

The influence of tree species, stratum and forest management – a case study from the Schwäbische Alb

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Introduction

The Biodiversity Exploratory Project (www.bioexploratories.de) investigates the relationship between biodiversity and ecosystem functioning on scales ranging from enzymes to species communities. The project has been established in three areas in Germany comprising the biosphere reserves Schwäbische Alb, Chorin Schorfheide, and the Hainich National Park. The initial focus is how biodiversity, ecosystem function and land use mutually influence each other. In our research we use saproxylic beetles as a model system. Dead wood has become a rare resource in managed forests (BIOBEC 2002) As a consequence the diversity within feeding guilds of saproxylic species (e.g. xylophages, mycetophages and predators) has decreased greatly. This loss of species is expected to also influence ecosystem function for example by lower rates of wood decomposition (JACTEL et al. 2009) or by less control of potential pest species. We initiated a comprehensive field experiment by accumulating large amounts of freshly cut deadwood in the canopy of *Fagus sylvatica*, *Picea abies* and *Pinus sylvestris* trees to directly investigate the importance of deadwood. We also accumulated deadwood on the ground beneath the study trees for comparison. Our research aims at disentangling the importance of the environmental factors tree species, stratum (canopy-ground), season and deadwood quality (measured by wood of different diameter) and forest management on the community composition of saproxylic beetles

Methodical approach

Deadwood was installed in the canopy by using an elevation platform. Attracted species were sampled by Flight Interception Traps (FITs) which were installed in front of the artificially deadwood enrichments. In all study trees we installed three bundles of deadwood of different diameter: 0 – 5cm; 6 – 10cm; 11 – 20cm. In total 20 trees per research area, representing different management types were selected for the deadwood enrichment experiments in the canopy. The same set-up was used for the ground deadwood. All FITs were emptied monthly from May to October in 2009. Beetles were sorted and identified to species.

Results

The results derived from saproxylic beetles suggest substantial complementarity (in respect to species diversity, assemblage composition, guild composition) between tree species as well as between canopy-ground assemblages. Furthermore, there is evidence that forest management influence distribution patterns of individual beetle species. However, there was no influence of forest management on guild composition, neither did we find that deadwood size was of importance.

Conclusion

Our deadwood enrichment experiment confirms the importance of freshly cut deadwood for beetle diversity adding evidence that this resource is limited in managed forests in Germany. Differences between the factors tree species, forest strata and season were evident, while wood size did not significantly influence assemblages.

Differences in guild composition are attributed to differences in micro climate conditions (VODKA et al. 2009). In contrast evidence of forest management was less clear. Whether deadwood also affects guild composition is subject of future studies which will also analyze how beetle-assemblage diversity and composition change during the process of wood decay over several years.

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