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A functional biogeography approach

to insular bird communities with mixed-origin species

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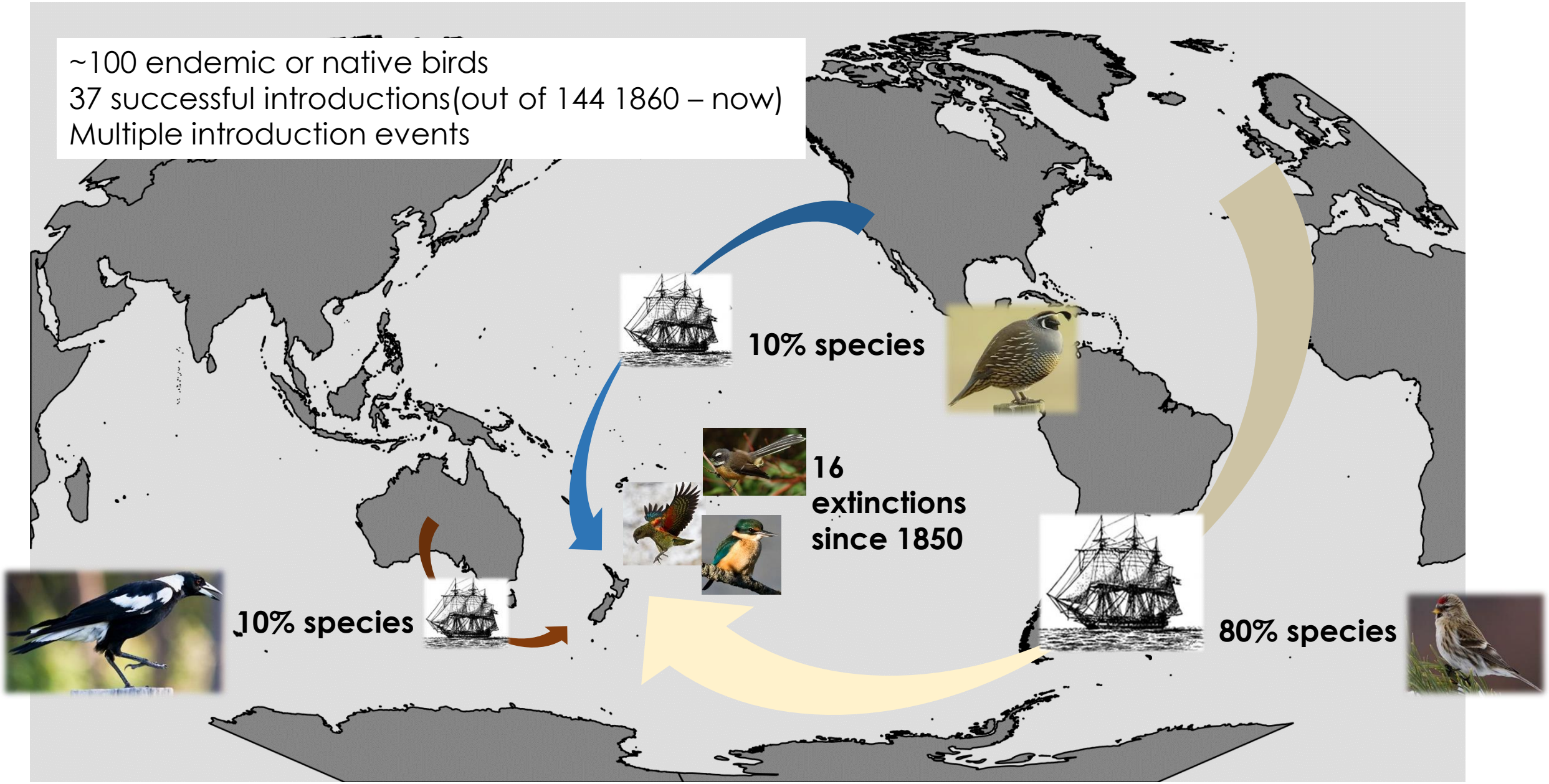

