

Relationship between fine-scale functional and coenological patterns in grasslands in Hungary

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Background & Aims: Connection between biodiversity and functioning in ecosystems is one of the most important questions in ecology. We are interested in a special aspect of this topic: the reliability of ecosystems. An ecosystem can provide ecosystem services (e.g. biomass production, CO₂ emission etc.) properly if its functioning is constant or rather predictable, i.e. the variation of its functional attributes remains within given range despite of the fluctuations of environmental variables.

The aim of this study was to characterize fine-scale vegetation structure and functional organization in various grasslands and to evaluate their relationships in the context of ecosystem reliability. According to our hypothesis, the highest functional reliability is expected in spatially well-organized plant communities with high structural complexity at fine scale.

Material & Methods: In our comparative study, we used a standard sampling protocol for detecting parallel the fine-scale patterns of structural and functional attributes of grassland vegetation. The cover of plant species was estimated in 10 cm and 15 cm diameter circles at 75 positions (at every 20 cm) arranged along 15 m circular transects. We also took biomass samples and measured soil respiration, soil temperature and soil moisture from the same positions. Fine-scale spatial patterns of species were sampled by recording the presence of rooting plant species in contiguous 5×5 cm and 10×10 cm microquadrats. Vegetation structure was evaluated by information theory models while functional patterns were analyzed by geostatistics. We used the spatial and temporal variation (CV%) of functional attributes (e.g. soil respiration) for indicating the degree of ecosystem reliability. For comparing different degree of community organizations at wide range of ecological conditions, open sand grasslands, steppe meadows on sand and loess, wet meadows and regenerating grasslands on abandoned agricultural fields were sampled in Hungary (more than 70 transects at 11 sites distributed across the country).

Main results & Interpretations: Lower CV% of soil respiration appeared in communities with higher structural diversity (higher maximum compositional diversity). This preliminary result supports our hypothesis that community level functioning is better regulated in communities with higher structural complexity and spatial organization. From practical point of view, these communities provide more reliable ecosystem services

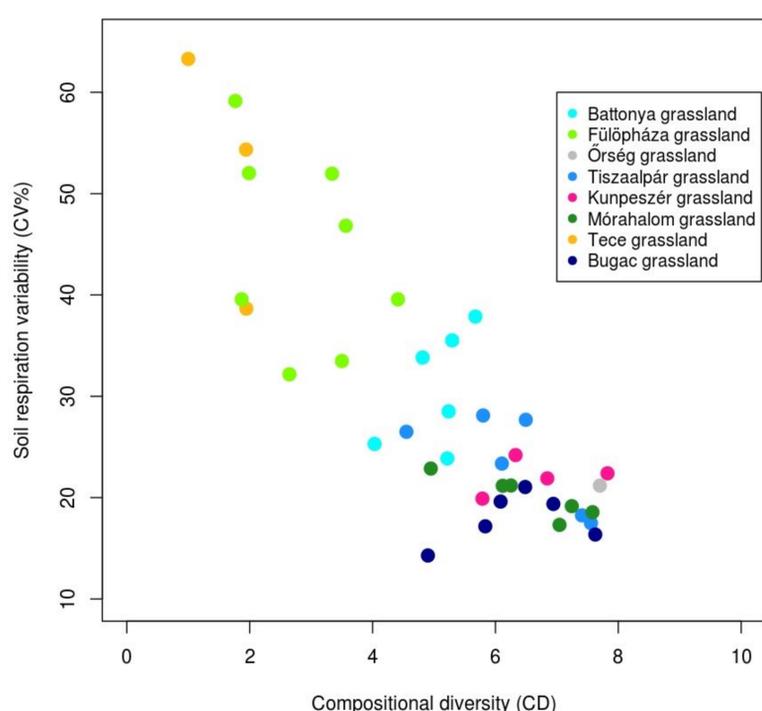


Figure 1. Comparing compositional diversity and variation of soil respiration in grasslands



Figure 2-4. Field sampling

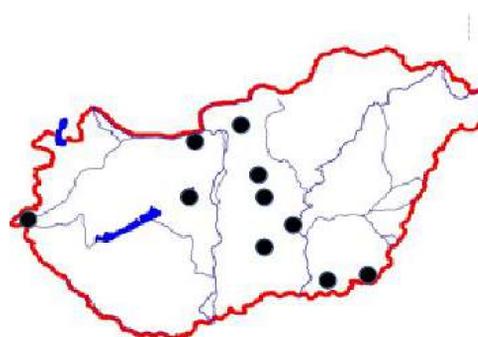


Figure 5. Sampling sites in Hungary

