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Jean-Yves Barnagaud, Luc Barbaro, Raphael Mossion Mossion, Marc Deconchat, Eckehard G. Brockerhoff

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A functional biogeography approach to insular bird communities with mixed-origin species



Jean-Yves Barnagaud

jean-yves.barnagaud@cefe.cnrs.fr

Raphaël Mossion

Eckehard G. Brocknerhoff

Marc Deconchat

Luc Barbaro



École Pratique
des Hautes Études

PSL



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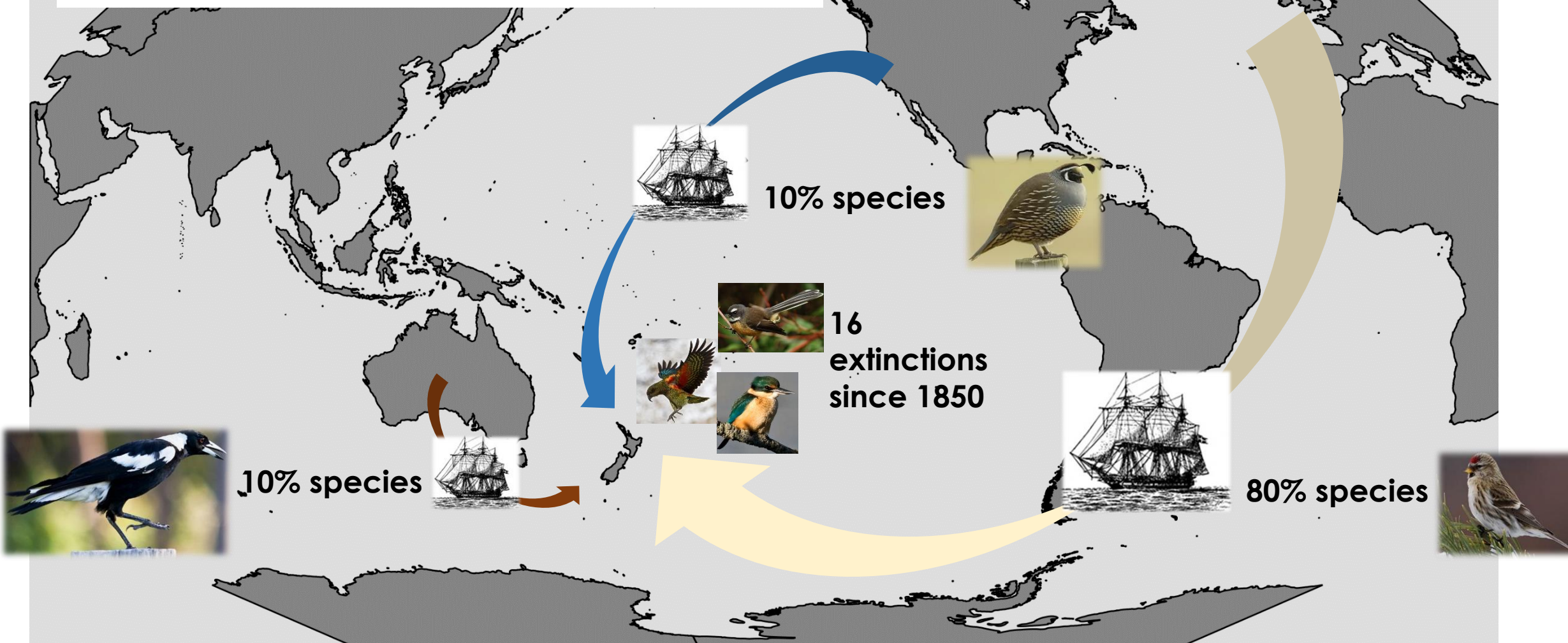
scion
FORESTS = PRODUCTS = INNOVATION

