Trait patterns of soil decomposers under climate manipulation field experiment: Collembola communities in the CLIMAITE study

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Abstract

Soil ecosystems and the fauna they host, are known to provide many services. Soil Collembola can therefore be used as bioindicators of soils functionality. In a global and climate change context, they are expected to be threatened. Thus, previous studies showed that European Collembola communities structure can be shaped by long-term adaptations to climate. Then, temperature plays a major role in the variation of species traits, especially in open habitats. We aim here to evaluate how trait patterns, at a community level, are impacted by an experimental climate manipulation design. The present study allows us to qualify the impacts of the upcoming climate changes during 21st century. In addition to a taxonomic approach, the functional approach allows us to detect changes in a complementary facet of soil biodiversity.

The CLIMAITE study was carried out in Denmark and aimed to simulate the predicted climate for year 2075. The study site consisted in an unmanaged heath/grassland ecosystem. The climate manipulation experiment included the following treatments: elevated CO2 concentration, elevated temperature, induced drought and control plots. The treatments were combined in all combinations for a total of 48 plots (Mikkelsen et al. 2008). Collembola

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were sampled in 10 cm depth soil cores, in 2007 and 2013, after 2 and 8 years of climate manipulation, respectively.
In a taxonomic approach, Collembola communities were impacted by elevated CO2 through increased C:N ratio, after 2 years (Holmstrup et al. 2017). This effect was not observed after 8 years, suggesting resilience within the soil biota in the long term. In a trait-based approach, most up-to-date Collembola trait databases versions of the BETSI.cesab.org (France) and SoilBioStore.au.dk (Denmark) projects were compiled. These latest results will focus on characterising the functional diversity of communities, and will aim to study the functional trajectory of communities along the different climatic factors combinations.