

Supplementary information

Reduced feeding activity of soil detritivores under warmer and drier conditions

Madhav P. Thakur^{1,2,*}, Peter B. Reich^{3,4}, Sarah E. Hobbie⁵, Artur Stefanski³, Roy Rich³,
Karen E. Rice³, William C. Eddy⁶, Nico Eisenhauer^{1,2}

¹ *German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig,
Deutscher Platz 5e, 04103 Leipzig, Germany*

² *Institute of Biology, Leipzig University, Deutscher Platz 5e, 04103 Leipzig, Germany*

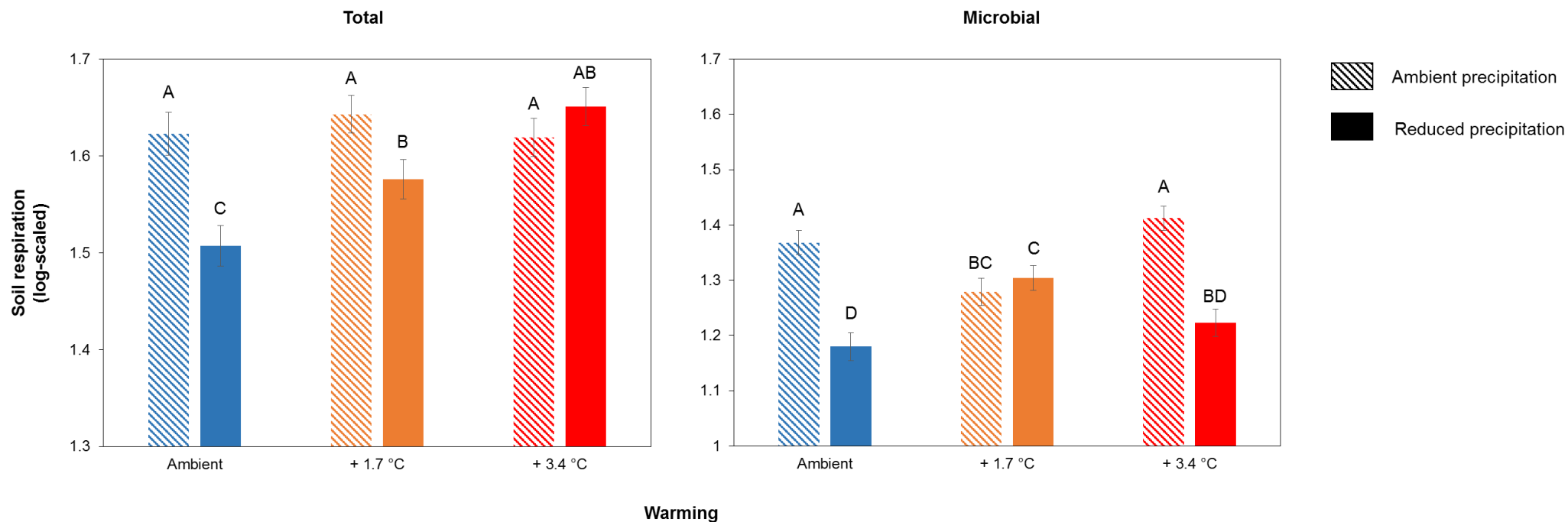
³ *Department of Forest Resources, University of Minnesota, 1530 North Cleveland
Avenue, St. Paul, MN 55108, USA*

⁴ *Hawkesbury Institute for the Environment, University of Western Sydney, Penrith,
NSW, 2751, Australia*