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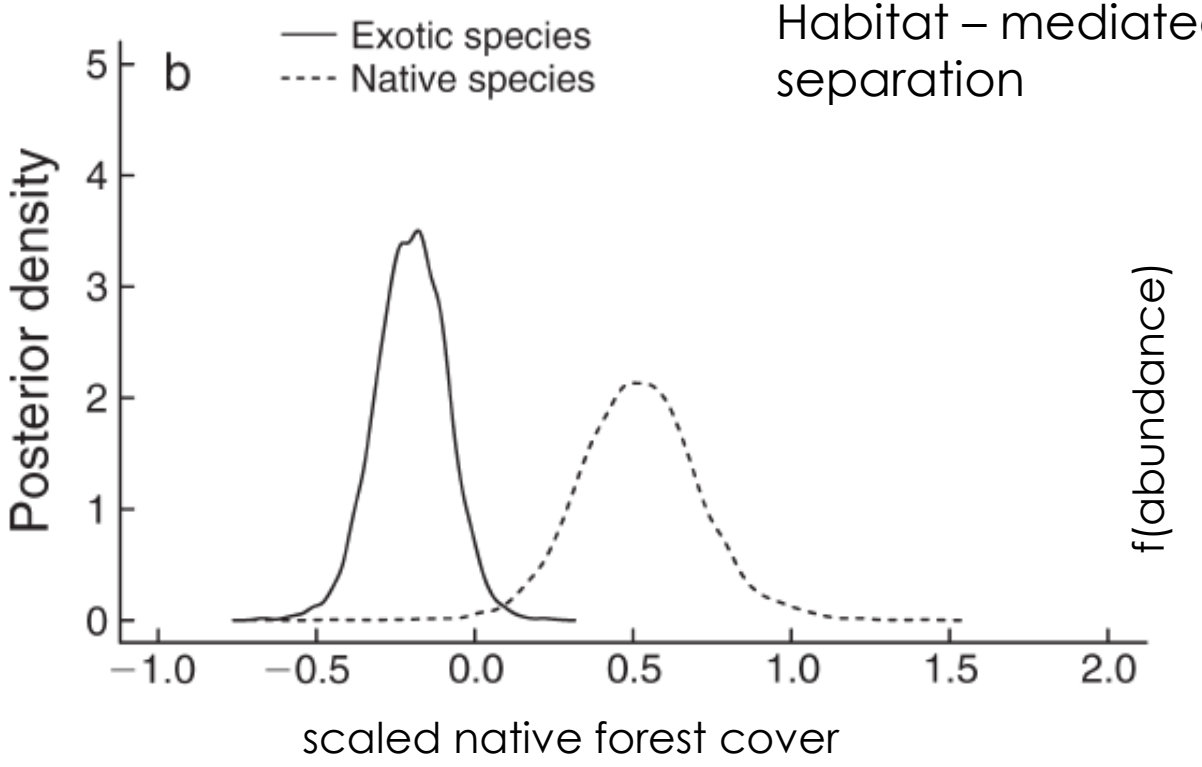
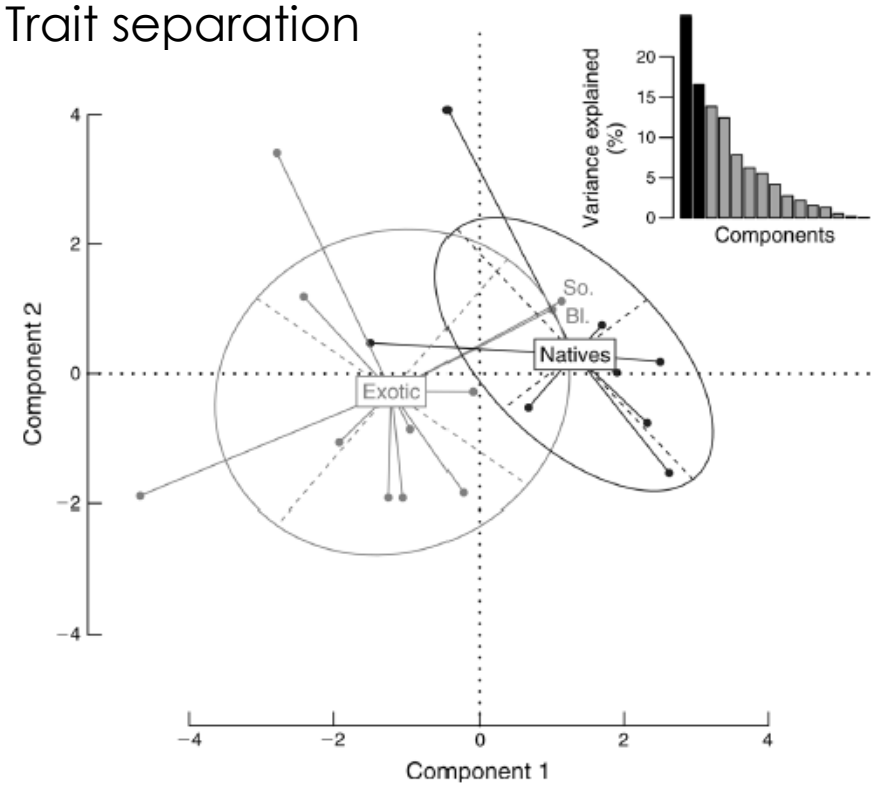
Habitat – mediated separation



Trait separation



Barnagaud et al., Ecology, 2014

Which **species' ecological traits** explain the **habitat-mediated separation** of native and alien species ?

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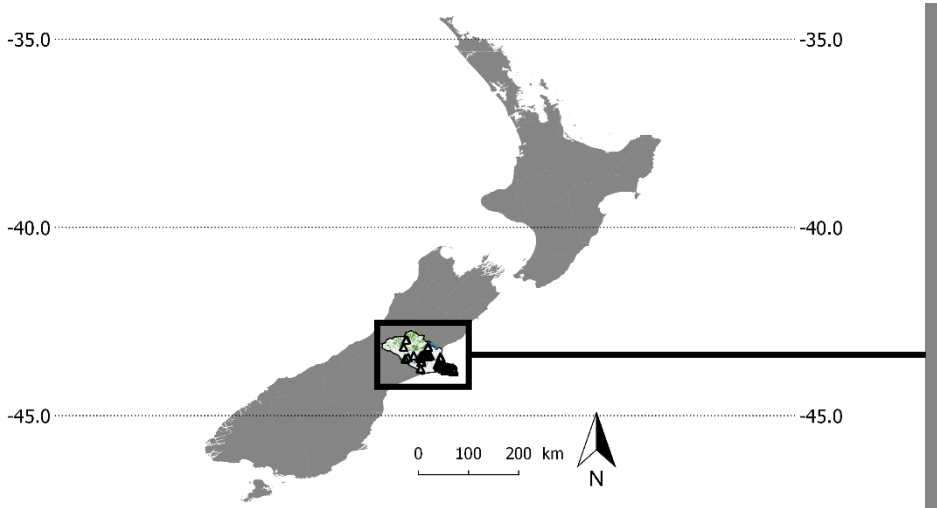

