Plant, earthworm, spider and bee diversity in agriculture fields of grazing and field crop farming systems in eight regions across Europe

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Abstracts

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Diversity of wild species living in agricultural fields is influenced by management practices and landscape characteristics. Factors acting on species diversity have contrasting effects on different species groups due to various dispersal abilities and resource requirements (Clough, Holzschuh et al. 2007).

The dataset of the EU-FP7 project BioBio was used to evaluate main drivers for plant, earthworm, spider and bee diversity in agricultural fields. In BioBio indicators for biodiversity in farmland were developed. The four species groups were selected as biodiversity indicators at the species level. Each species group fulfills distinct functions in the agricultural ecosystems. Plants act as primary producers and provide the food resource for all herbivores. Earthworms belong to the group of soil detritivores. Spiders are predators and have a potential role in the control of agricultural pests. Bees perform pollination (Kremen, Williams et al. 2007). In this study, data from eight case studies are investigated: specialist livestock grazing in Hungary, Norway, Switzerland and Wales, field crop and horticulture farming systems in Austria, France and the Netherlands and a mixed farming system in Germany. All four species groups were surveyed in a total of 385 agricultural fields. Based on questionnaires, management information was provided by the farmers. Hence, the pesticide use, the nitrogen input and the number of mechanical operations were recorded for each agricultural field. Additionally, field characteristics were assessed. Furthermore, the landscape composition in a buffer of 250 m was estimated for each field from aerial photographs. These explanatory variables will be included in models to explain the species assemblages of plants, earthworms, spiders and bees on agricultural

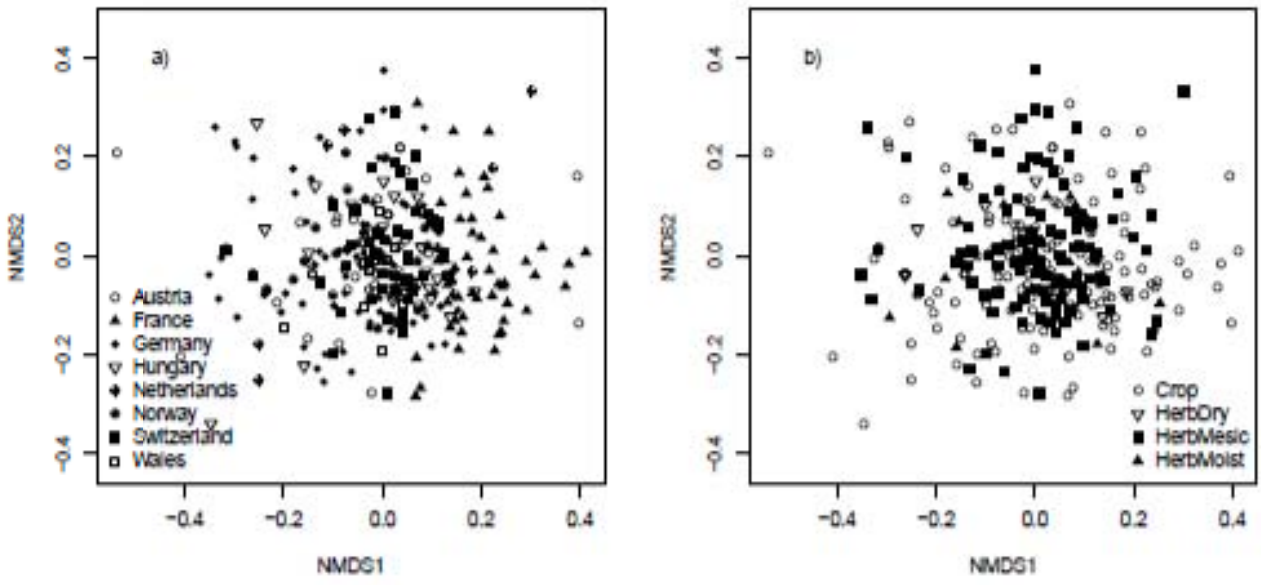

Fig. 1: One example of species assemblages. Non-metric multidimensional scaling of earthworm species, grouped by case studies (a) and main habitat types (b).

fields. Species assemblages are applied as response variable since it takes into account both species richness and species abundance (Fig. 1). If just species richness is considered as diversity measurement, the contribution of frequent and rare species to the diversity is counted equally. However, focusing on species assemblages also takes account of the distribution of the species and enables us to detect more detailed patterns.

Results based on analysis of the diverse farming systems and regions will reveal whether nitrogen input, herbicide use and the number of mechanical operations act on plant diversity as expected. While management variables of fields are assumed to be the main drivers for earthworm diversity, landscape features may play an important additional role for spiders, which are known to use perennial vegetation outside the field for overwintering (Schmidt and Tscharntke 2005). Similarly, we will test whether bee diversity is more related to the landscape composition in the surroundings of fields or to small scale field characteristics and management practices (e.g. insecticide use).

The findings of the study will show the main drivers for plant, earthworm, spider and bee species assemblages in agricultural fields with respect to various farming systems. Such detailed investigations of driving factors for biodiversity in farming landscapes are necessary to implement effective measures in agro-environmental schemes.

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