# Analysing:

# 1) Biodiversity of ant communities along an elevational gradient and

# 2) Taxonomic composition of arthropods along plant diversity gradient in the Jena Experiment

**Course:** Quantitative Community Ecology in R

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## Introduction

## Methodology

### Collection of data and experimental design

Sample collection was conducted as part of the *Jena Experiment*, located in the city of Jena, Germany. In total, 80 experimental plots measuring 20 x 20 m were manipulated with 60 plant species (native to Central Europe mesophilic grasland) to establish a gradient in plant species richness (1 (n = 14), 2 (n = 16), 4 (n = 16), 8 (n = 16), 16 (n = 14), and 60 (n = 4)) and functional group richness (grasses, small herbs, tall herbs, legumes). In 2010, arthropod communities were sampled within each plot, based on abundance counts of individuals, which were subsequently classified into the following taxonomic groups according to Ebeling et al. (2017): Araneae, Carabidae, Chilopoda, Cicadina, Coleoptera_rest, Diplopoda, Heteroptera, Isopoda, Opiliones, Orthoptera, Staphylinidae.

### Data analysis

To extract the main gradients of arthropod composition, we performed a principal component analysis (PCA) on the Hellinger-transformed species matrix (Legendre & Gallagher 2001). The Hellinger-transformation was applied due to high differences in the abundances of the individual taxa. By taking the square root of the relative species abundances, the importance of dominant species gets thereby reduced (Borcardet al. 2011).

*I don't know if we want to include the following information, as it seems to be irrelevant, but I Oksana also did this step in her scripts. Plus I still think its necessary because otherwise we wouldn't know wether linear methods are applicable. Anyway, lmk what you guys think.*

The assessment of gradient length by observing the first axis (0.875) of the Detrended correspondence analysis (DCA) applied to the transformed data confirmed that the species composition responds linearly to the sampled gradients (Leps & Smilauer XXX).

Afterwards, environmental data was fitted onto the ordination to portray the correlation of the variables with the arthropod composition following the approach of Legendre & Gallagher (2001). Therefore, all variables were included in the envfitfunction from the vegan package (Oksanen et al., 2015), which used a Monte-Carlo-Test with 1000 permutations to evaluate the significance of each variable. Only variables with a significant $p$-value $< 0.05$ were included in the presented figure.

## Results

The PCA projection revealed important changes in arthropod composition along the plant diversity gradient. Axes 1 and 2 represented 58.44% of the variance of the Hellinger-transformed species matrix.

- using envit() function

**Transformation of environmental data:**

- we have presence absence data (functional plant groups)
- and we have species diversity data (2,4,8,16) of sawn species, do weed need to transform them into categories (1,2,3,4,5)?

## Further Notes:

Here is a paper from the Jena Experiment dealing with anthropodes and plant diversity:

https://doi.org/10.1016/j.baae.2017.09.014

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