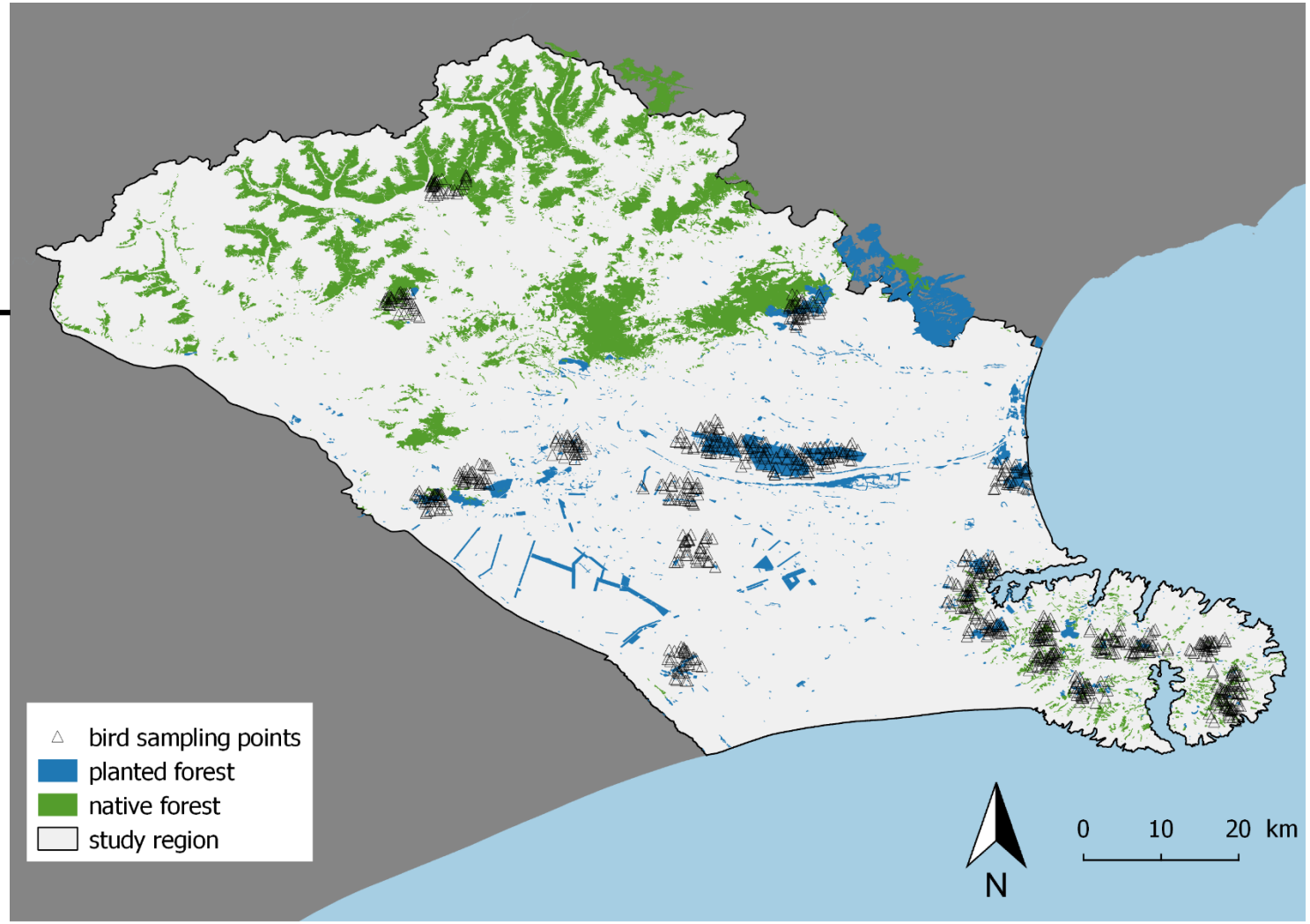

Bird sampling

- 917 point counts
- 7 ± 3 species / point
- Total = 48 species (19 alien, 29 native & endemics)
- Native forest / Planted forest / Open habitats

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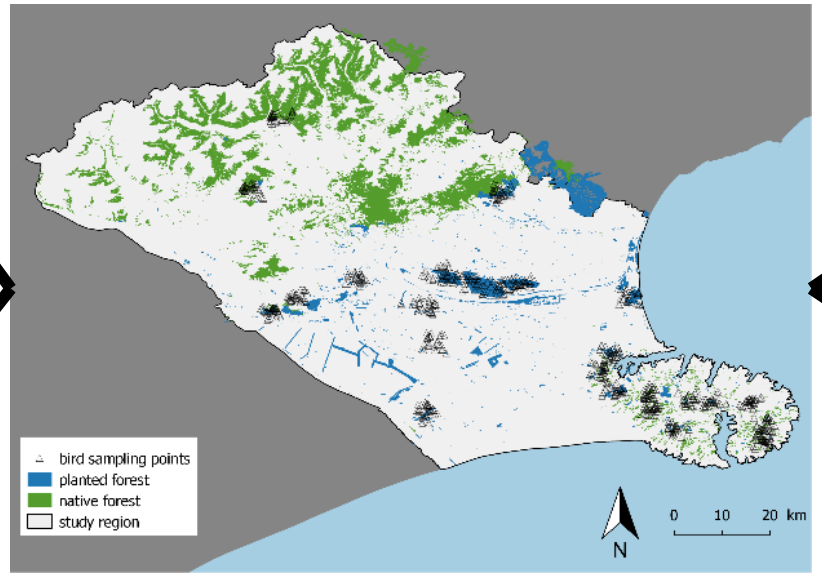
7 habitat variables

bird community matrix



10 ecological traits

A phylogenetic and spatial RLQ analysis : **ordination-based** distribution of **trait syndroms** along **environmental gradients** controlled for evolutionary trait conservatism and spatial autocorrelation

