Biochemical Society Student Report

Aims of the project

Over the summer, I completed my Internship at the University of Bristol's Griffiths Lab. The overarching aim of this research group was to answer how soil biota diversity and the interaction of below and above ground organisms influences forest functioning and regeneration in Old-growth European forests. Within this expansive project, my aim was to aid with their investigation by mapping the interactions in soil biotic communities within the scale of the microclimate in their field plots; as well as looking at the link Carbon sequestration. This was done with the purpose of establishing a higher resolution insight into what factors influence Carbon sequestration in microclimates, which is on a smaller scale than previous work done. This was to address gaps in knowledge that underpin forest restoration strategies.

Summary of the work undertaken

To help investigate this question, I first undertook a variety of laboratory techniques to capture the heterogeneity in the soil biota. From each field plot, five eDNA samples were taken from each randomly allocated microclimate measurement stations. I helped to freeze dry these samples to homogenize the soil before eDNA sequencing was used to find what species were present and to construct the soil food web within the microclimate. This method was used because it captured the DNA from all organisms that had been to the site and left DNA. However, the drawback of this technique is that the biomass of each trophic level cannot be found, so we used three other techniques to determine this.

To uncover the biomass of the microfauna, mesofauna and macrofauna present in each of the plot's microclimates, I helped to do perform Nematode extractions, Tullgren's and looking at species collected in pitfall traps. This allowed us to compare the eDNA results and gave us insight into the biomass of the species collected.
I also helped to take a host of Abiotic measurements to determine C stocks in the soil, which could then be used later in data analysis to determine links between the C stocks and soil biotic diversity. I also determined the amount of microbial carbon stored in the samples by performing chloroform extraction techniques in the lab, which bursts the microbial cells so you can measure the carbon in the soil before and after the technique. Soil moisture content was measured by drying the soil to see the change in weight. I was also able to witness demonstrations on taking the pH of the soil samples.

Another aspect that was investigated was characterizing the understory vegetation present. This was done to investigate if the biomass or species of leaf litter collecting on the ground was influencing decomposition processes and carbon sequestration. To do this, we collected leaf litter falling from the canopy in each plot was collected in nets. The biomass of each species of tree species leaves was then determined. This was done to aid the lab in assessing the relative importance of soil biotic, abiotic factors and vegetation composition in determining diversity-productivity relationships.

Description of results/ outcome of the project and how this will be taken forward by the research group.

The work I did will be used in analysis by other members of the research group to test their hypothesis that: the community composition of soil organisms explains a substantial proportion of the unexplained variation in forest diversity-productivity relationships and is positively associated with carbon storage. This analysis is being undertaken once they finish the rest of their lab-based experiments later this month, as they also desire to measure Nitrogen, Phosphorus, soil bulk density and organic matter content of their samples as factors, which was not possible to do in the period of my project. However, the work I did will be an integral part in their study and will contribute to their findings at the end of their project. They will use the information I have collected alongside these other factors to determine how species interactions in the microclimate scale can influence carbon stocks.

Consideration of the Impact of the work/results

One of the primary aims of this research group is to address gaps in knowledge regarding mechanisms that underpin successful forest restoration. This group's work will help produce more effective policies and implement forest restoration projects of old-growth European forests. The group has support from the groups Woodland Trust and Natural England, demonstrating its relevance. This is in line with the Biochemistry societies ethos, as it promotes sharing new knowledge and research that will be used with other groups to promote effective policies. It also will encourage a wider dialogue in the field as this work collaborates with many other research labs.

Discussion of the subject specific transferable skills gained and its contribution to further career goals

The support offered by this grant has allowed me the opportunity to engage with experienced scientists, in a research group with a demonstrated record of high quality and significant research on the scientific community. The studentship has also enabled me to make long-lasting connections in the biochemical field and has given me unique and rare insight into the process of research. Working in an environment that was previously unfamiliar for me has improved my resilience and adaptability to new events and has challenged me to become a more pro-active learner to face many different tasks. I have gained many transferable skills to take forward into my future career, such as working within a team to achieve required targets and conducting myself in the most professional and appropriate manner. I would like to thank the Biochemistry society for the chance to gain experience in biochemical research and I hope this experience will enhance my eligibility for jobs on the graduate market.

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