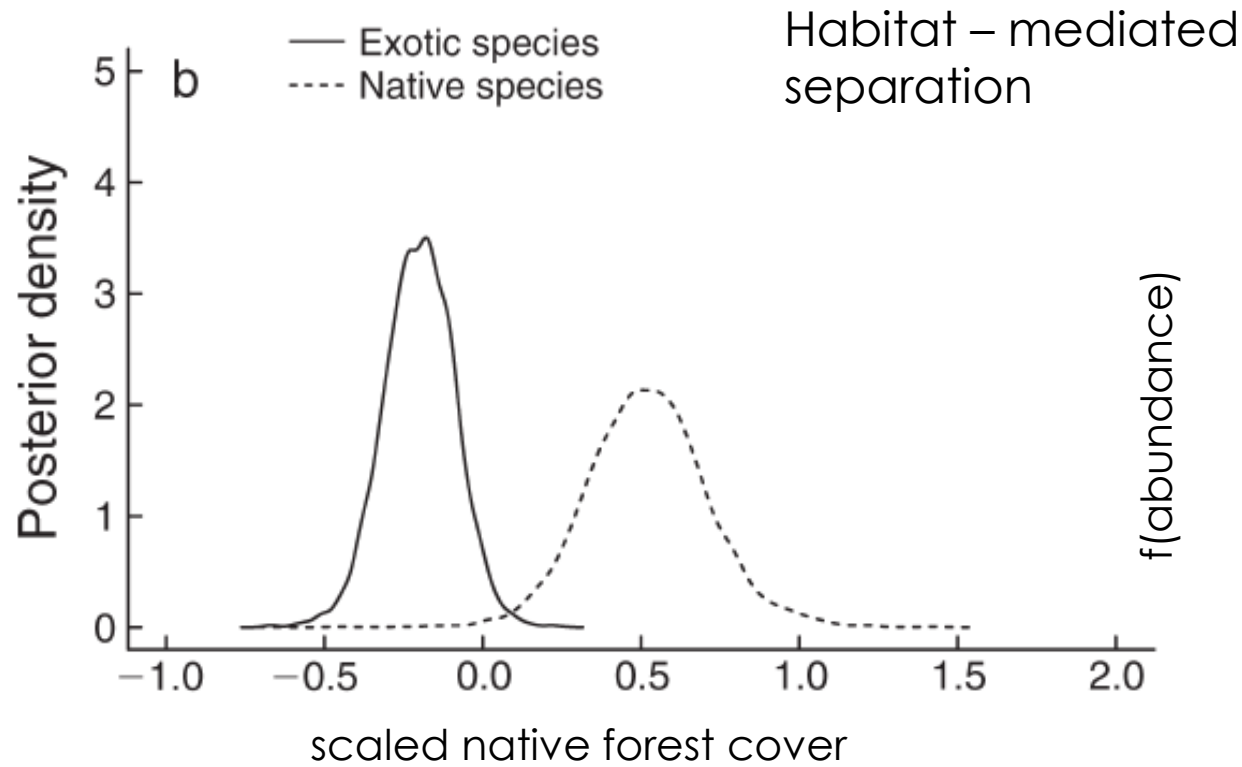


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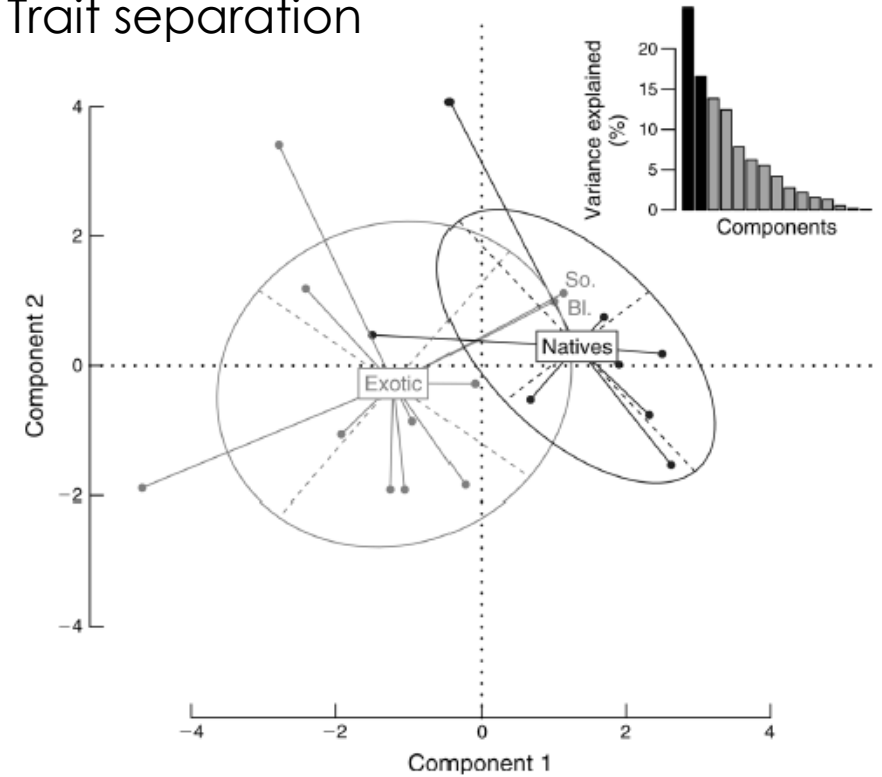
~100 endemic or native birds
37 successful introductions (out of 144 1860 – now)
Multiple introduction events



