ARPHA Conference Abstracts 9: e201640
doi: 10.3897/aca.9.e201640

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Conference Abstract

Geographic and anthropogenic factors drive distinct trait assembly patterns in native and non-native seed plants on islands

Fabio Mologni[‡], Peter Bellingham[§], Ewen Cameron[|], Franz Essl[‡,¶], Bernd Lenzner[‡], Anthony Wright[#]

‡ University of Vienna, Vienna, Austria
§ Bioeconomy Science Institute, Lincoln, New Zealand
| Auckland Museum, Auckland, New Zealand
¶ Austrian Environment Agency, Vienna, Austria
# Canterbury Museum, Christchurch, New Zealand

Corresponding author: Fabio Mologni (fabio.mologni@gmail.com)

Received: 28 May 2026 | Published: 28 May 2026

Citation: Mologni F, Bellingham P, Cameron E, Essl F, Lenzner B, Wright A (2026) Geographic and anthropogenic factors drive distinct trait assembly patterns in native and non-native seed plants on islands. ARPHA Conference Abstracts 9: e201640. https://doi.org/10.3897/aca.9.e201640

Abstract

Islands harbor disproportionate biodiversity yet suffer most global extinctions. Thus, it is critical to understand how geography, human influence, and conservation shape plant trait assembly on islands. We analyzed over 1,000 native and non-native seed plant species across 264 islands off northern Aotearoa New Zealand. We tested how dispersal-persistence trade-offs manifest by investigating the covariation of plant height and seed mass, and how they differ between native and non-native plant species. We combined trait-coordination (standardized major axis) and probabilistic niche approaches and related slope and strength (R^2) of allometry, trait-space volume, and niche overlap to island attributes (i.e., area, isolation, exposure to ocean-borne disturbances, proximity to urban areas, and conservation status). Across all species, height and seed mass were positively correlated, but slopes differed between groups (likelihood ratio = 22.29, $p < 0.001$). Native species showed a steeper allometry than non-natives. Distributions of plant height (K–S D = 0.375, $p < 0.001$) and seed mass (D = 0.110, $p = 0.011$) also differed, with non-natives being shorter with larger seeds. Native species occupied a larger trait space than non-natives (Volume = 14.54 vs 7.94

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regionally; 11.52 vs 3.27 by island). Non-native niches were largely nested within native ones (regional overlap: 95.3%; by island: 93.7%), with a weaker reverse pattern (81.4% regionally; 57.2% by island). Geographic and anthropogenic attributes explained variation in allometry and niche metrics, but differently for natives and non-natives. Natives were largely unaffected by island attributes, except for the strength of the allometric relationships, which declined with area, increased with isolation, and was higher con protected islands. Conversely, non-natives were strongly affected by island attributes. Area positively affected both the slope and strength of the non-native allometric relationship. Distance from urban areas negatively influenced the strength of the allometry and niche space volume. While isolation was non-significant, exposure negatively affected most parameters (slope, R2, and niche volume). The native niche overlap (i.e., their occupancy of non-native trait space) also declined with exposure and distance from urban areas, likely indicating non-native niche contraction. Together, these findings indicate that island plant communities are structured by coordinated trait trade-offs, with non-native species community assembly being primarily regulated by exposure to ocean-borne disturbances.

Keywords

Biological Invasions, Island Biogeography, Seed Plant Species, Functional Biogeography, Aotearoa New Zealand

Presenting author

Fabio Mologni

Presented at

Neobiota 2026, the 14th International Conference on Biological Invasions

Conflicts of interest