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To cite this version:

HAL Id: hal-02734158
https://hal.inrae.fr/hal-02734158
Submitted on 2 Jun 2020

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

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

10% species
16 extinctions since 1850
80% species

10% species

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

Barnagaud et al., Ecology, 2014
Bird sampling

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