

Soil warming changes litter chemistry and fungal community composition but not decomposition rate

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Background

Increased temperatures are expected to increase rates of litter decay, but temperature effects on fungal communities will likely mediate this response. We used an *in situ* litter decay experiment to examine effects of warming on fungal community composition, enzyme activities, and litter chemistry in decomposing litter.

Methods

- Leaf litter bags were allowed to decompose for one or two years in a forest stand exposed to 9 years of soil warming (+5 °C above ambient).

- RNA and DNA were extracted from litter, and the fungal ITS2 region was sequenced by 454 sequencing.

- Extracellular enzyme activities were measured using standard methods:

- Beta-glucosidase (BG)
- Cellobiohydrolase (CBH)
- Phenol oxidase (PPO, ABTS)
- Peroxidase (PERgross, TMB)
- Leucine aminopeptidase (LAP)
- N-acetylglucosaminidase (NAG)
- Acid-phosphatase (PHOS)

- Molecular litter chemistry was measured by py-GC/MS.

Treatment abbreviations

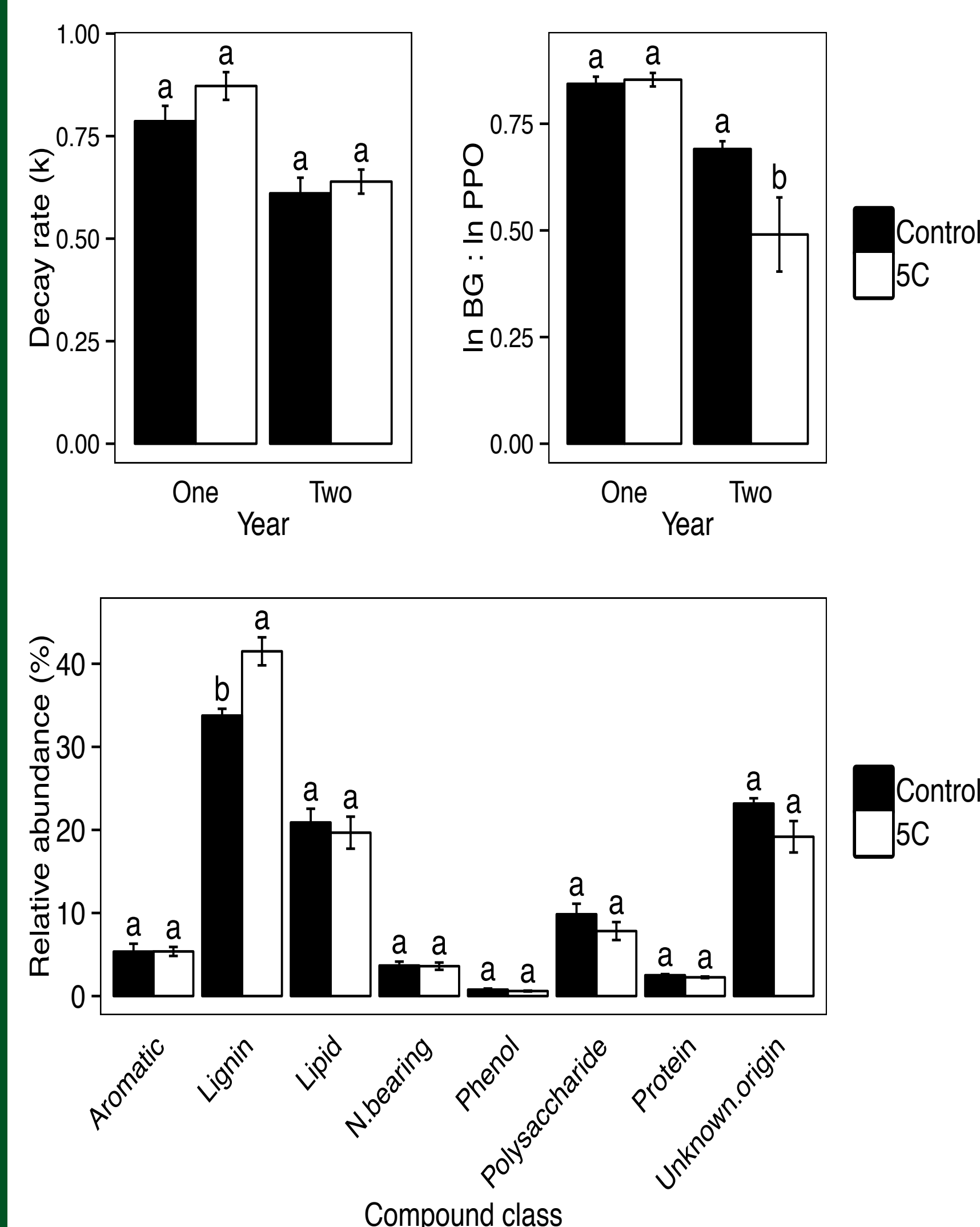
- Control: ambient temperature
- 5C: heated 5 °C above ambient



