Temporal patterns of plant endemism in world islands

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Abstract

A key feature of islands is their high level of endemism. In plants, more than 70,000 species are endemic to islands. Endemism is both relevant for biodiversity conservation and to understand how biodiversity has been shaped. Yet endemism has mostly been studied at the species level and some important features of endemism may have been missed. Especially current approaches do not inform about the age of endemic species. This topic has been widely discussed for more than a century as it may reveal the diversification process at the origin of endemic species. In this context a distinction should be made between neo-endemism, which shed light on areas where are confined recently diverged species, and paleo-endemism, which reflects areas of range-restricted and ancient taxa. Here we took advantage of the recent development of dated phylogenies to measure phylogenetic endemism in world islands. We then used null models to identify centers of endemism and whether they belonged to the neo, paleo or mixed endemism categories (areas neither dominated by paleo or neo endemism). We focused on Monocotyledons in 4,306 islands across the world. We then explored, thanks to Boosted Regression Trees and multi-model selection, how geographic, bioclimatic and historic factors may have shaped temporal patterns of endemism. We observed that centers of endemism, a majority of them being mixed endemism islands, were found at a higher concentration in the southern hemisphere. Abiotic variables driving temporal patterns of endemism varied with the category of endemism. Nonetheless we found that high elevation, high number of ecosystems, low latitude, low wind speed may have highly contributed to shape centers of endemism. This study thus provides new insights on patterns of insular diversity and its formation. Besides, estimating relative endemism age may guide conservation through the identification of potential museums orcradles of biodiversity.

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