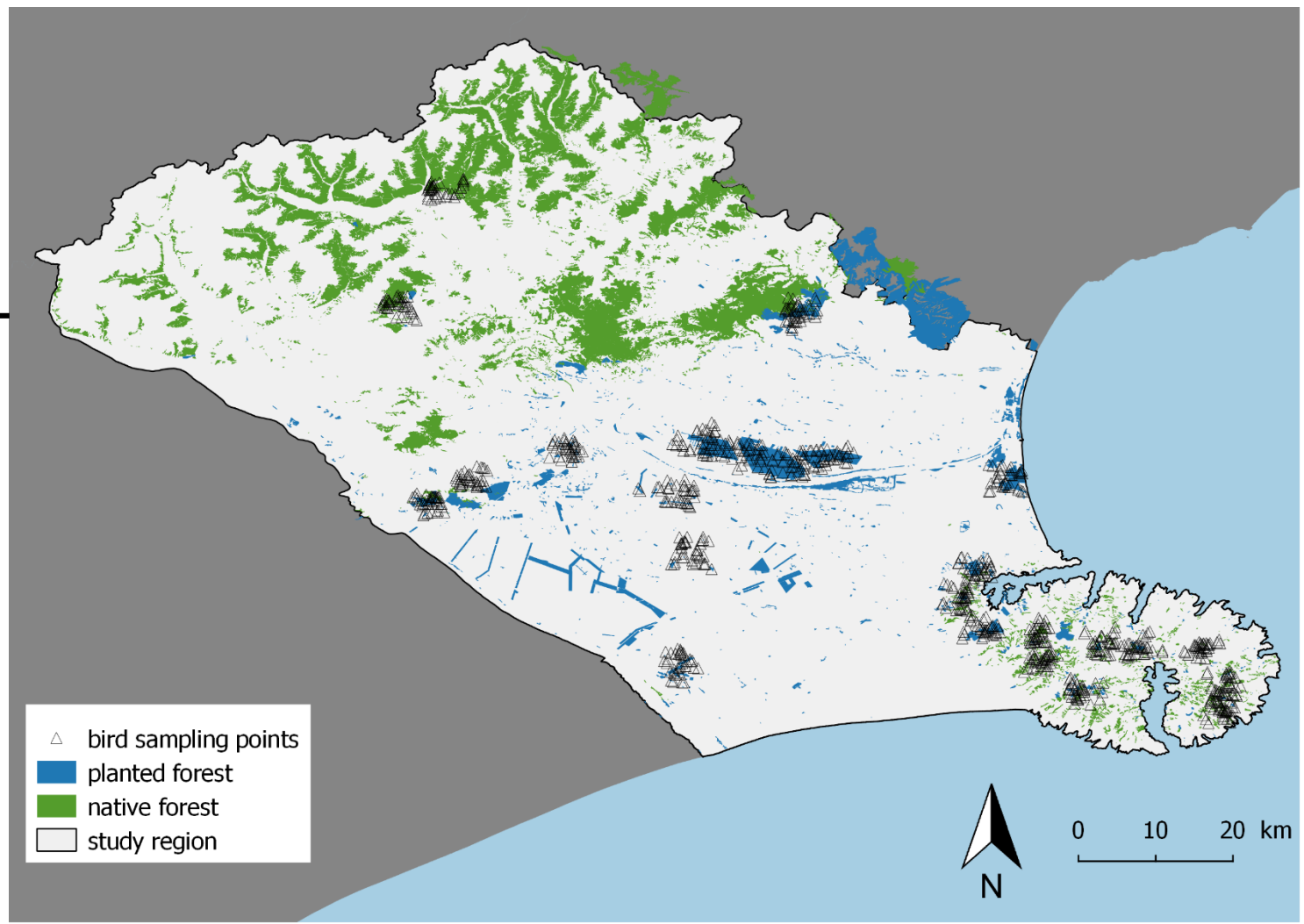
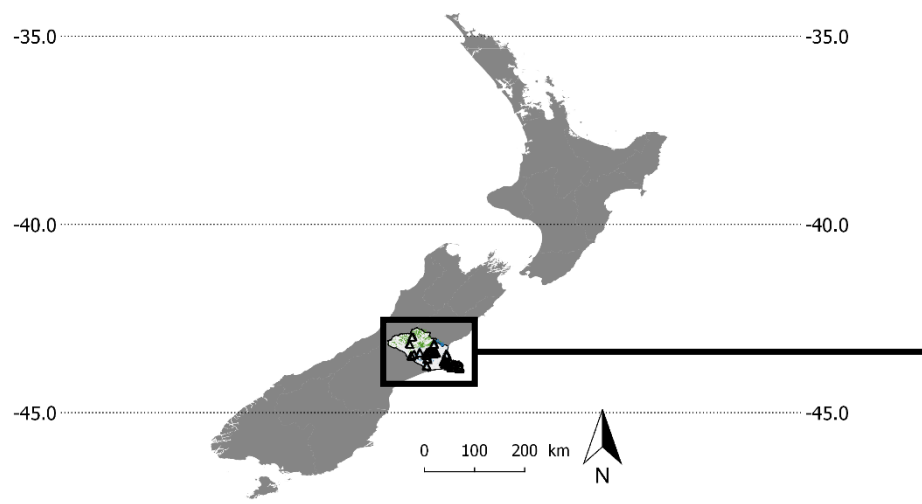


