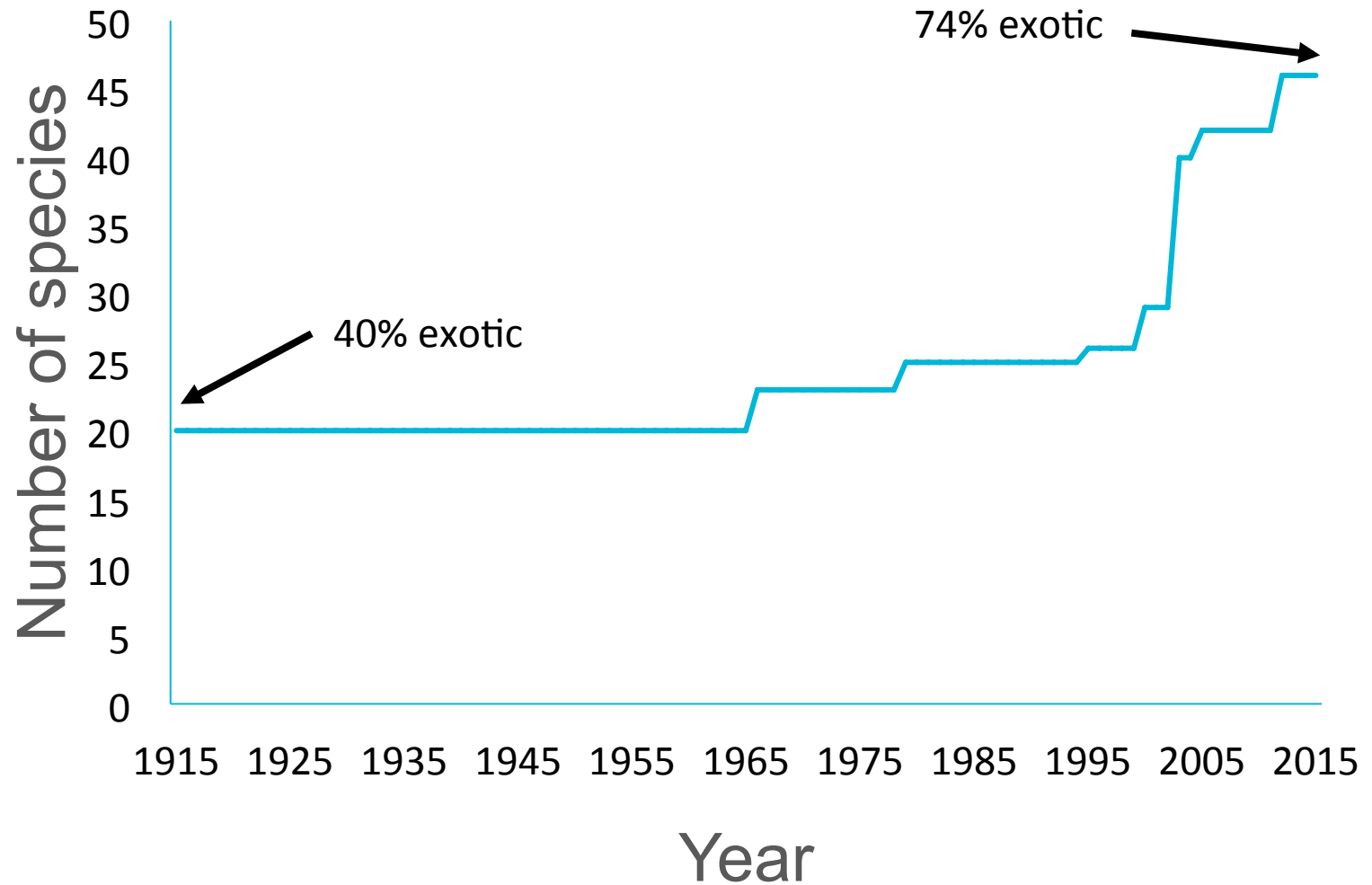
Australia spent \$350 million against fire ants in past 10 years
Just committed another \$400 million over the next 10 years