Pavoine et al, J.Ecol. 2011

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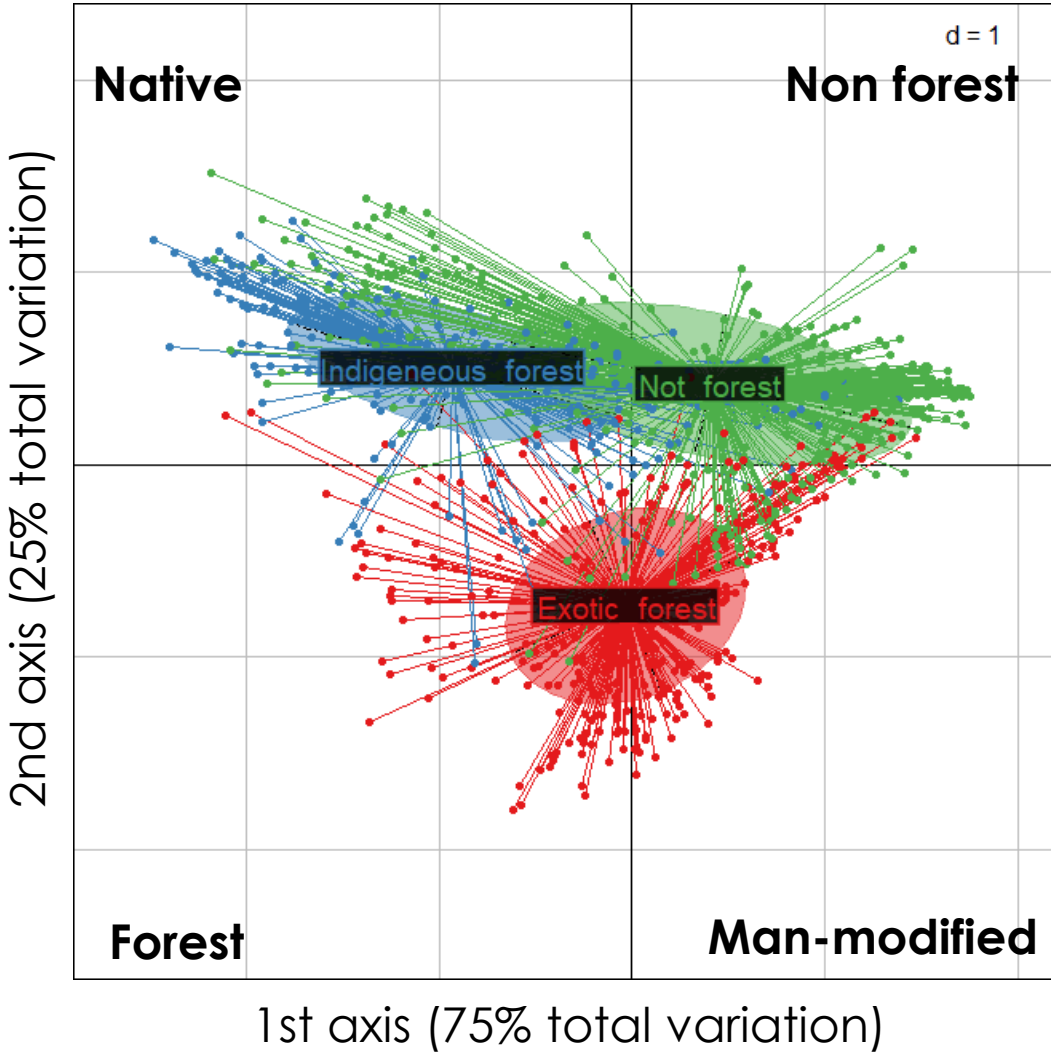