Barnagaud et al., Ecology, 2014

Trait separation



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



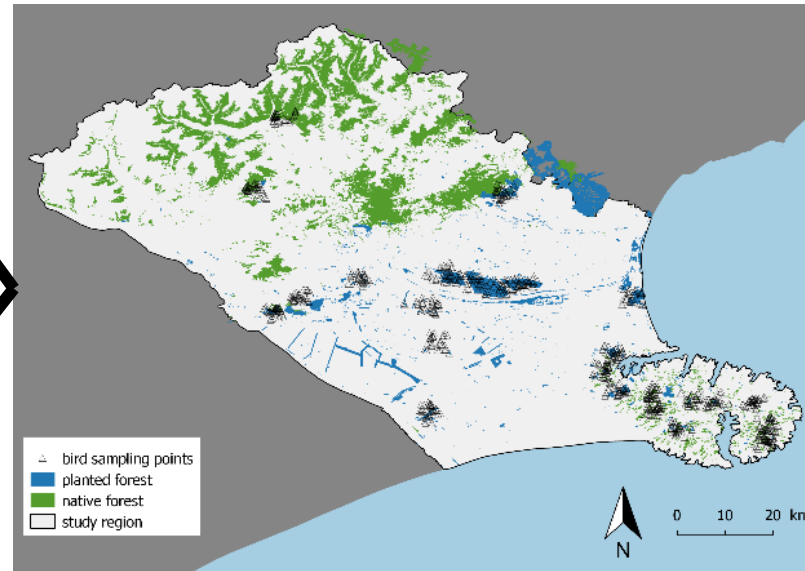
Bird sampling