Fire ants cost USA \$6 billion annually



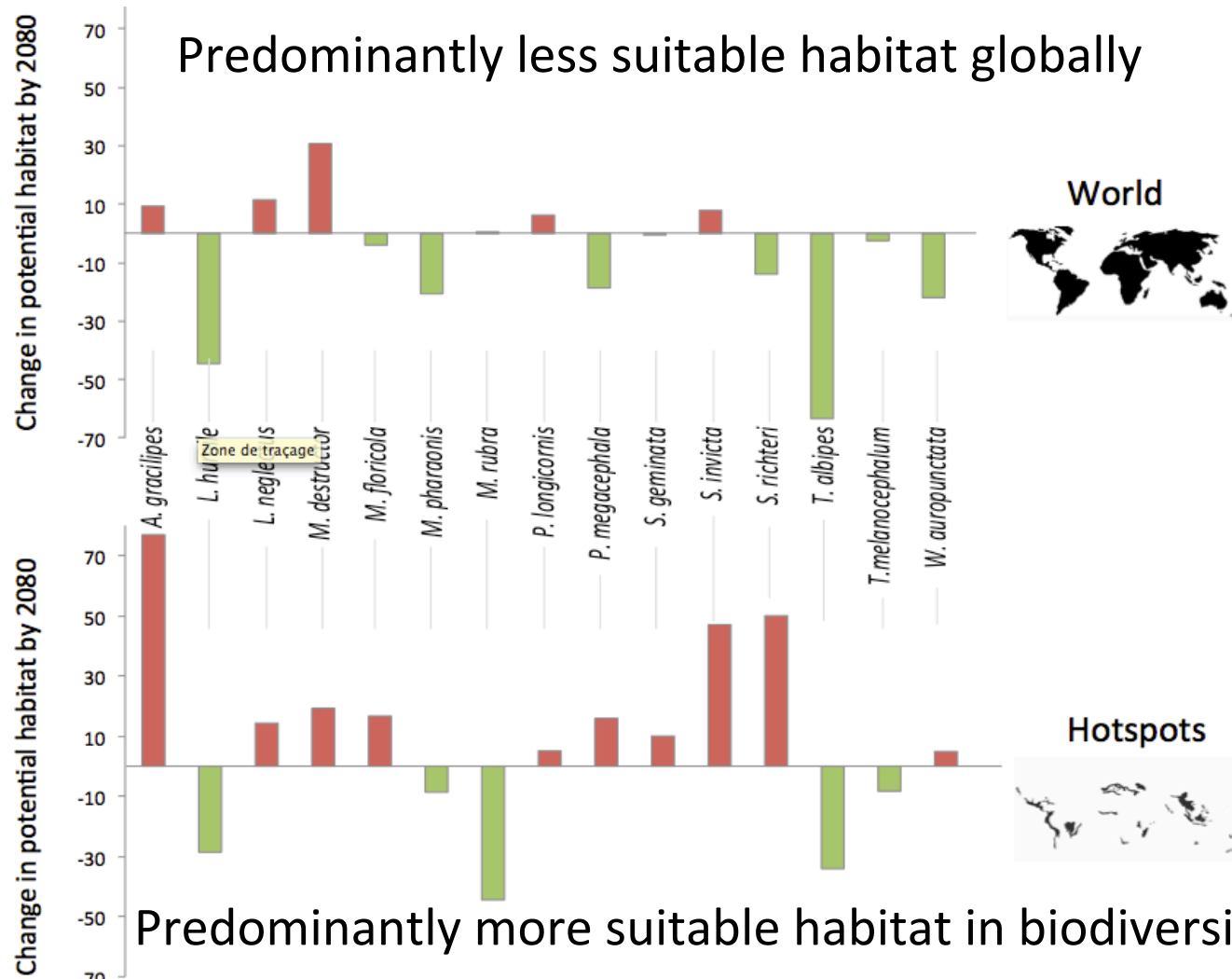
What are the future predictions of ant invasions?

Ant species accumulation on Lord Howe Island



Hoffmann et al. (2017) *NeoBiota* **34**, 41-52

Habitat suitability change with climate change



Implications

Invasive ant issues on islands likely to worsen

Change in invasive ant species

Rise of the temperate species

Pachycondyla chinensis (Asian needle ant)

Myrmica rubra (red pennant ant)

