
Past and current landscape heterogeneity drives functional structure of plant and bird assemblages

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Abstract

Landscape heterogeneity, characterized by habitat composition and configuration in space, is a major driver of biodiversity. It indeed affects species movement and dispersal, driving species coexistence. Responses may be dependent over time depending on the species ability to persist and propagate after landscape modifications.

This study aims to determine the effects of the current and past landscape heterogeneity on two contrasted groups: plants and birds. We used a functional approach to understand the mechanisms underlying the responses of these organisms to landscape heterogeneity. We recorded landscape heterogeneity for three dates (2000, 1985, 1963) and assemblages of plants (hedgerows and grasslands) and birds in 20 landscape plots of 1km². We characterized the functional diversity and aggregated trait values using a set of functional traits related to dispersion, phenology and life strategy. We used null models to quantify the functional convergence or divergence for each trait and tested then for the effect of landscape composition and configuration on the non-random responses.

For both groups, we detected non-random functional diversity due to changes in species occurrence. Plant and bird assemblages responded rather to the past landscape than the current one, demonstrating a delay in their functional response. Functional diversity in plants generally increased with decreasing heterogeneity of landscape configuration (higher mean area). A high heterogeneity of configuration favored hedgerow species with a short flowering durations and seed persistence and heavy seeds. Landscapes characterized by high percentage of grassland favored grassland species with late flowering and high clonal reproduction. Birds with low a brood number and a long life span were favored by an increase in heterogeneity of configuration.

This study offers interesting patterns in two contrasted biological groups and a new understanding on the mechanisms underlying the effects landscape changes on biodiversity.

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