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

7 habitat variables



bird community matrix

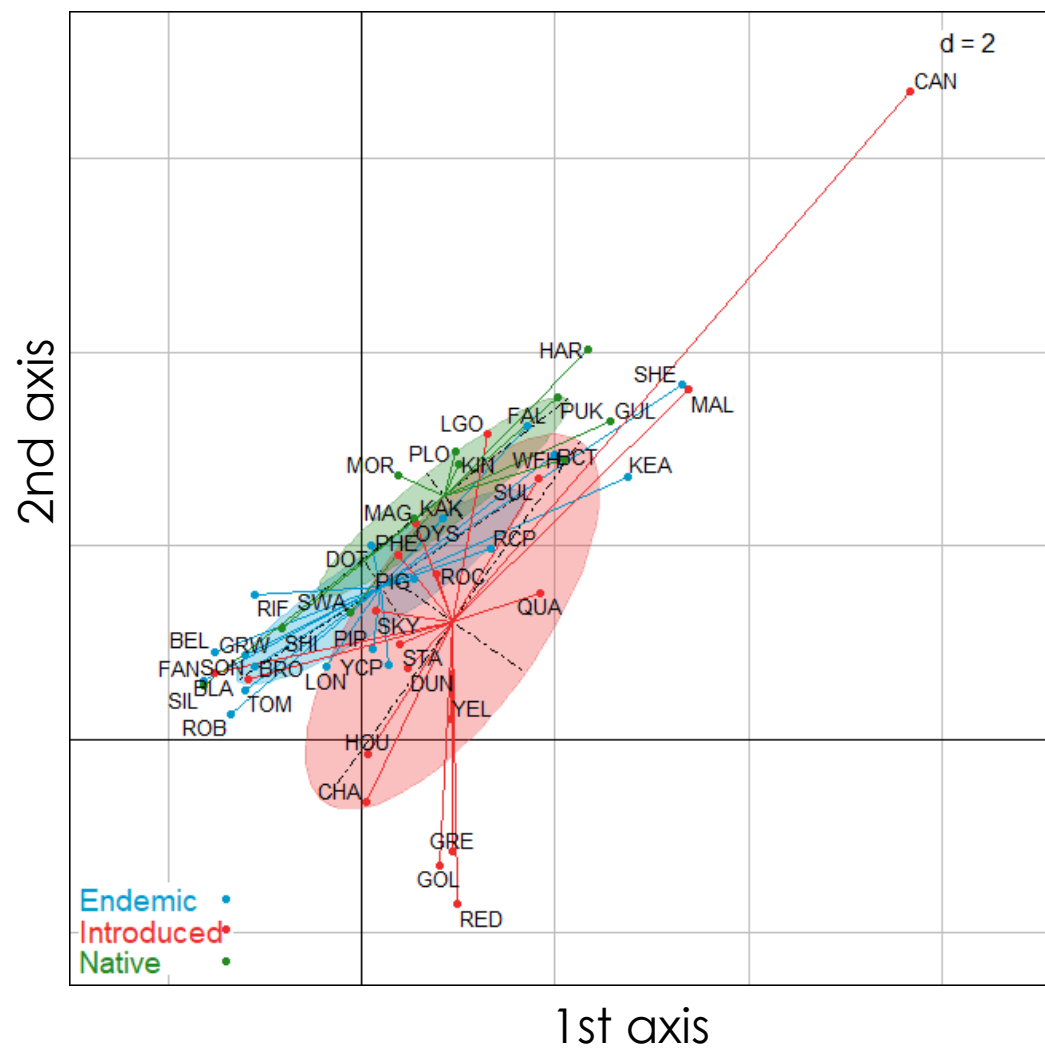
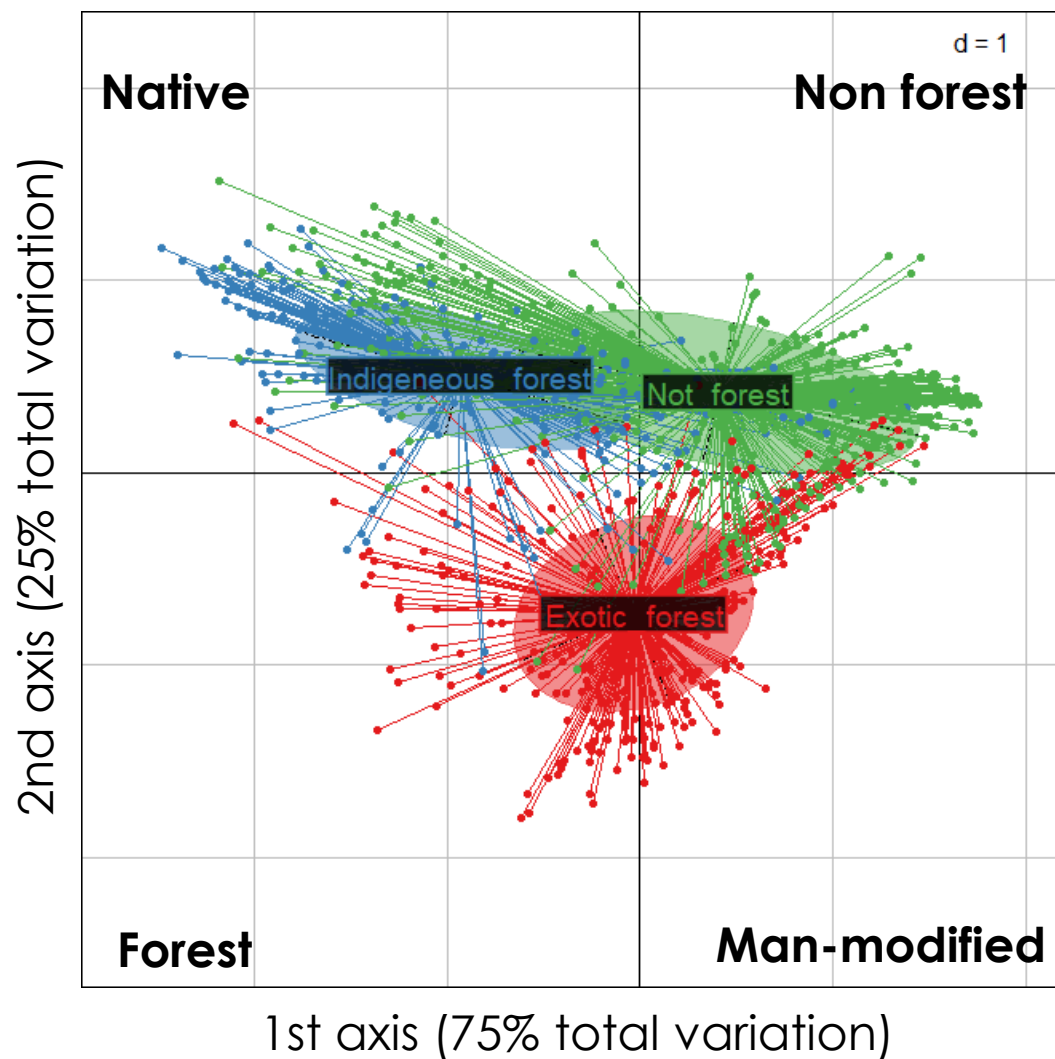