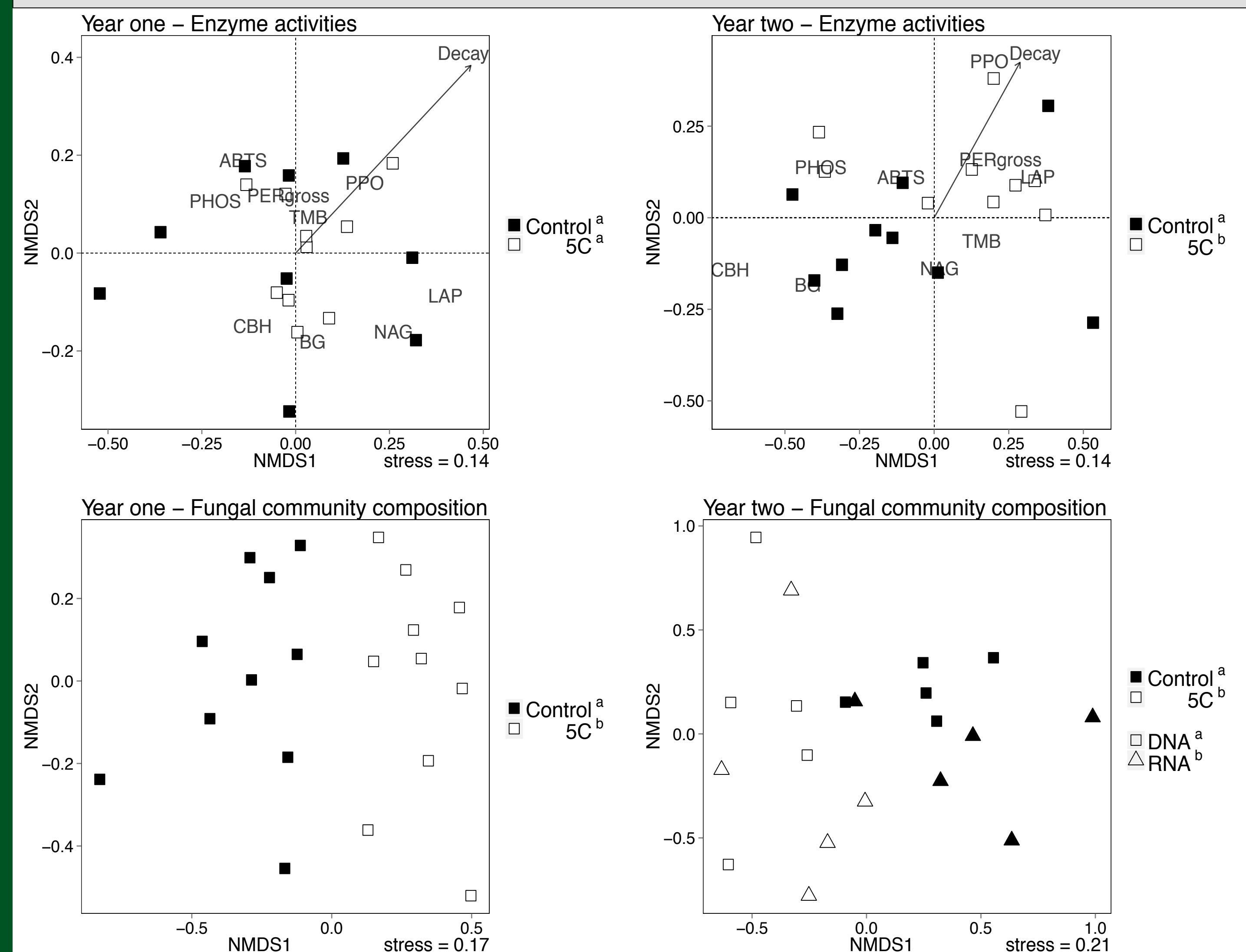
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Results

