

# The effects of N canopy enrichment and warmer soil on the composition and diversity of phyllosphere microbial communities of black spruce

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## CONTEXT

Air temperatures and anthropogenic N depositions are projected to rise dramatically in the future, particularly at high latitudes. It is therefore important to understand if, and to what extent, these disturbances could affect the productivity of boreal trees.

## 1. QUESTION

How do phyllosphere microbial communities respond to soil heating and canopy N enrichment?

## 2. METHODS



### 1.1 Sampling



### 1.2 DNA extraction



### 1.3 DNA Amplification

PCR, 16s rRNA gene (799F-1115R)

### 1.4 Clean up and normalization of PCR products

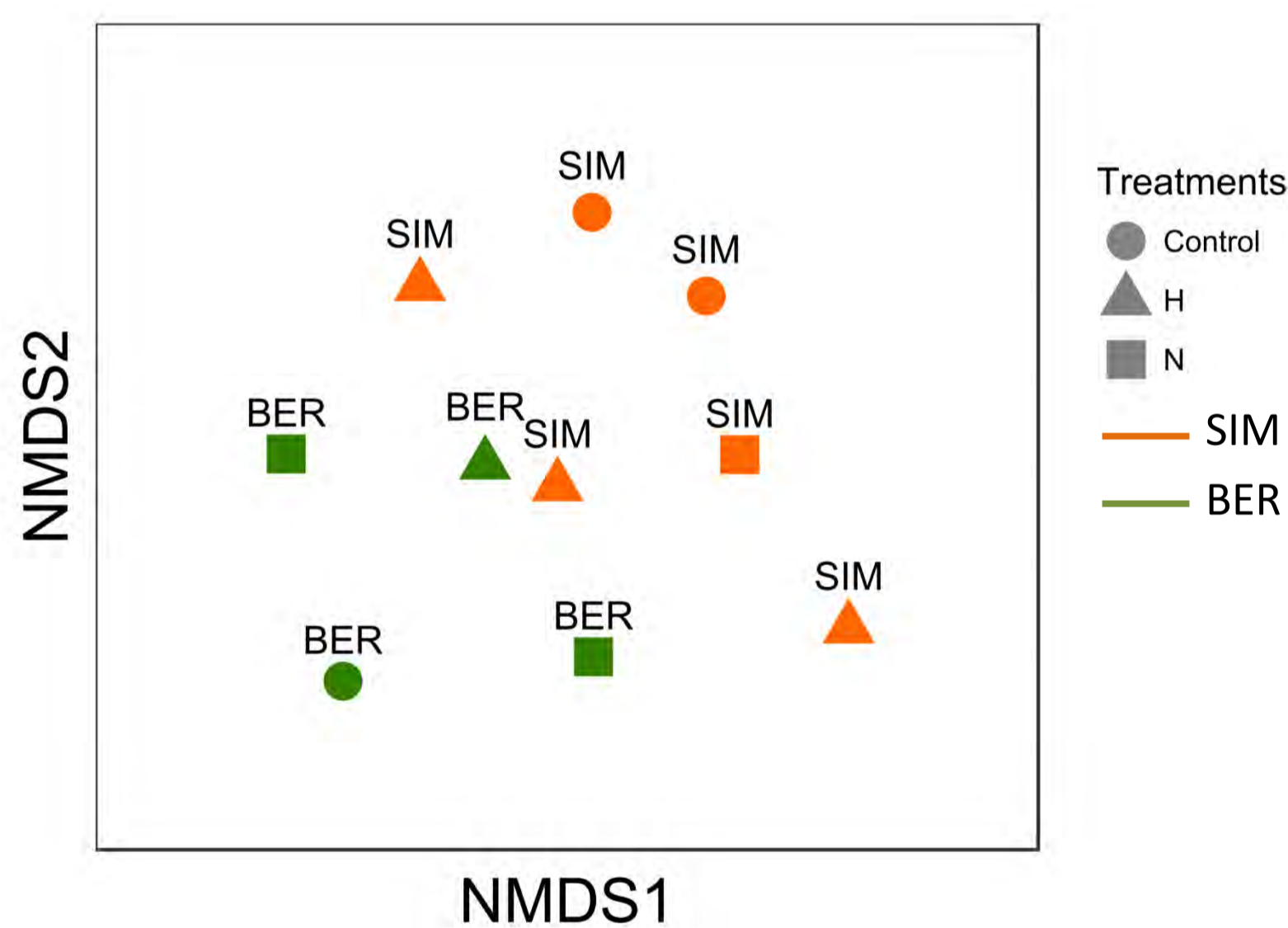
### 1.5 Sequencing

Illumina Miseq technology

### 1.6 Data processing

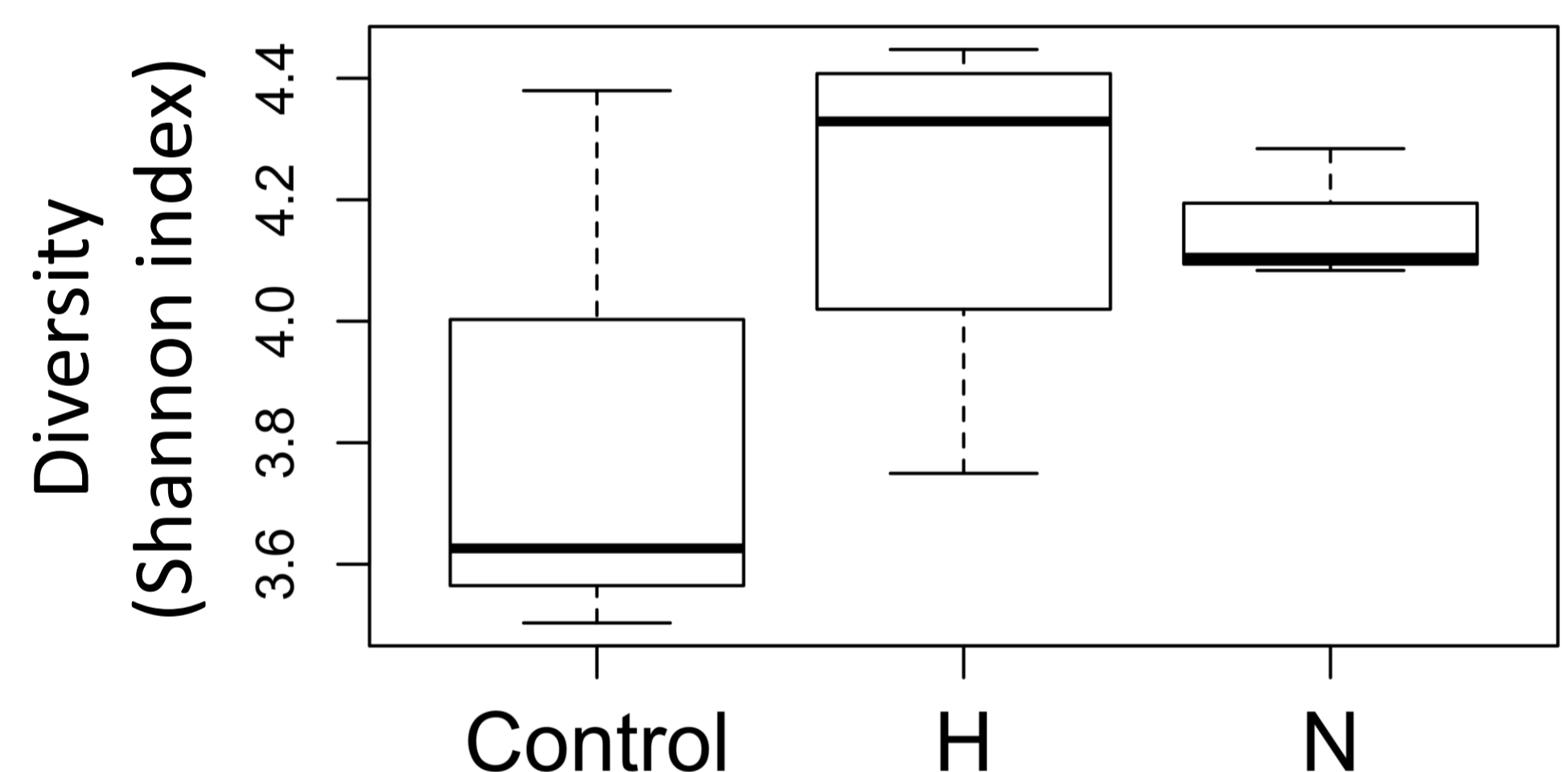
Raw sequence reads were processed using QIIME 1.9.1 software to bin sequences into 97% OTUs (UCLUST) and identify OTUs taxonomically using greengenes reference database.

