

Testing the habitat heterogeneity hypothesis for a successional gradient in grasslands

S. Kesting, J. Isselstein

University of Göttingen/Germany

Objective

How is plant species diversity affected by succession?

Introduction

Scrub encroachment as a sign of succession of grasslands leads to a higher habitat heterogeneity. According to the habitat heterogeneity hypothesis (e.g. MacArthur & Wilson 1967) species diversity should be improved. This effect is expected to be scale dependent.

General methodology

- descriptive correlative gradient analysis
- stratified systematic sampling design
- 30 plots (100 m²) each with 10 subplots (1 m²), 5 habitat types
- Intensity of scrub encroachment is defined as:
Scrub index = log (cover * canopy high)

Results

The correlation of species diversity and scrub index shows Figure 1. Linear regression shows no significant correlation ($R^2 = 0.033$ n.s.). Nevertheless, nonparametric loess regression suggests a nonlinear correlation with maximum species number at medium scrub index.

The hierarchical analysis of species diversity points out the same result (Figure 2 right). The mean α -diversity as well as β_1 - and β_2 -diversity reach their highest values at medium scrub indices (scrub class five and three). In addition, Figure 2 (left) shows the partitioning of species diversity for the different habitat types.

Conclusions

The habitat heterogeneity hypothesis as a fundamental idea of ecology could be affirmed for a successional gradient in grasslands. Maxima of species diversity at different hierarchical scales were found at medium scrub invaded grasslands. Scale dependent effects could not be observed.

This result emphasises the importance of habitat heterogeneity on biodiversity and therefore on nature conservation.

Reference

MacArthur, R. H., Wilson, E. O. (1967): The theory of island biogeography. Princeton University Press, Princeton.