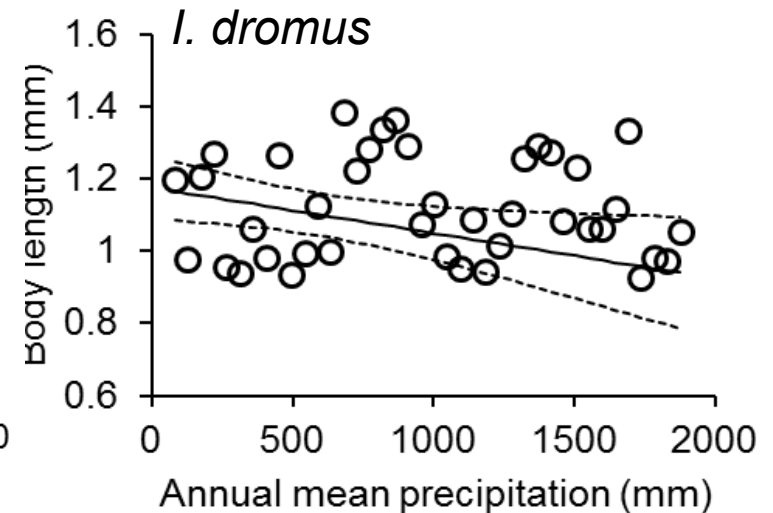
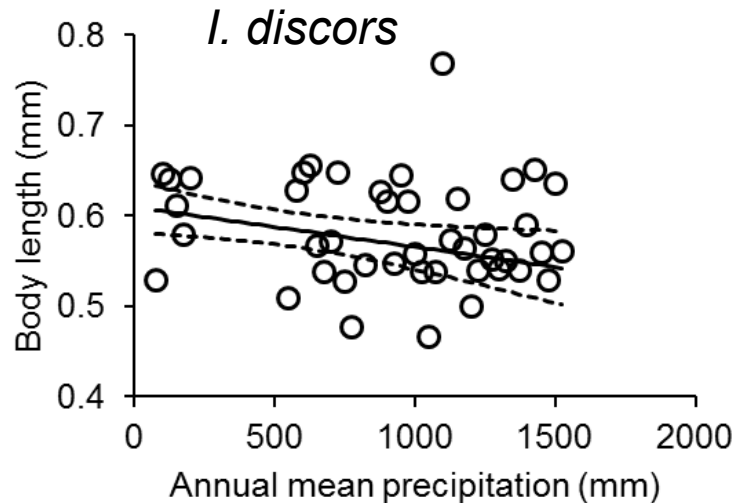
Lasius neglectus (European house ant)

Lepisiota frauenfeldi (browsing ant)

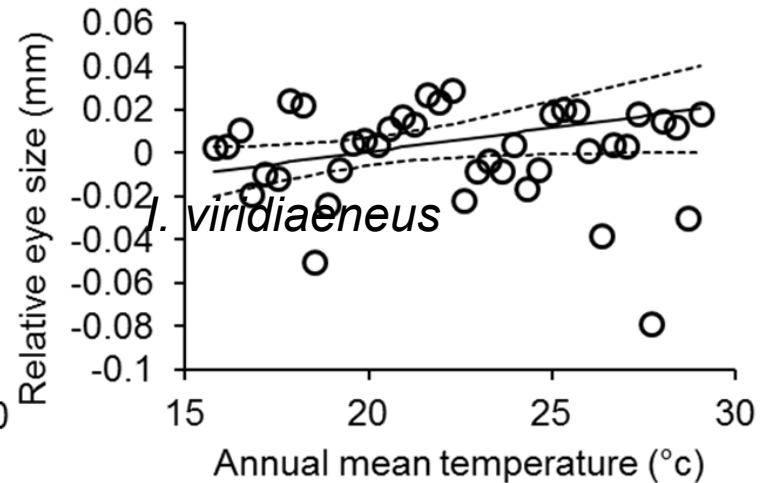
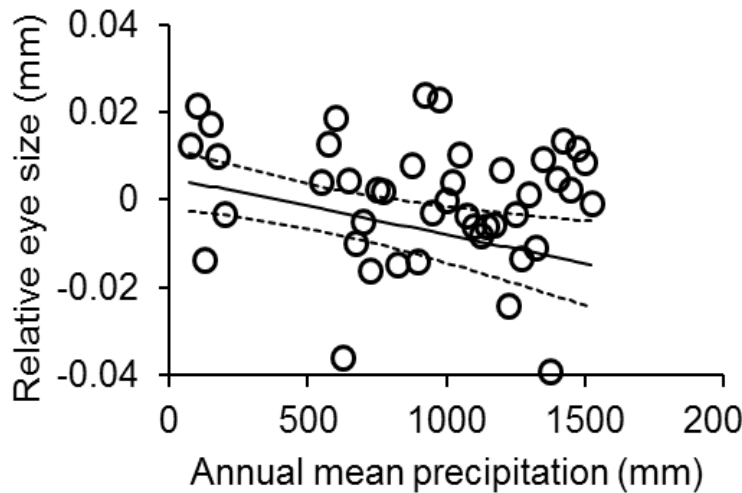
Biosecurity of today needs to refocus for the biosecurity needs of tomorrow

