High species richness turnover of vascular epiphytes is associated with water availability along the elevation gradient of Volcán Maderas, Nicaragua

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Abstract

Research that has been conducted documenting species richness patterns on tropical mountains has resulted in conflicting observations: monotonic declines with increasing elevation, monotonic increase with increasing elevation, and a mid-elevation 'bulge.' Currently, it is unclear if these differences are due to environmental differences associated with the various study areas, the taxonomic groups or ecological groups (e.g., growth form) sampled, or the scale of the study area along an elevation gradient. Because of the difficulty in sampling and identifying canopy-dwelling plants, the number of inventories quantifying tropical epiphytes is relatively limited and recent. In this study, we provide a detailed qualitative and quantitative assessment of the vascular epiphyte flora and its spatial distribution on Volcán Maderas, Isla de Ometepe, Nicaragua, including weather and environmental measurements along the entire elevation gradient of the volcano. We sampled epiphytes in five distinct forest types associated with increasing elevation as follows: dry forest, humid forest, wet forest, cloud forest, and elfin forest Five weather stations were placed along the elevation gradient for us to relate observed patterns to environmental conditions. A hump-shaped species richness pattern was detected for all vascular epiphytes at approximately 1000 m in elevation (cloud forest), yet species abundance increased with increasing elevation. In total we obtained 206 unique species identifications of vascular epiphytes belonging to 26 families and 73 genera. The most species-rich family was the Orchidaceae with 55 species for the entire elevation gradient, followed by Bromeliaceae (29 species), Araceae (23), Polypodiaceae (25), Dryopteridaceae (16), and Piperaceae (11), with all other families respresented by fewer than 10 species each. We found that richness patterns differ phylogenetically within epiphytes, possibly due to different adaptive strategies, and species for the most part appear to be narrowly distributed within specific habitat zones along the elevation gradient.

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