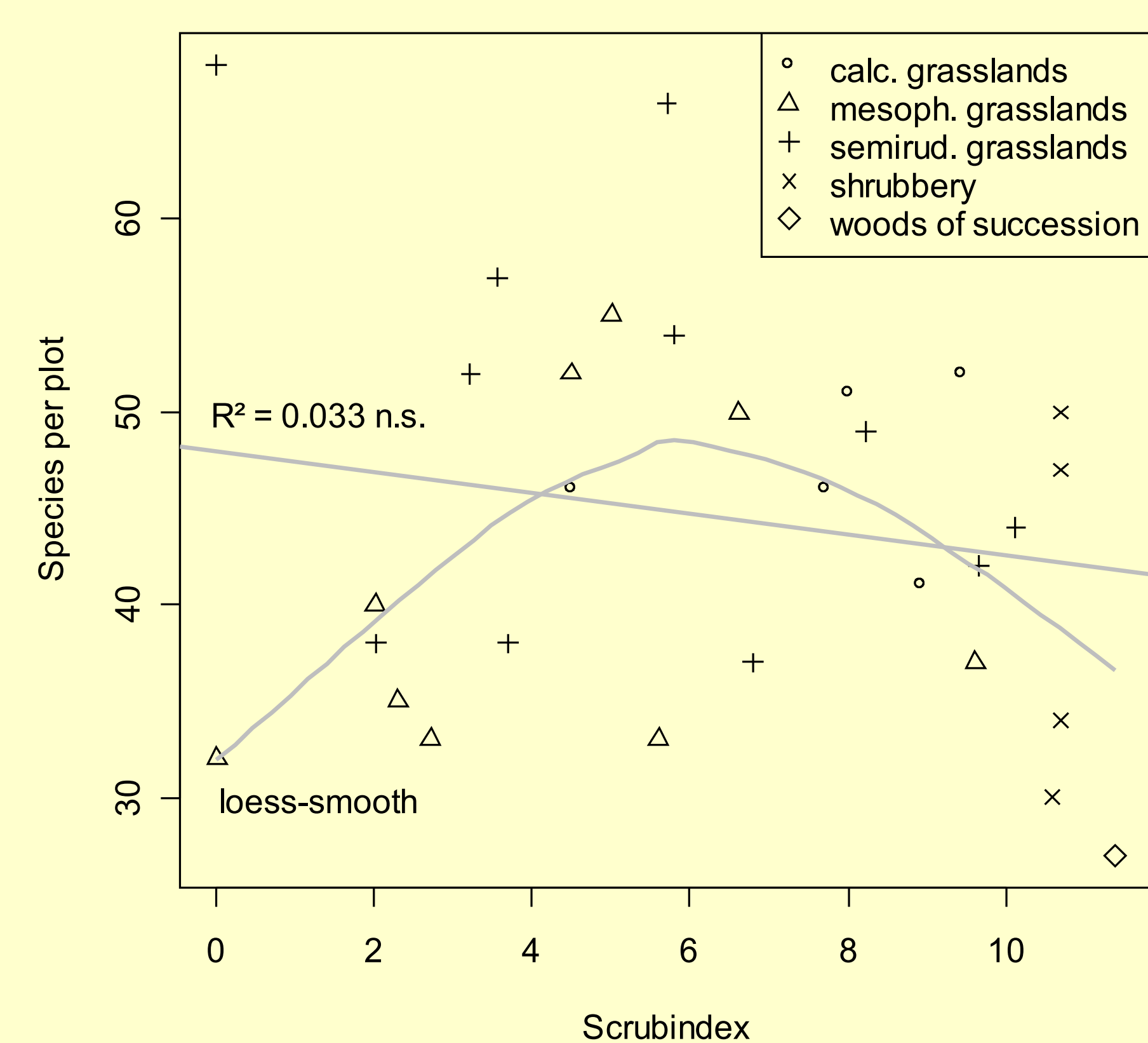


Figure 1: Scatter plot of number of species per plot vs. scrub index with linear and loess regression.

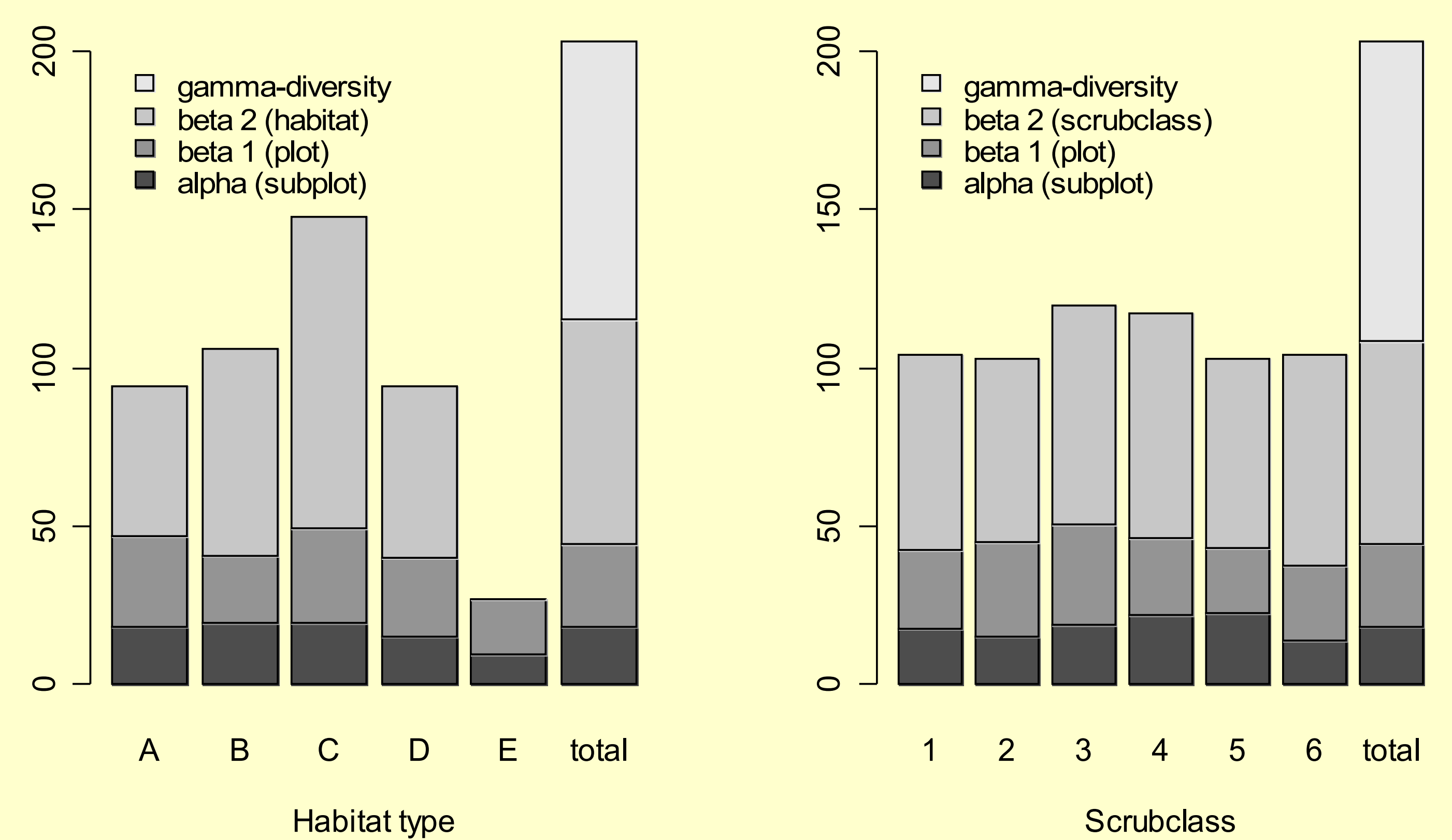


Figure 2: Additive partitioning of plant species diversity. left: Classification of habitat type (A: calcareous grasslands, B: mesophytic grasslands, C: semiruderal grasslands, D: shrubbery, E: woods of succession), right: Classification of scrub intensity (5 plots per class, ordered by ascending scrub index).