## 3. RESULTS



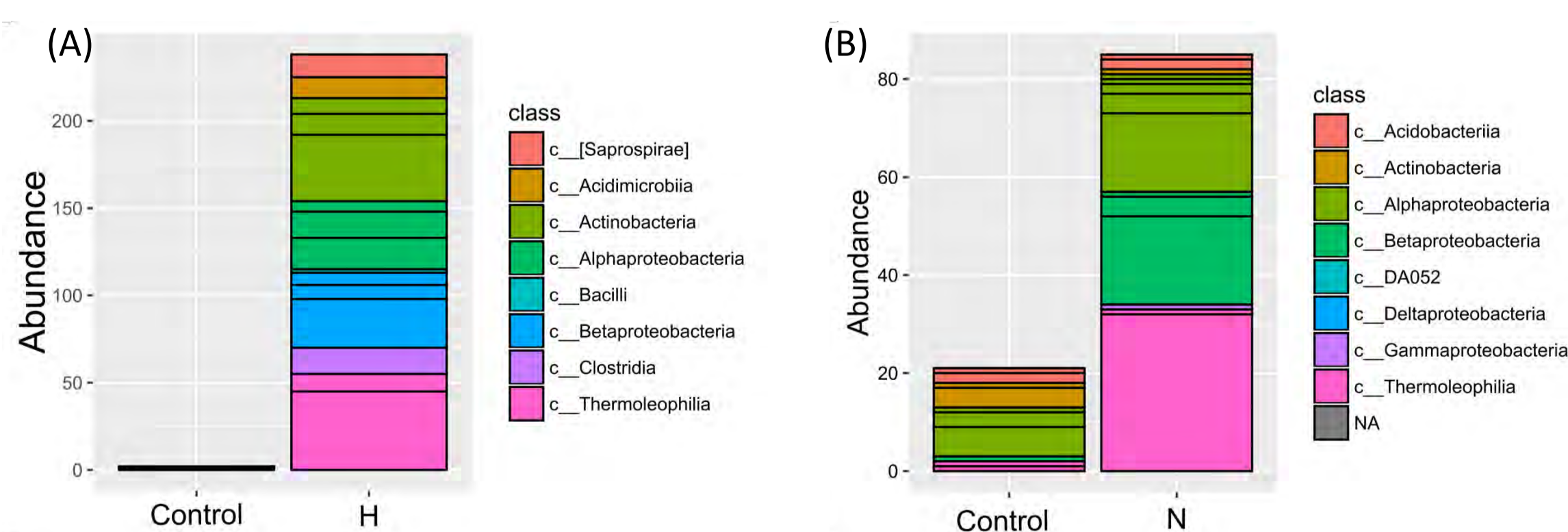
**Figure 1.** Nonmetric multidimensional scaling (NMDS) ordination of variation in bacterial community structure between the two study sites and the two treatments (H = soil heating, N = Nitrogen enrichment).

▪ Bacterial community structure varied significantly between the two study sites ( $p = 0.013$ ) but soil heating and N enrichment had no effects.



**Figure 2.** Bacterial community diversity among treatments (H = soil heating, N = Nitrogen enrichment). Diversity did not differ significantly among treatments (ANOVA;  $p > 0.05$ ).

▪ Soil heating and N enrichment had no effect on bacterial community diversity.  
▪ Bacterial community diversity did not differ between the two study sites (data not shown).



**Figure 3.** Taxonomic composition of bacterial phyllosphere communities showing the OTUs (97% operational taxonomic units) that were significantly more abundant in the treatment compared to the control (H = soil heating, N = Nitrogen enrichment).

▪ Some OTUs were more abundant when the soil was heated (15 OTUs) and after N enrichment (44 OTUs) compared to the control.

## 4. TAKEAWAY

Even though soil heating and N enrichment had no effect on bacterial community structure, we detected some effects at the species levels.

Next step would be to learn more about these bacterial species, and study the link between these species and other variables that could potentially affect boreal forests productivity (e.g. soil C and N).