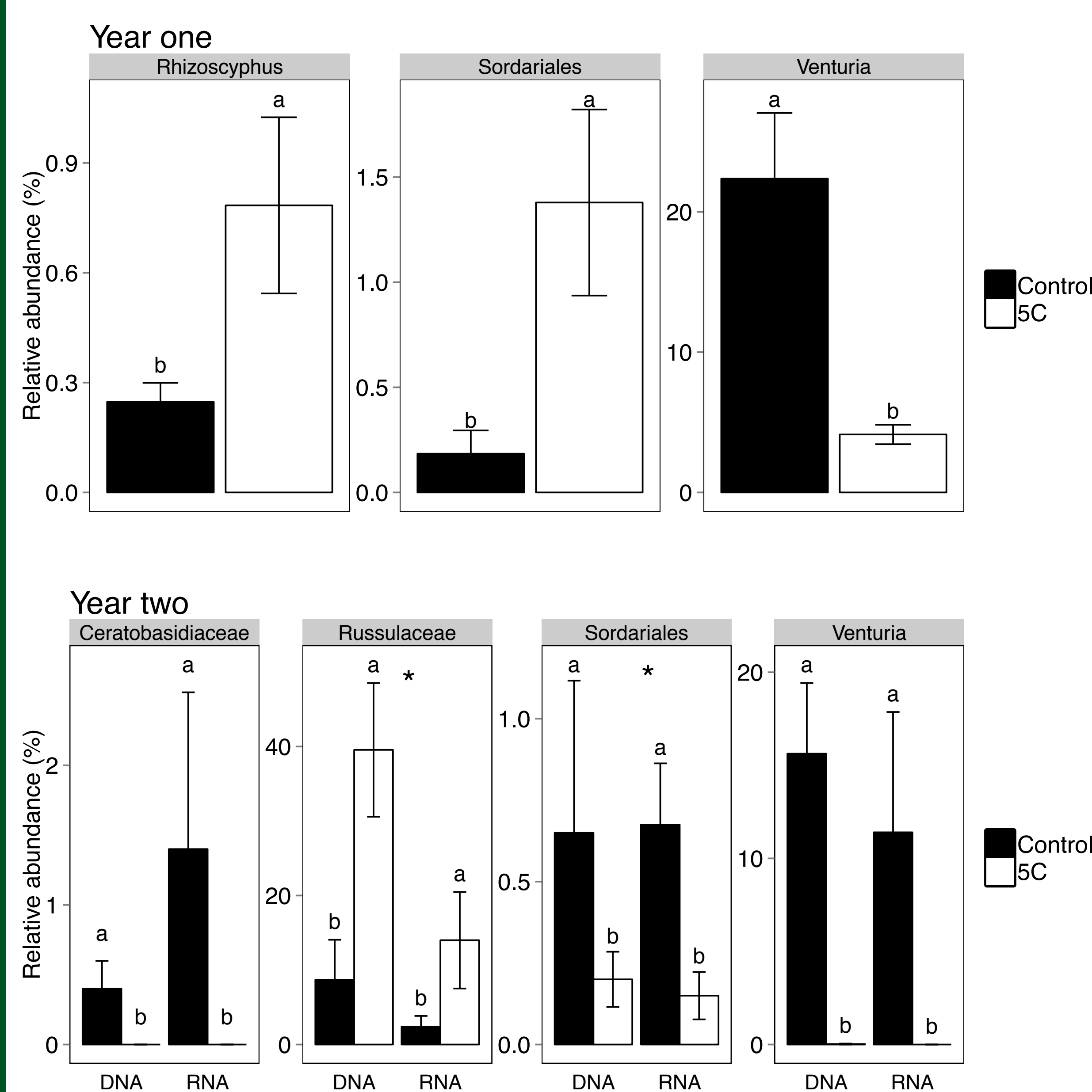
Warming did not affect decay rate, but did reduce litter quality



