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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
Which *species’ ecological traits* explain the *habitat-mediated separation* of native and alien species?
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
1st axis
Forest

2nd axis
Man-modified

Native

2nd axis

Insectivore, sedentary and solitary native 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

Large and productive ground foragers with mixed diets

Tree nesting, highly productive, alien 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
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.