Environments affect morphology

Body size

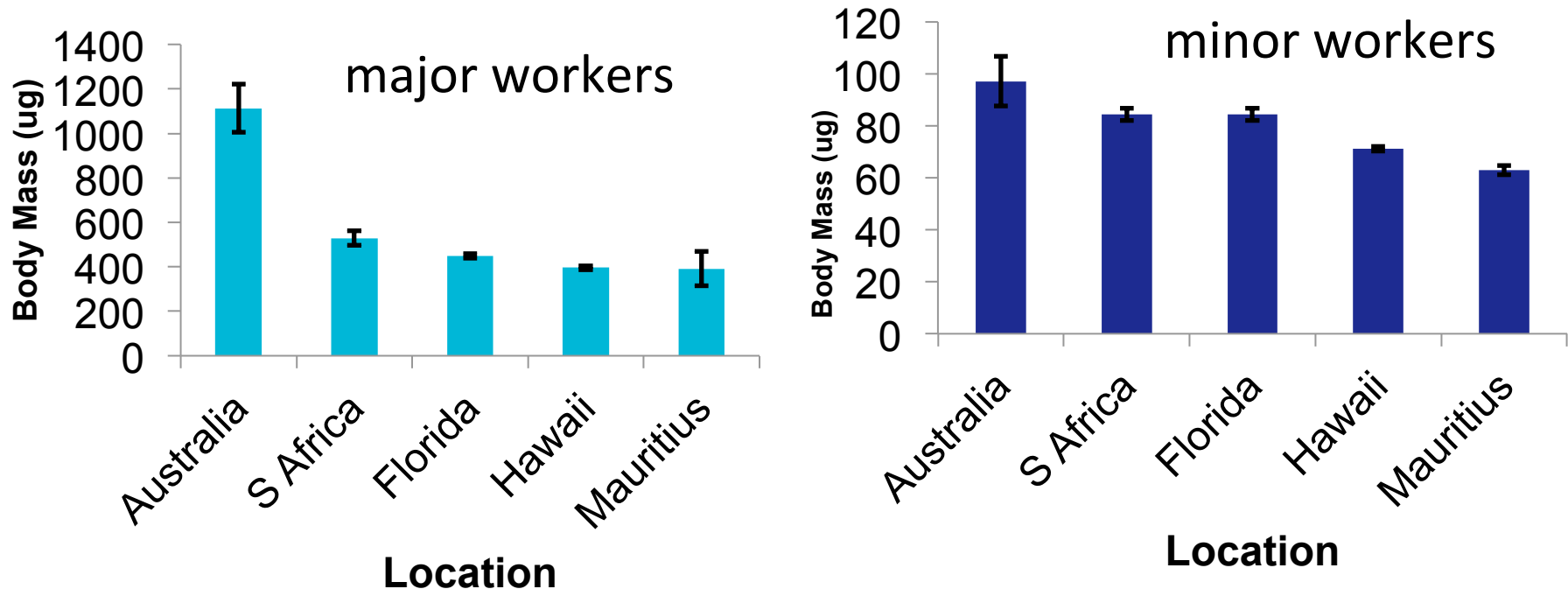


Relative eye size



Katayo, Gibb, Shattuck, unpublished data (La Trobe University)

Differing environments affect morphology



Unclear if/how climate change will affect morphology and what the implications would be