10 ecological traits



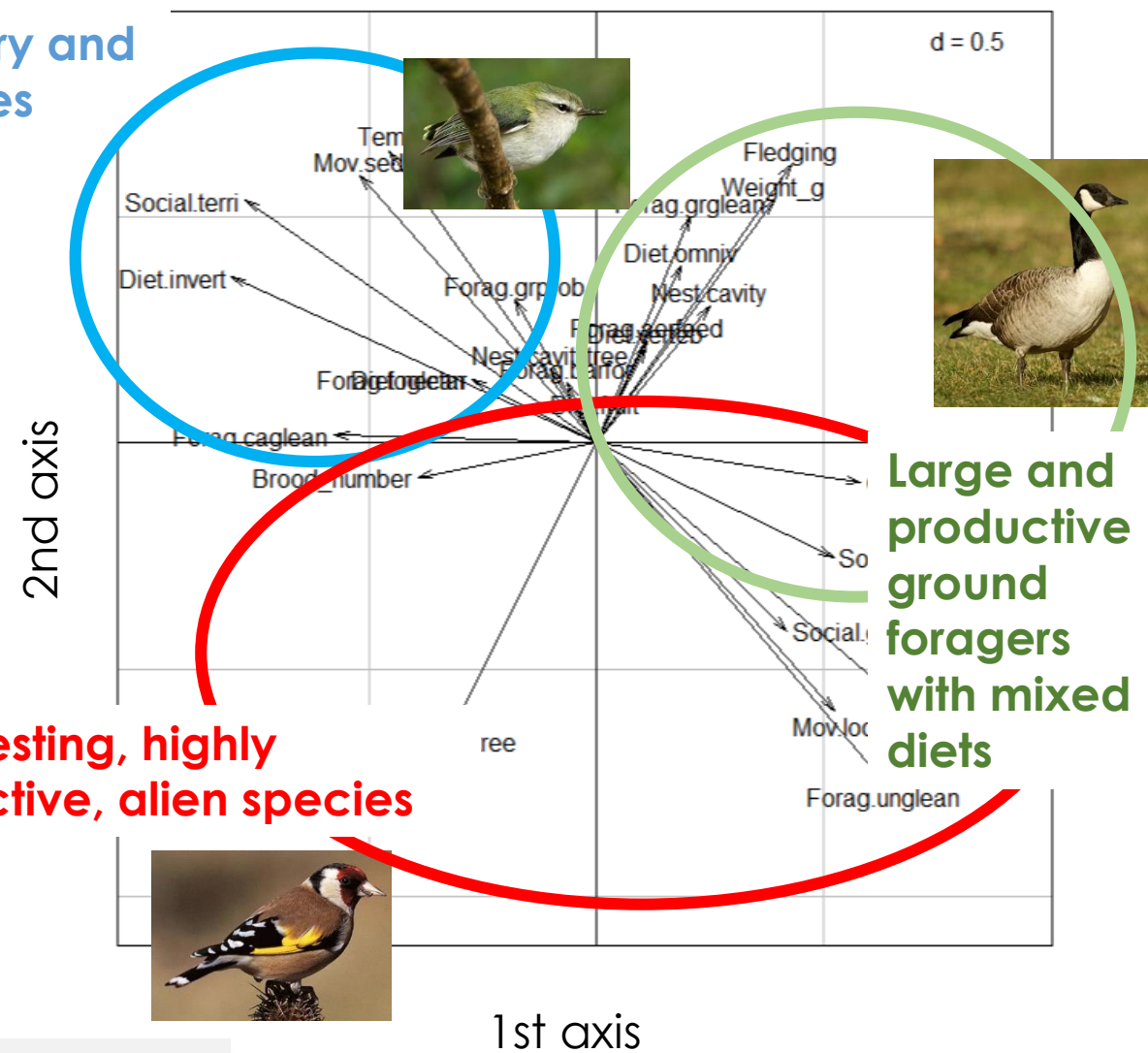
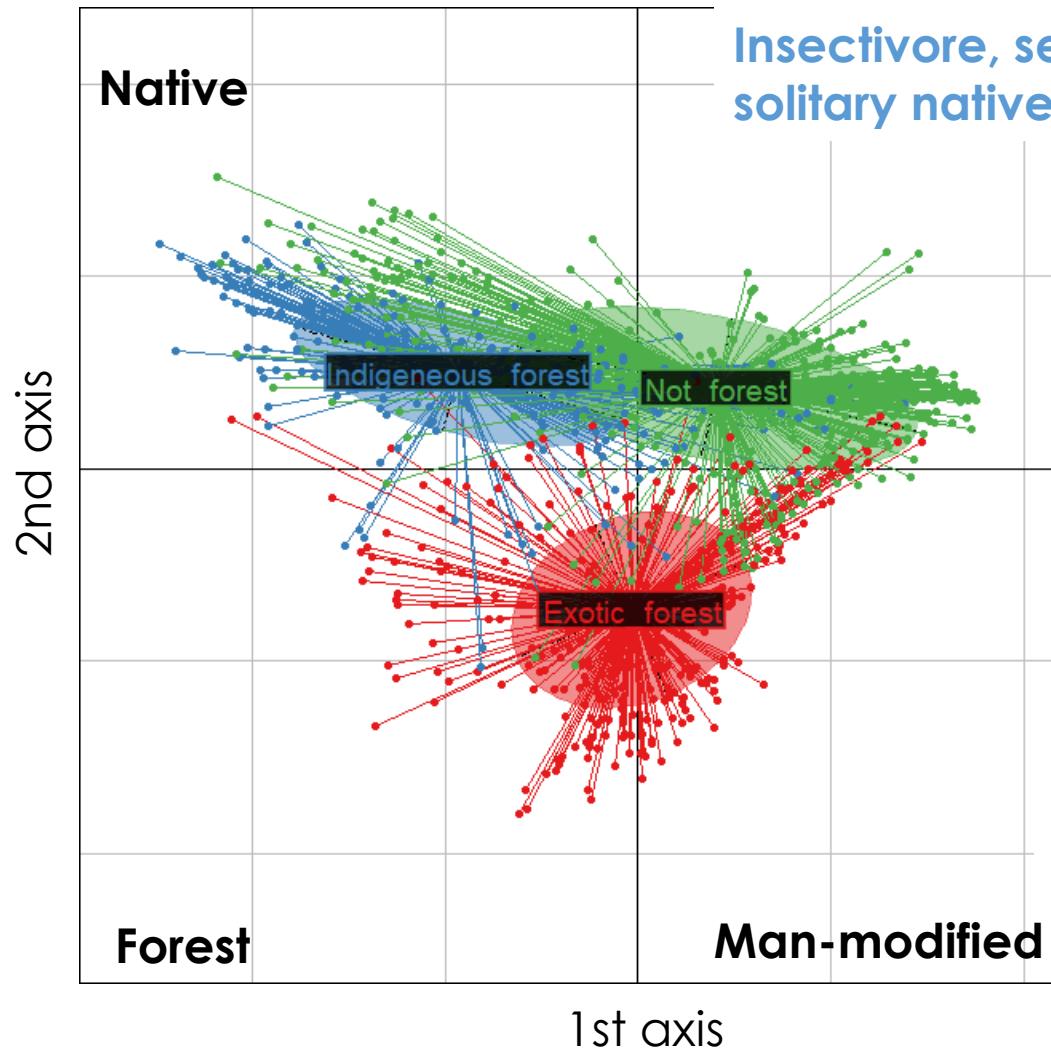
A phylogenetic and spatial RLQ analysis : **ordination-based** distribution of **trait syndromes** along **environmental gradients** controlled for evolutionary trait conservatism and spatial autocorrelation

