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Patterns of floristic diversity in forest openings of the Trascău Mountains (Southeastern Carpathians)

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Forest openings (clearings) are particular ecological settings harbouring various plant species groups, i.e. grassland, forest, and edge species. In the low-elevated regions of the Southeastern Carpathians, patches of grassy vegetation enclosed within woodlands have been maintained by an extensive grazing regime, which has been exerted once trees have been artificially cleared. Since these openings are rich in species and display high floristical turnover, we considered them as appropriate models to test the behaviour of various diversity measures proposed in the literature. Our sampling was conducted in 40 openings of different sizes, ranging between 15 and 50 m in width, and using transects with four 1-m² plots. We measured canopy openness using hemispherical photos (for each 1-m² plot), heat load index, altitude, and recorded tree litter cover and bedrock type. Species richness at 1 m² was modelled as a function of these variables using generalized linear mixed models (GLMMs). β -diversity, as calculated with five distinct measures, was modelled against the means and ranges of the variables along each transect, using multiple linear regressions. Species richness at 1 m² was explained mostly by canopy openness and tree litter cover. The additive and multiplicative measures of β -diversity behaved differently when it came to their relationships with the predictors, as the first was explained by canopy openness range and the second by altitude. The multiplicative β -diversity was similar to the Sørensen-based multiple-site dissimilarity. Neither β -diversity expressed by the slope of distance decay nor Simpson-based multiple-site dissimilarity did have significant relationships with the variables. Our discussion is based on possible ecological explanations for these contrasting relationships, while taking into account also the mathematical constraints of the diversity measures used. We articulate the necessity of simultaneously considering multiple diversity measures when seeking underlying causes of variation in community structure.

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