Status of invasive ant eradication attempts

316 eradication campaigns against 11 species

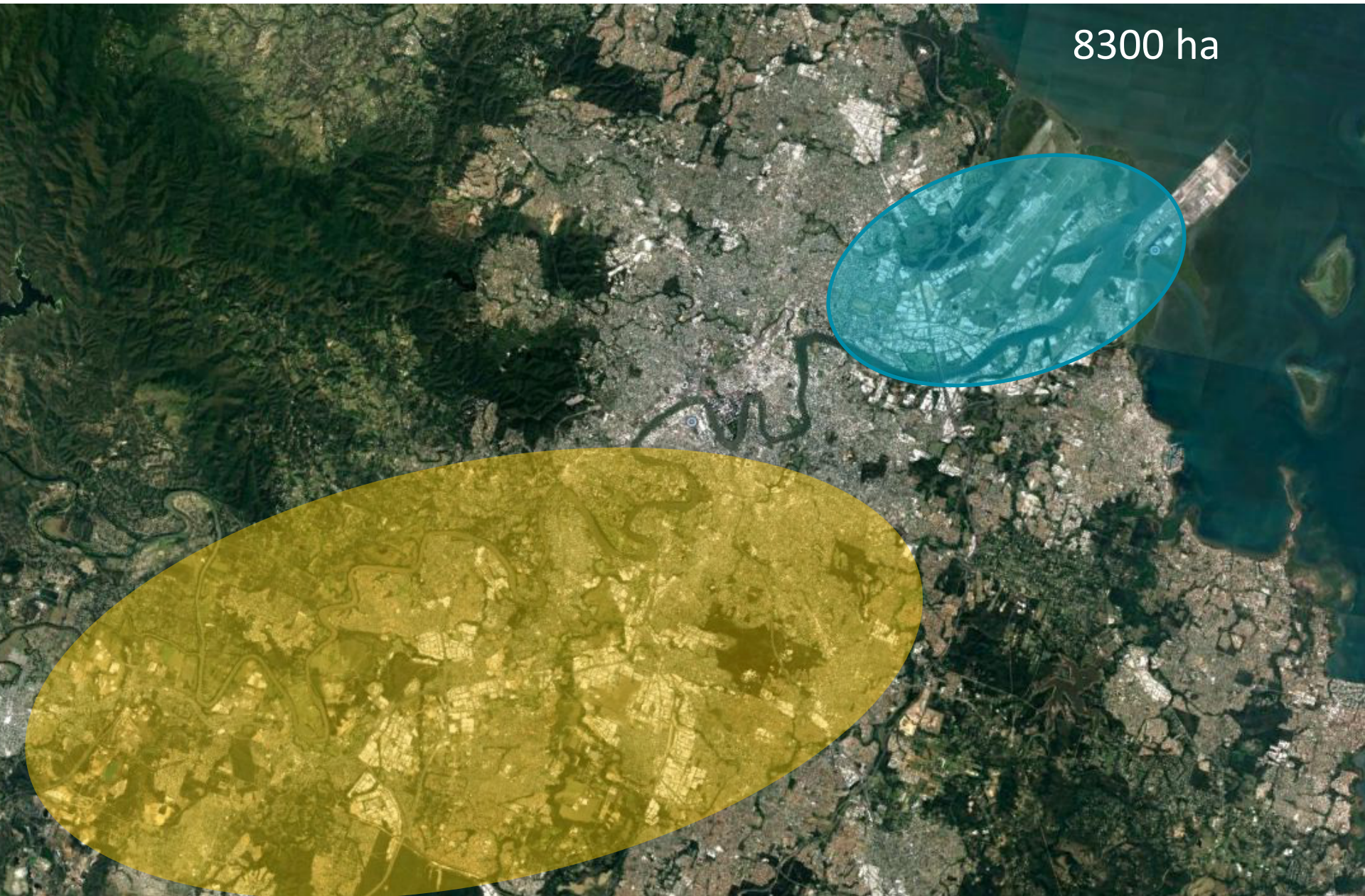
Slightly less than half (n=144) were confirmed successful

