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# Niches and neutrality on a tropical oceanic island: explaining diversity and turnover in moth assemblages in island rainforests

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## Abstract

Spatially driven turnover in species composition and relative abundance drives gamma diversity in all ecosystems. Assemblages of nocturnal Lepidoptera in rainforests are powerful tools for estimating and understanding this heterogeneity. There are three fundamental theoretical hypotheses for explaining this place-to-place change: neutral stochasticity, niche-driven opportunity and historical contingency. These mechanisms may act in concert and, in any case, are not necessarily independent of each other. At two seasons in 2018 we sampled moths across a set of ten sites in the mid-elevation rainforests of eastern Réunion. A total of 6115 individuals of about 280 species was processed. We analysed these against distance and pre-existing data on the woody flora of the same sites. Unique for these data sets, we were able to subdivide the species encountered into local and regional endemics, and non-endemics. The outcomes are complex but, in summary, local occurrence of the generally more diet-restricted endemic moths is more likely to be niche-driven due to evolved host-plant preferences while occurrence of the generally more polyphagous non-endemic species is most parsimoniously explained by stochastic neutral mechanisms. Spatial pattern in the underlying native flora may also occur as stochastic neutrally assembled sets across the rainforest region (with implications for native moth species) whereas introduced species reflect human-driven historical contingency. Implications of future changes will be discussed.

**Keywords:** Mascarenes, moths, Lepidoptera, Réunion, species turnover, woody plants

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