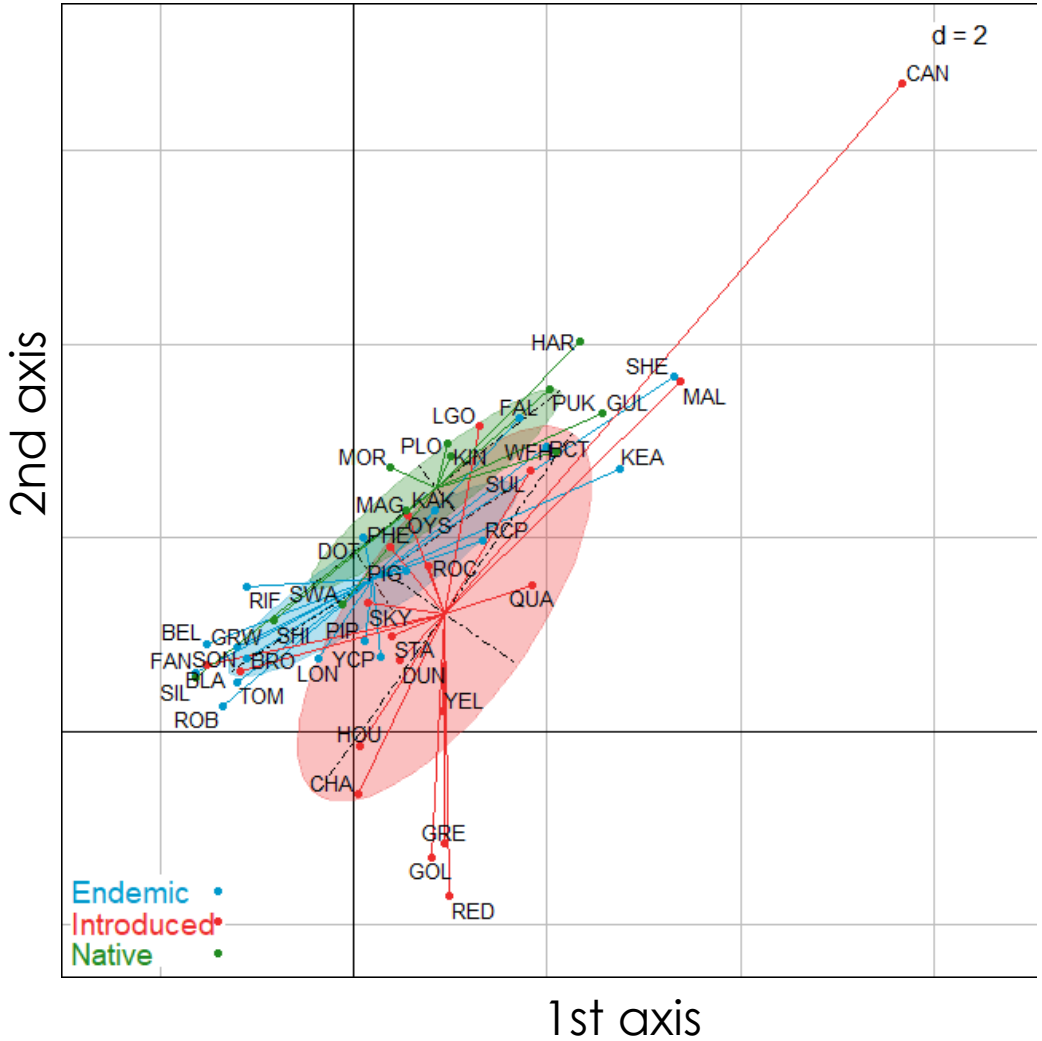
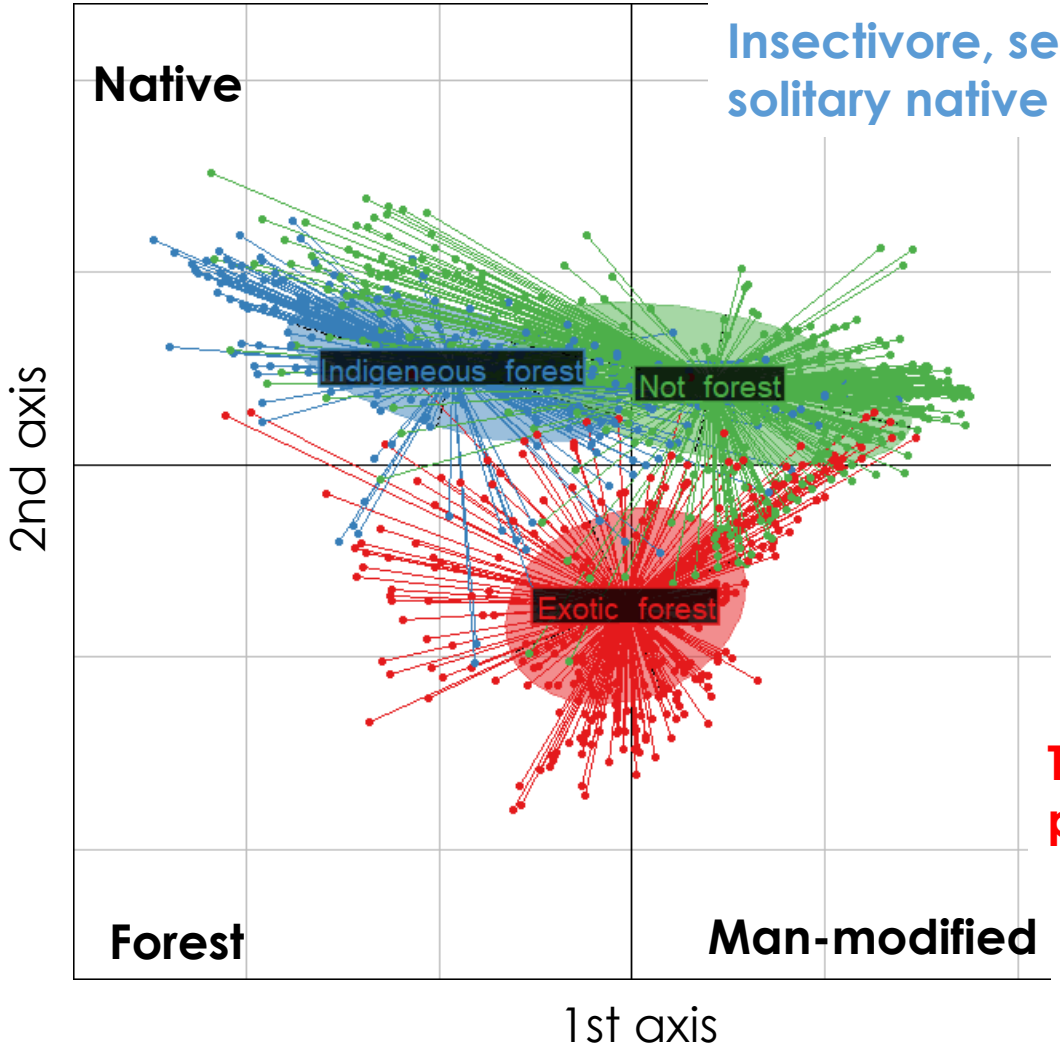