Failures = 74 (23%),

Unknown outcome = 98 (31%) of which 92 were ongoing

Success in combined area of 9,500 hectares

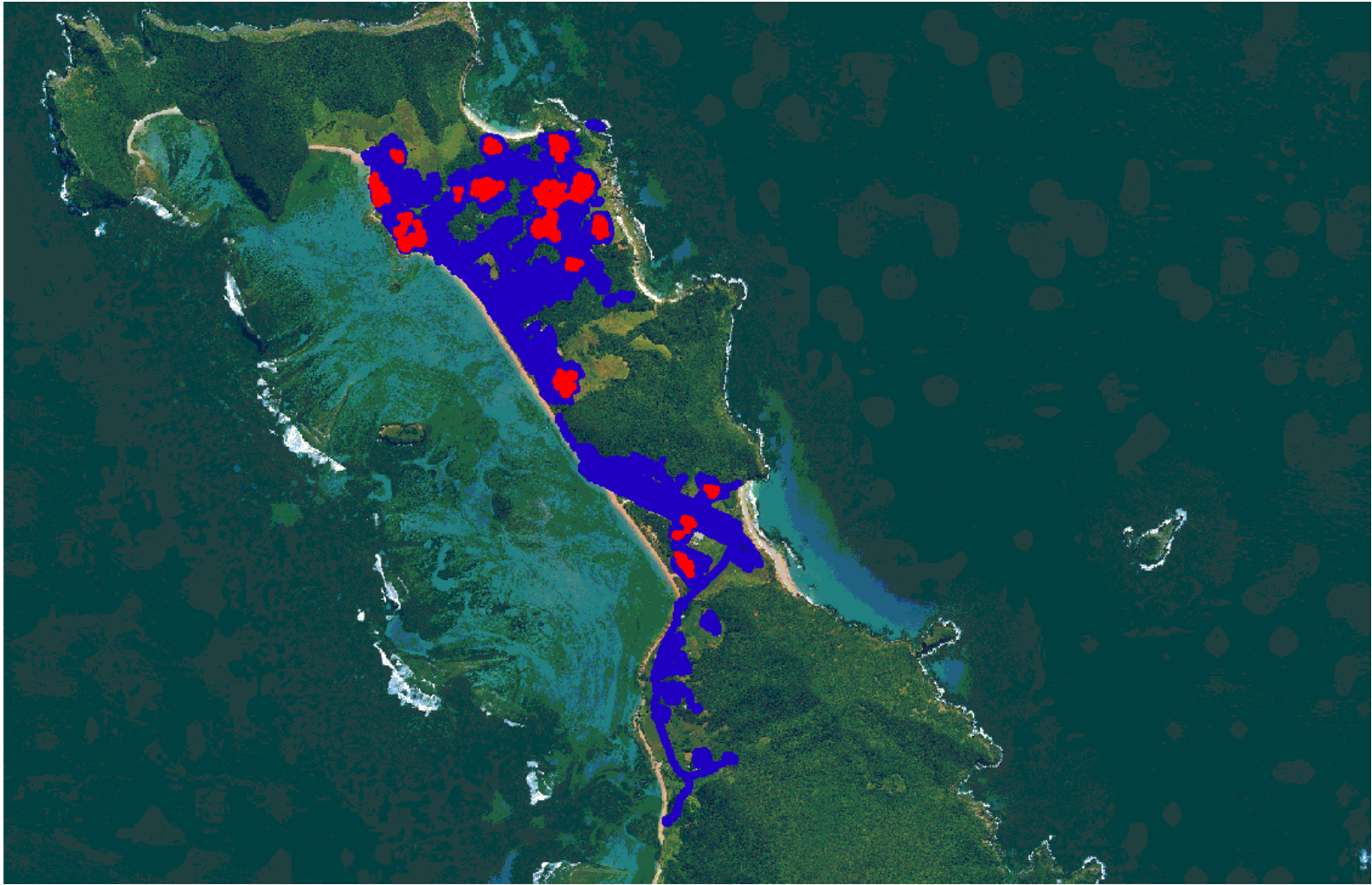
One stand-out eradication



Of 144 ant eradications globally, only 10 have been on islands



African big-headed ant soon to be declared eradicated from Lord Howe Island



Two factors hindering ant eradication

Risk of significant non-target impacts preventing eradication attempts

Inability to effectively conduct large-scale post-treatment assessments

Non-target impacts

Non-target impacts were rarely found

Those present were predictable and managed (eg land crabs)

Conservation outcomes >> non-target impacts

Non-target impacts are a factor limiting the pace and geography of ant eradications.



Need to scale-up post-treatment assessments



Ant detection dogs



Electronic noses and cybernoses

DiagNose



Fox 3000



Cyranose



12 metal oxide sensors

12 conducting
polymers type sensors

Re-scaling of technology



Toxic genetics – a species-specific solution

- RNA interference (RNAi)
(whereby we can interfere with some part of a species' genetics that is critical for life = toxic genetics)
- Examples daughterless offspring
 communication interference
 loss of a critical protein

(potentially the first use of genomics for conservation)

Summary

- Ant invasions (and probably invasions generally) are likely to worsen on islands
- Requirement for eradications are likely to increase, especially on islands
- Innovations are improving our eradication abilities with greatest benefits for island
- Biosecurity should be a greater focus to prevent invasions

Thankyou

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