Pavoine et al, J.Ecol. 2011



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**



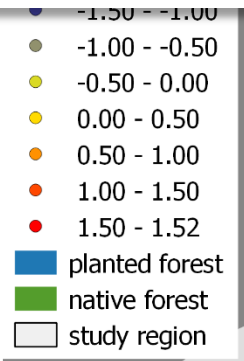
Ecological traits account for species' segregation :

- **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

Forest specialists with territorial behaviour, insect diets and low clutch sizes

Generalist species with social or non-territorial behaviours, seed-based diets and high clutch sizes

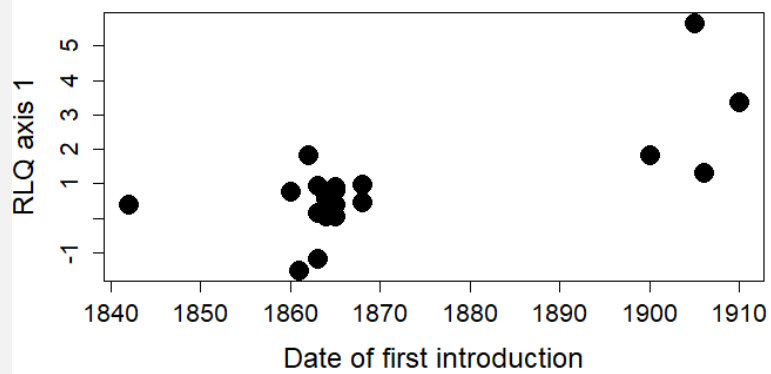
Heterogeneous assemblages dominated by large omnivorous species



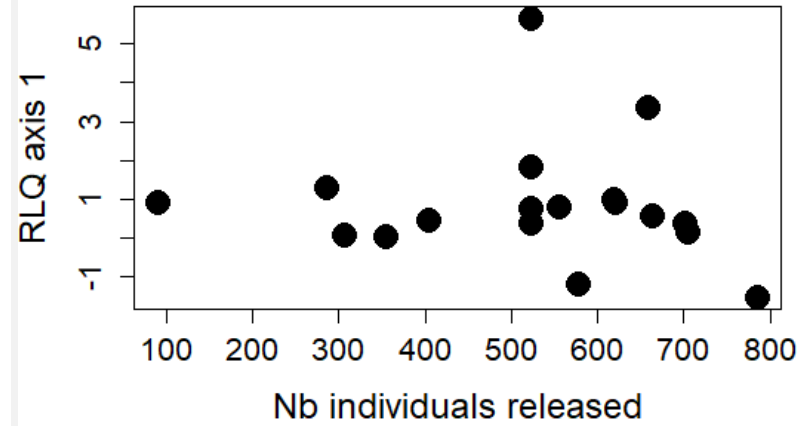
- A north-west – south-east segregation of ecological traits associated with an **altitudinal** and **habitat composition** gradient
- **Local ecological filters** based on traits operate over a **regional scale**