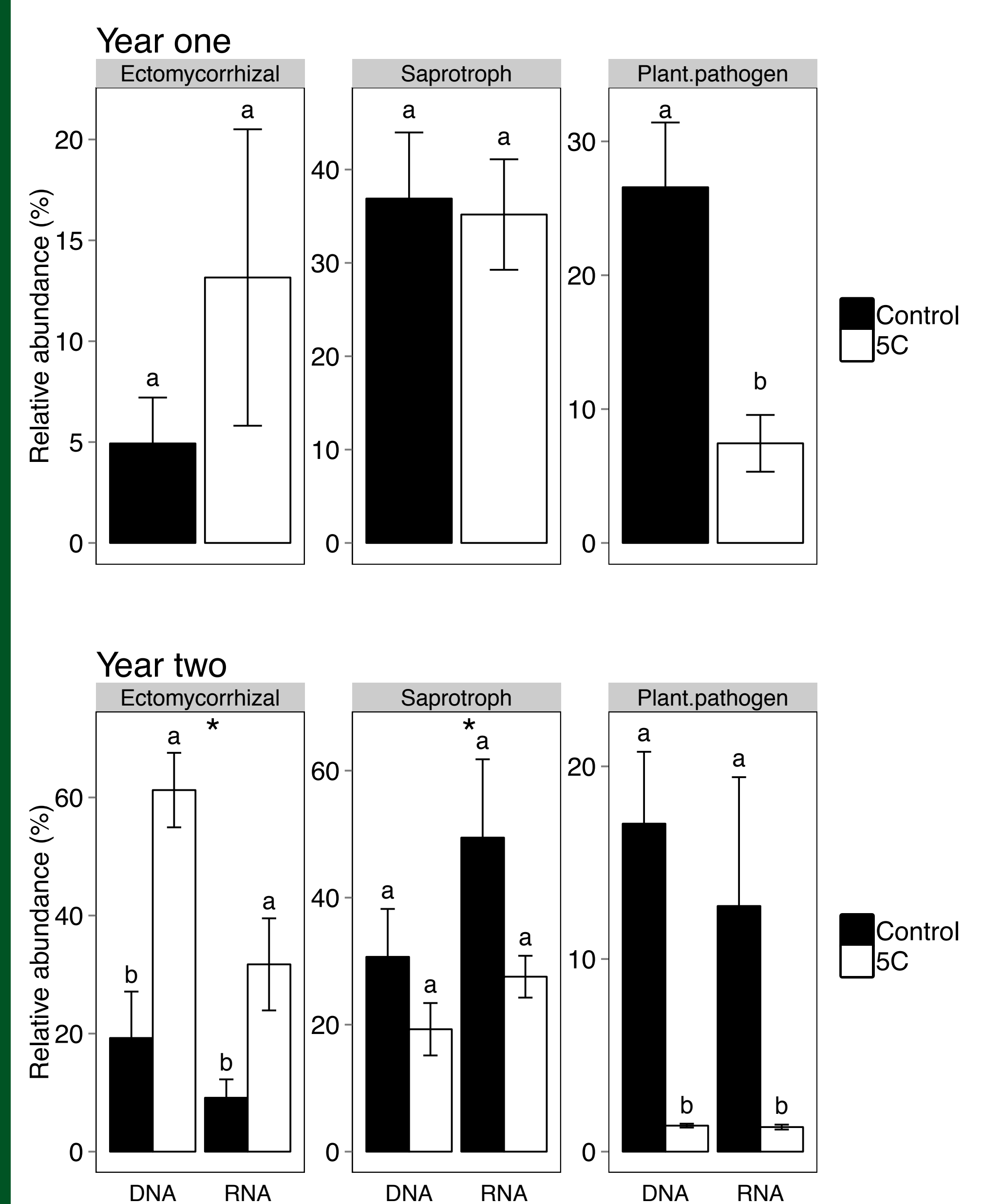
Altered enzyme activities after two years coincided with altered fungal community composition