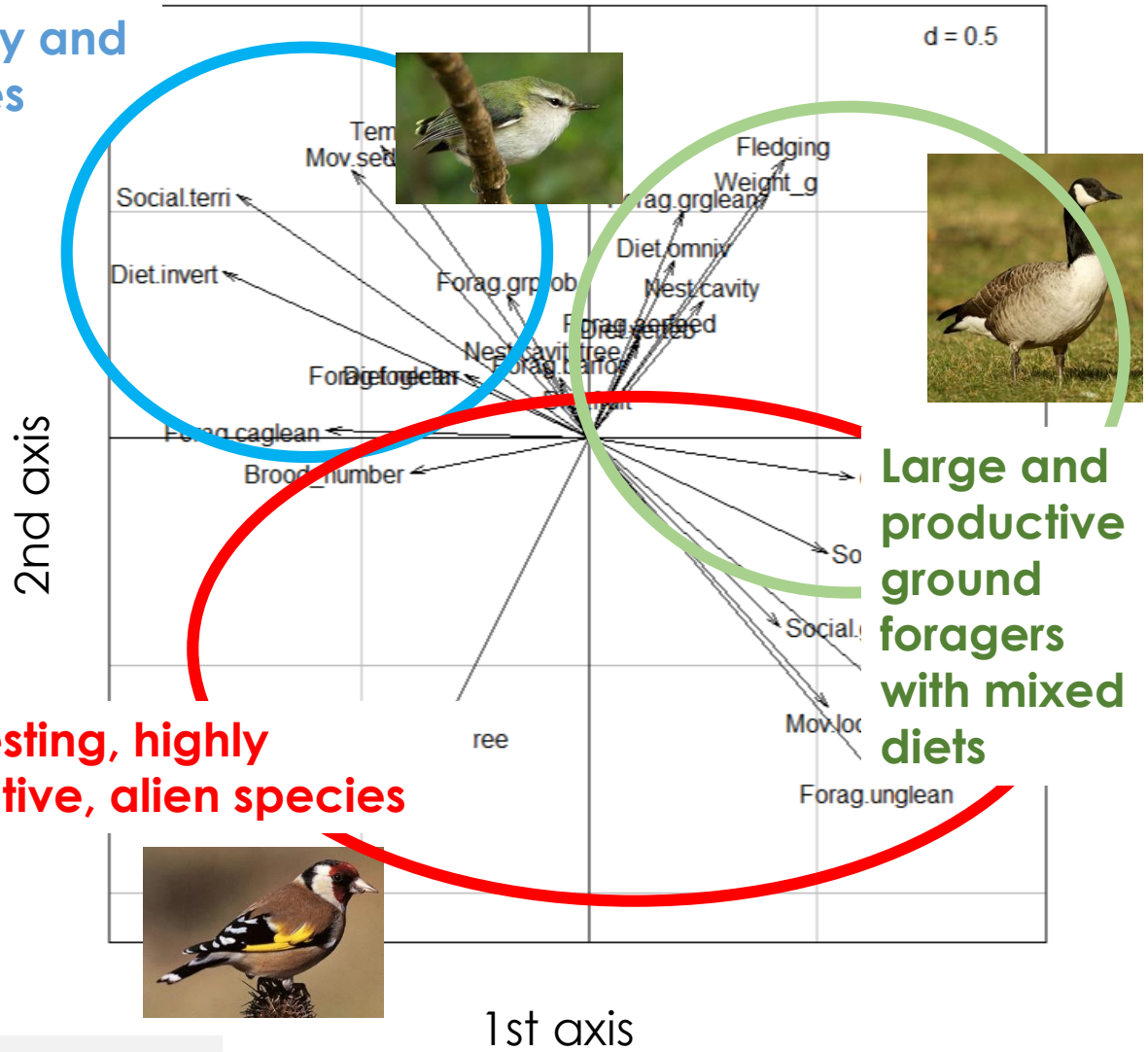


A clear separation of :

- **Ecological traits** associated with **native forest / plantations**
- **Alien** species in **plantations**
- A **mixed** suite of traits and species in **open habitats**



Insectivore, sedentary and solitary native species



Large and productive ground foragers with mixed diets

Tree nesting, highly productive, alien species

Ecological traits account for species' segregation :

- **Small to large** species from forests to open habitats
- **Insectivores to granivores** from native forests to plantations
- **Higher trait diversity** in native and open habitats