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

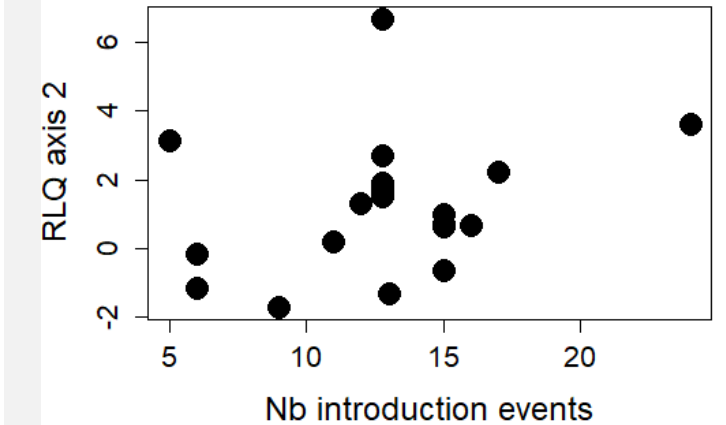
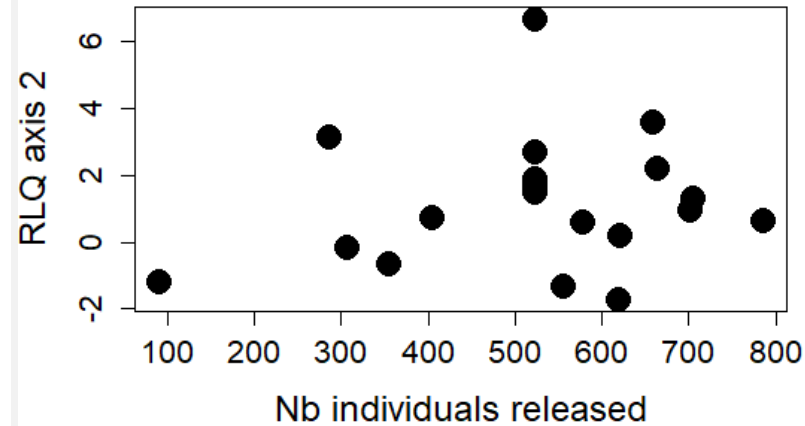
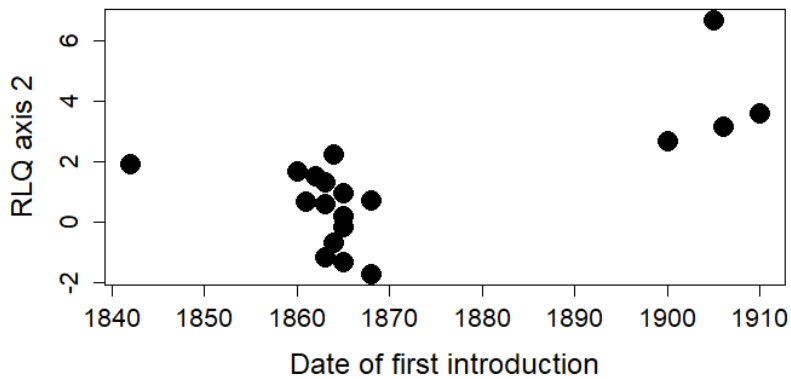
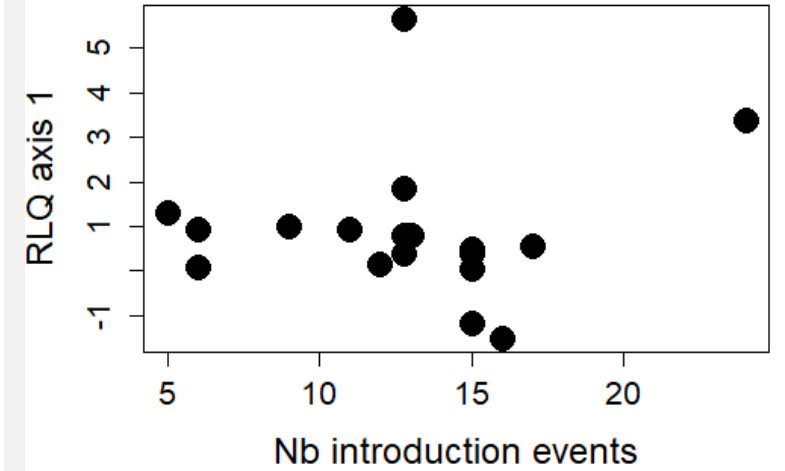
Date of first introduction



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

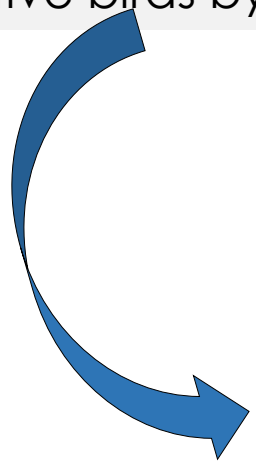


Current segregation of alien and native birds by habitat

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



Future assemblages?



1860 1930

2010

2100

- 
- 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 segregated 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