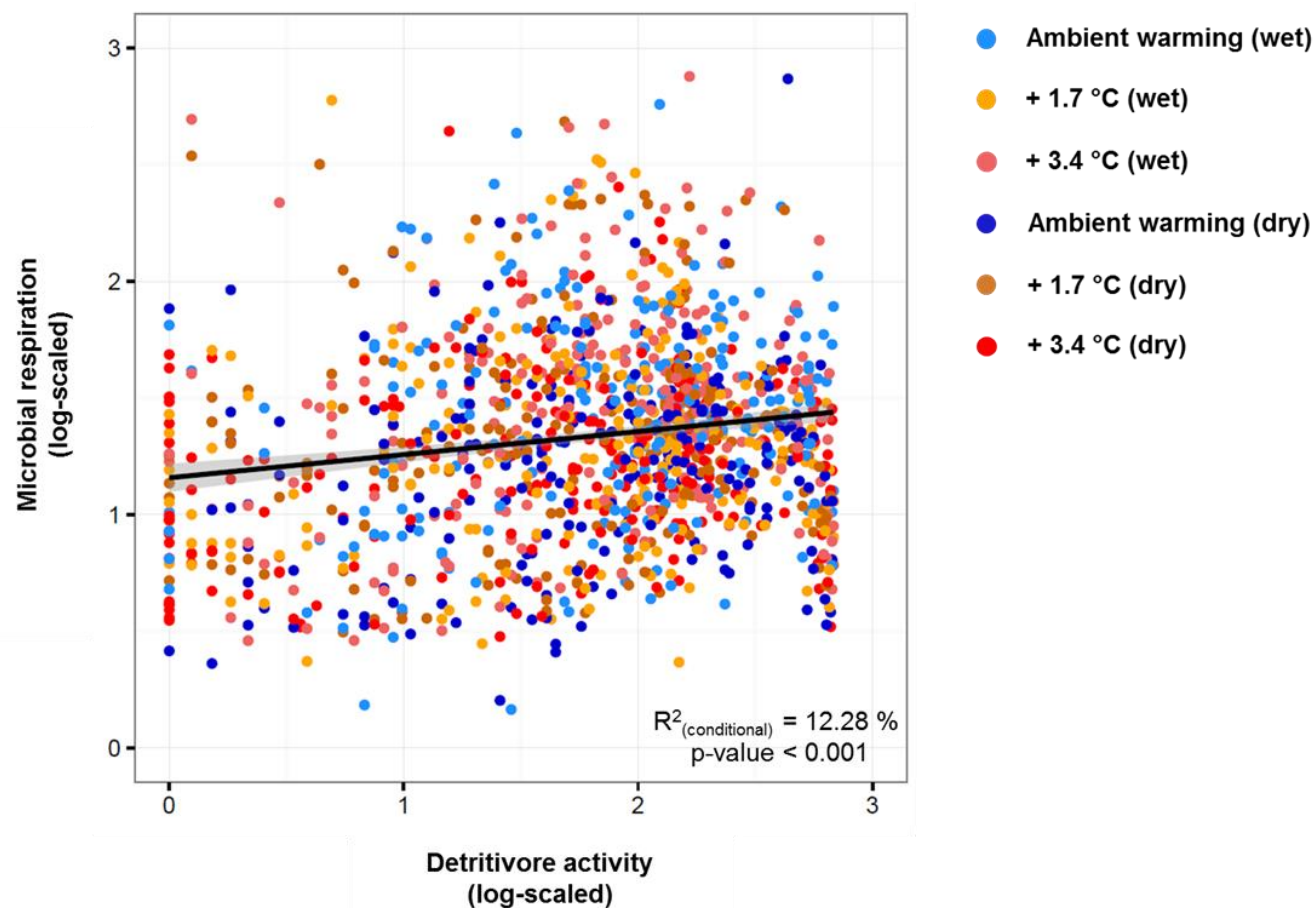
⁵ *Department of Ecology, Evolution, and Behavior, University of Minnesota, St. Paul, MN
55108, USA*

⁶ *Department of Plant Biology, University of Illinois Urbana-Champaign, Urbana, IL
61801, USA*

*Corresponding author (madhav.prakash.thakur@gmail.com)