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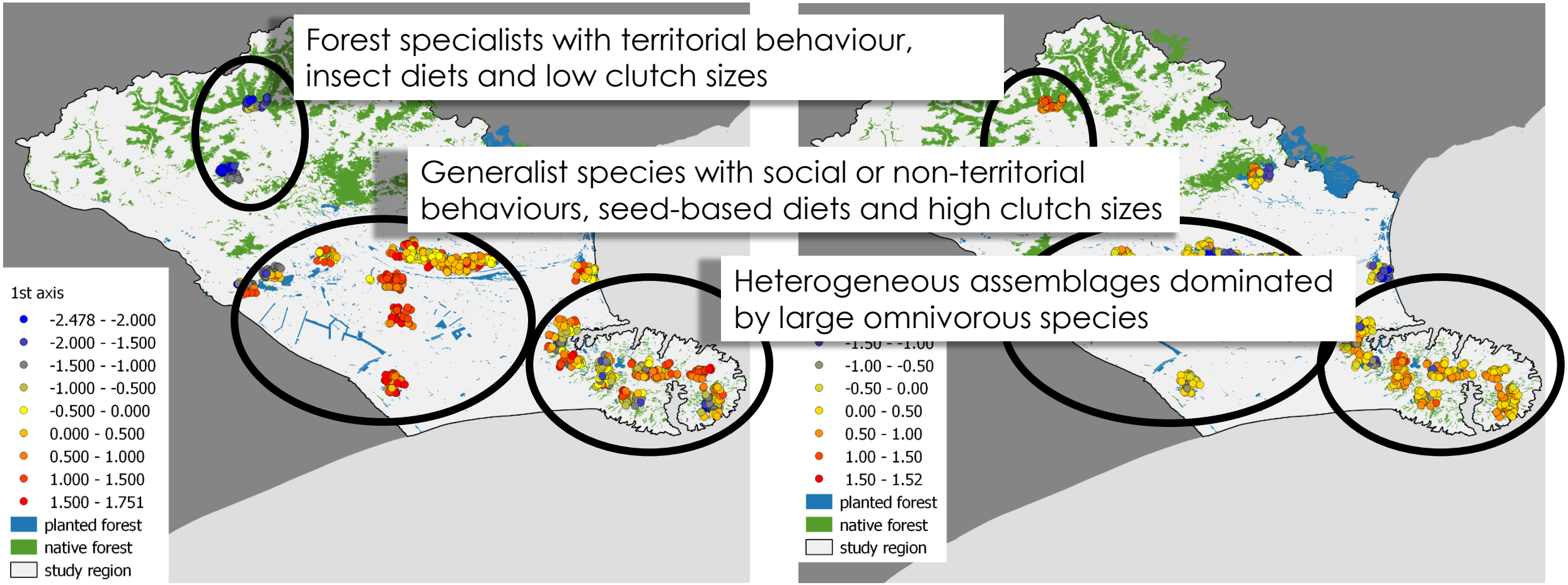

- A north-west – south-east segregation of ecological traits associated with an **altitudinal** and **habitat composition** gradient
- **Local ecological filters** based on traits operate over a **regional scale**

- Fragmented habitats in the Banks peninsula shows a **lower landscape-level filter** but a **strong local segregation** of traits

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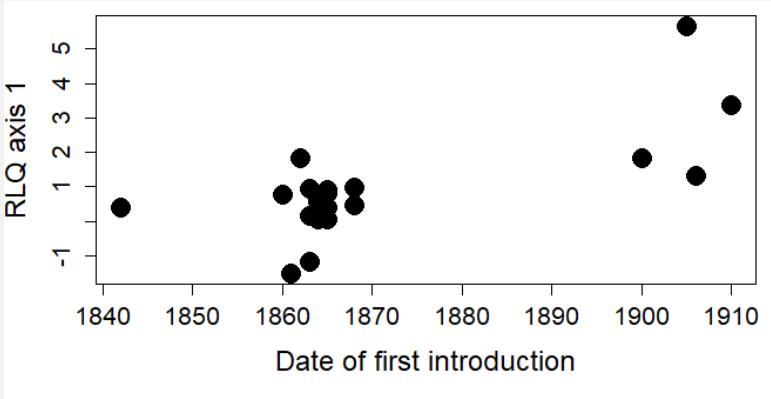
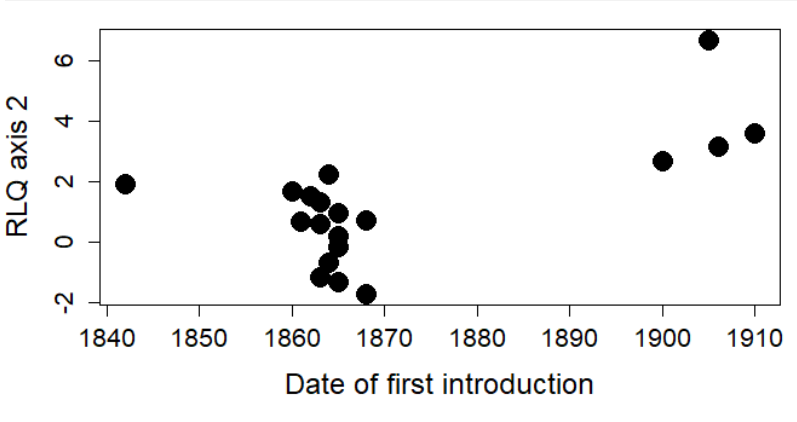
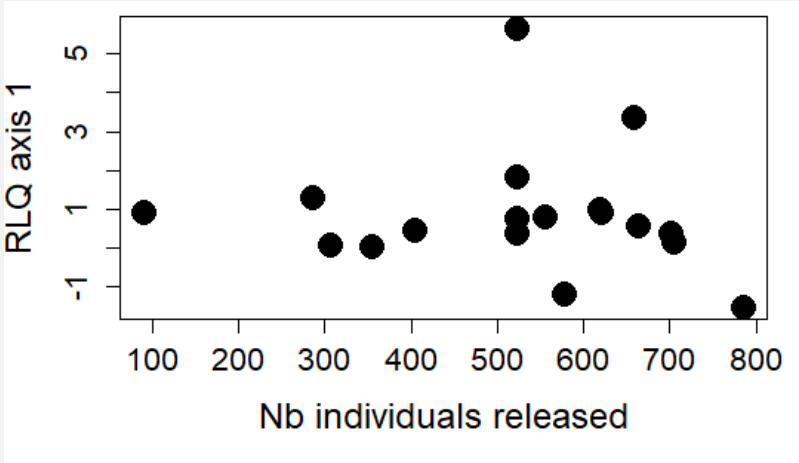
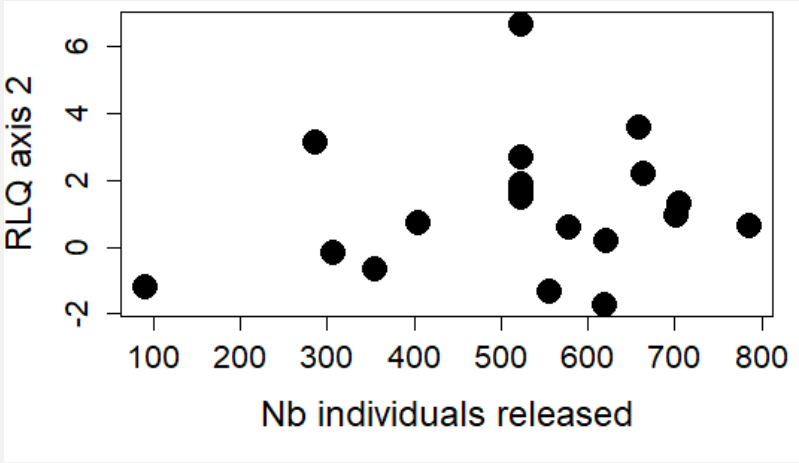
Date of first introduction



