F2: Research line 1

Traits meet trophic interactions: predicting the effects of climate change on soil carbon cycling using litter-detritivore functional traits (NWO).

Understanding and predicting the effects of climate changes on ecosystem processes is a big challenge to ecologists. Recent evidence has shown that the indirect effects of climate change on soil processes due to shifts in community composition can be much greater than direct environmental effects. Therefore, understanding how climate changes affect ecological communities and how the changed communities affect ecosystem processes is crucial to increase our predictability on ecosystem functioning and stability in the context of climate change. In this project, we propose that by identifying decomposer response traits to litter quality and environmental conditions and possible links between decomposer response and effect traits, we will increase our ability to predict how climate changes will affect community composition and subsequently, the carbon cycle. We chose terrestrial isopods as a model organism to study how the interaction between decomposer and litter functional diversity affects ecosystem processes rates and stability. We are using microcosm experiments in which we manipulate litter quality and water availability to record species responses, as well as their effects on ecosystems processes.

Participants: Andre Dias, Hans Cornelissen, Jacintha Ellers, Martin Zimmer, David Wardle and Jasper van Ruijven

Isopod community trait composition affects the stability of ecosystem processes (Sciex)

If and especially how biodiversity affects ecosystem functioning is currently hotly debated. The functional component of biodiversity (community trait composition) has been identified as the key factor driving the functioning of the ecosystems. Two chief components of community trait composition are hypothesized to exert a major effects on ecosystems: (i) the dominant trait values in a community (measured by community trait means, CTM), and (ii) the degree of functional trait differences among species (measured by functional trait dissimilitarity, FTD). The aim of this project is to assess the relative role of CTM and FTD on the stability of ecosystem processes. We will determine which component of community traits make ecosystem functions (soil respiration, leaf litter mass loss, leaf litter fragmentation, and leaching of nitrogen) more resistant against species invasion, using isopods as a model species. We expect that the results of our study contribute to opening-up a new area of research at the interface of landscape ecology (land use change) and community ecology (community functioning). Moreover, we expected to significantly contribute to the understanding of biodiversity effects on ecosystem functioning, fill the

gap between ecological theories and functioning of communities and, finally paving the road for a more functionally focussed management of ecosystem services.

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Interactions between mosses, vascular plants and soil invertebrates together influence soil respiration (NWO-IPY).

Ecosystems in northern biomes, particularly peatlands, are globally important accumulators of carbon (SOM). Changes in the turnover of SOM and thereby the release of CO_2 trough soil respiration will have severe impacts on C budgets and will feed back to climate. Climate change will have its effect on C turnover both through the vegetation composition, via its effects on litter quality, but also by changing the composition and activity of the decomposer community. This project focuses on how interactions between mosses, vascular plants and soil invertebrates together influence the soil respiration. The innovative part of this research is that the focus lie on the functional properties of the species, i.e. the 'functional traits' that relate to decomposition. The experimental work will take place in Abisko, subarctic northern Sweden, and includes: (i) Screening of the most abundant mosses, vascular plants and soil invertebrates for their 'functional traits', (ii) Researching what happens to the trait spectra of soil invertebrate communities after climate warming, (iii) Quantify how changes in the relative dominance of mosses and vascular plants (i.e. the trait composition) and the trait make-up of the soil invertebrate community effects litter decomposition, soil respiration and nutrient leaching, and (iv) Assess the role of soil invertebrates in decomposition by adding 13^C labelled litter to the mesocosms and following the labelled carbon through the different soil compartments.

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