
A trait-based approach to assess functional responses of epiphytic liverworts to environmental gradients

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Abstract

Assessing species responses to changes in their environment and the effect of biotic interactions in shaping communities, are important steps in understanding ecosystem functioning. A trait-based approach assessing community diversity might be as important as, and/or more meaningful than other community ecology approaches. The aim of this study is to use trait-based approach to assess the relationship between bryophyte species functional diversity and community assembly. We evaluate how bryophyte species functionally interact with their abiotic and biotic environments and how habitat filtering and niche differentiation influence bryophyte assemblages along an elevational gradient. This study was carried out in Marojejy National Park, northern Madagascar. Epiphytic liverworts were collected along an elevational gradient, at 200 m intervals from 250 m to 2050 m (BRYOLAT methodology). Twelve morphological traits potentially related to resource use, life history, species defence, resistance to desiccation and photosynthetic activity are studied. Our results provide evidence that assemblage of epiphytic liverwort community is driven by climatic conditions and vegetation structure, affecting the occurrence of species among and within communities. Liverwort's morphological traits tend to shift from convergent to divergent with an increasing elevation. Higher temperature and taller vegetation appear to have driven a strong functional convergence of size related traits at lower elevations but have allowed for divergence in these at higher elevation. Habitat filtering and niche differentiation along the same transect both explained observed species abundance in communities. Whilst habitat filtering is associated with trait convergence and is strongest at lower elevations, niche differentiation associated with trait divergence occurs at higher elevations and is higher at the most species-rich sites. Other physiological traits related to features such as, photosynthetic capacity and carbon fixation need to be considered in the future to better understand relationships between species composition and ecosystem processes. Environmental filtering and niche differentiation jointly determine species occurrence and distribution within communities. Such result in understanding functional traits diversity of bryophyte assemblages is important notably in the evaluation of Malagasy tropical forest ecosystems state as a basis for conservation planning.

Keywords: Liverworts, Madagascar, Marojejy National Park, Morphological traits, Rainforest

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