GEORG-AUGUST-UNIVERSITÄT GÖTTINGEN

RTG 2300

RTG 2300 Guest Lecture Series 2019

Trophic interactions in the leaf-litter arthropod community: Insights from mesocosm experiments in North American deciduous forests

Prof. David H. Wise

Condensing the complexity of the soil food web into tractable, process-based models is a formidable challenge. A necessary first step is to simplify the entire food web into sub-webs of relatively few trophic groupings, but even such simple models are sterile without estimates of interaction strengths between the model's trophic groups. One approach to estimating interaction strengths is the field mesocosm experiment, in which replicated samples of the sub-web are perturbed by directly altering densities of targeted groups or changing inputs to the system, with non-perturbed samples as controls. The strengths of direct and indirect interactions are then revealed by the magnitudes of changes in trophic-group densities and impacts on ecosystem processes such as decomposition. Mesocosms were fenced or open portions of the forest floor ranging from 1-20 m^2. In the soil food web arthropods of the litter layer are particularly amenable to such mesocosm studies.

This presentation provides an overview of results from two decades of mesocosm experiments conducted by Prof. Wise, his students and colleagues. These short- and long-term experiments examined interactions within arthropod-dominated sub-webs in the leaf litter of several North American deciduous forests. We manipulated predator densities, introduced supplemental detritus, and imposed extremes of average rainfall predicted by climate-change models. Most studies to be discussed were perturbation experiments. Exceptions are research that evaluated the correlation between trophic-group densities and natural variation in fungal communities in litter and lower soil horizons; and a PCR-based study of the temporal stability of the spider-focused sub-web on the forest floor.

The goal of this presentation is to summarize the pattern of interaction strengths derived from an array of related studies in order to shed light on bottom-up and top-down control processes. This synthesis should help researchers develop and evaluate general process-based models of trophic interactions in arthropod-focused sub-webs of the soil system.

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