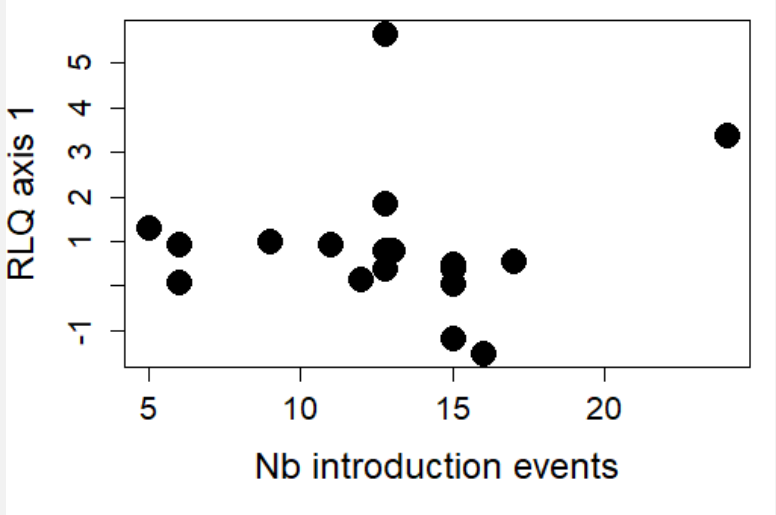


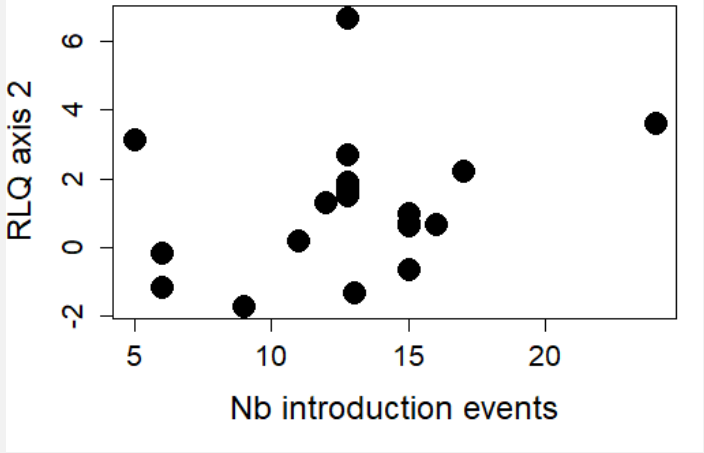
Number of individuals released





Number of introduction events





- The **first introductions** concerned forest granivores
- Late colonization of open habitats
- **Introduction effort** does not explain the distribution of traits in landscapes

Initial introduction events

High stochasticity
Introduction effort
Ability to thrive in novel environments
Competitive exclusion

Successful introductions

Trait-based ecological filters
Use of empty niches by a few aliens
Colonization of man-created habitats

Current segregation of alien and native birds by habitat

Long term settlement?
Evolutionary constraints vs local adaptation / plasticity?
Stability of current trait-habitat associations?

Future assemblages?

1860 ***1930*** ***2010*** ***2100***

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- The segregation of native and alien species in New-Zealand is mediated by **habitat filters** operating on **ecological traits** along forest composition gradients

- **In fragmented landscapes**, alien / native species are not segretated but trait filters still operate at the **local habitat** scale

- In the NZ context, **ecological traits provide a better explanation than introduction history** to the distribution of alien birds across habitats

- These ecological filters plead for a **strict conservation of native habitats** in a land sparing approach

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