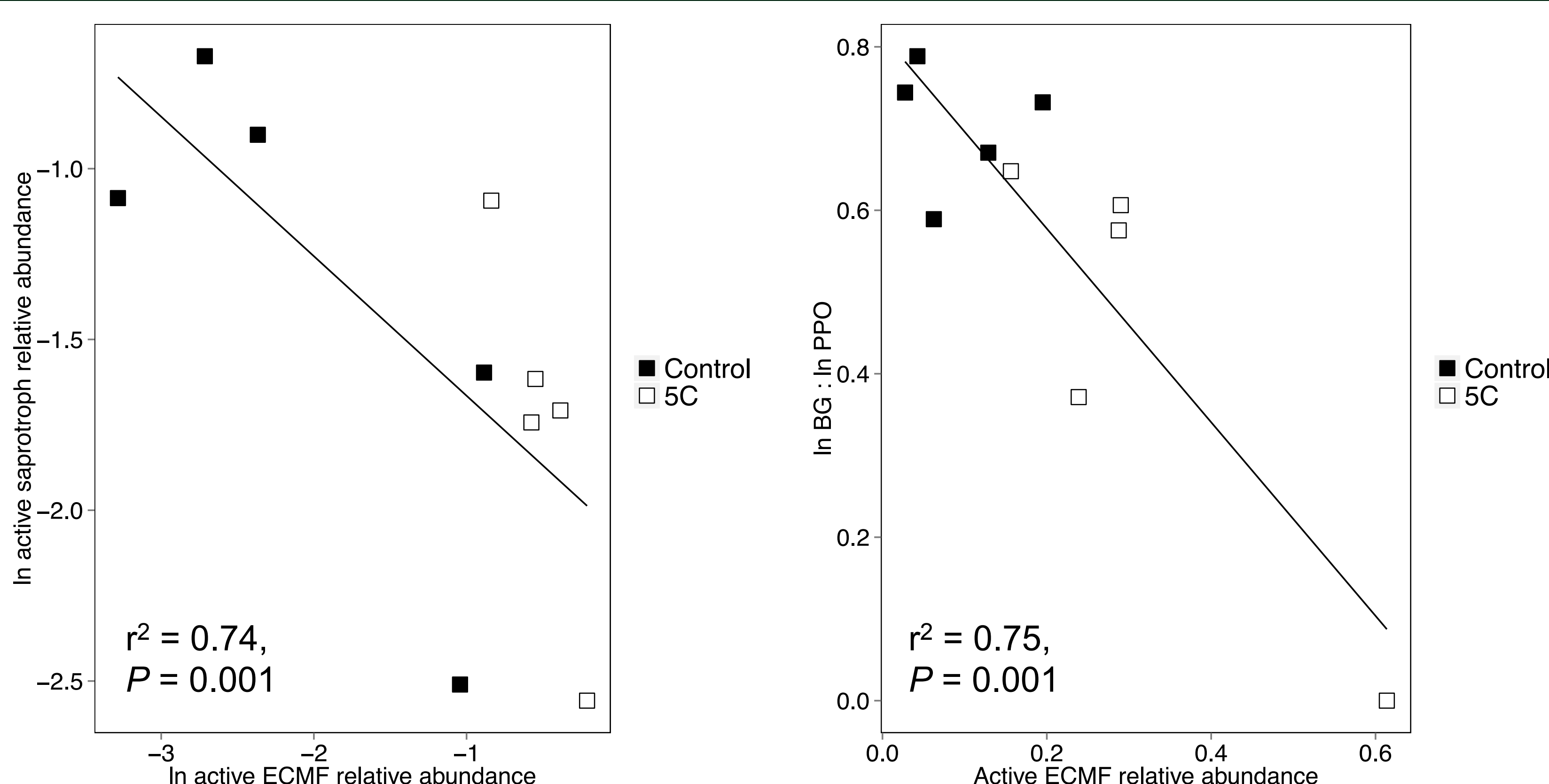
Russulaceae were favored by warming



ECM fungi were favored by warming



ECM fungi were negatively correlated with saprotrophs and BG:PPO



Summary

Warming increased lignin relative abundance and decreased BG:PPO after two years.

A shift in enzyme activities was correlated with a concomitant shift in the fungal community.

Warming has increased tree growth and N mineralization at this site (Melillo *et al.* 2011, *PNAS*). ECM fungi may be favored by increased photosynthate exudation.

Decreased litter quality or competition between ECM fungi and saprotrophs may limit decay rate.

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