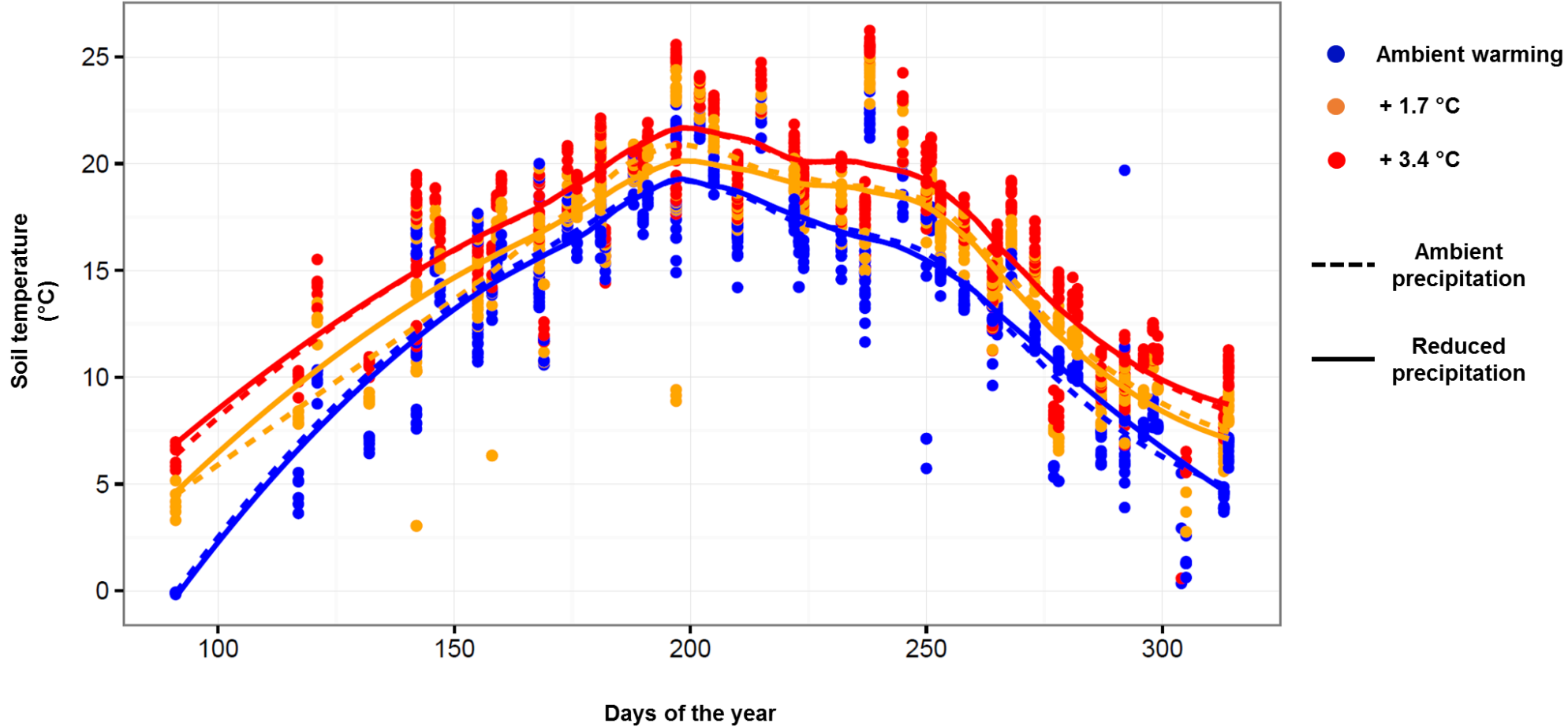
Supplementary figure 1: Total soil respiration and soil microbial respiration ($\mu\text{mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$) in response to experimental warming and reduced precipitation for the period of 2012-2015 across two boreal forest sites (Cloquet and Ely). The letters on top of the bars are from post-hoc Tukey HSD tests run on mixed-effects models. The model structure used for the mixed-effects model are identical to that for detritivore feeding activity.



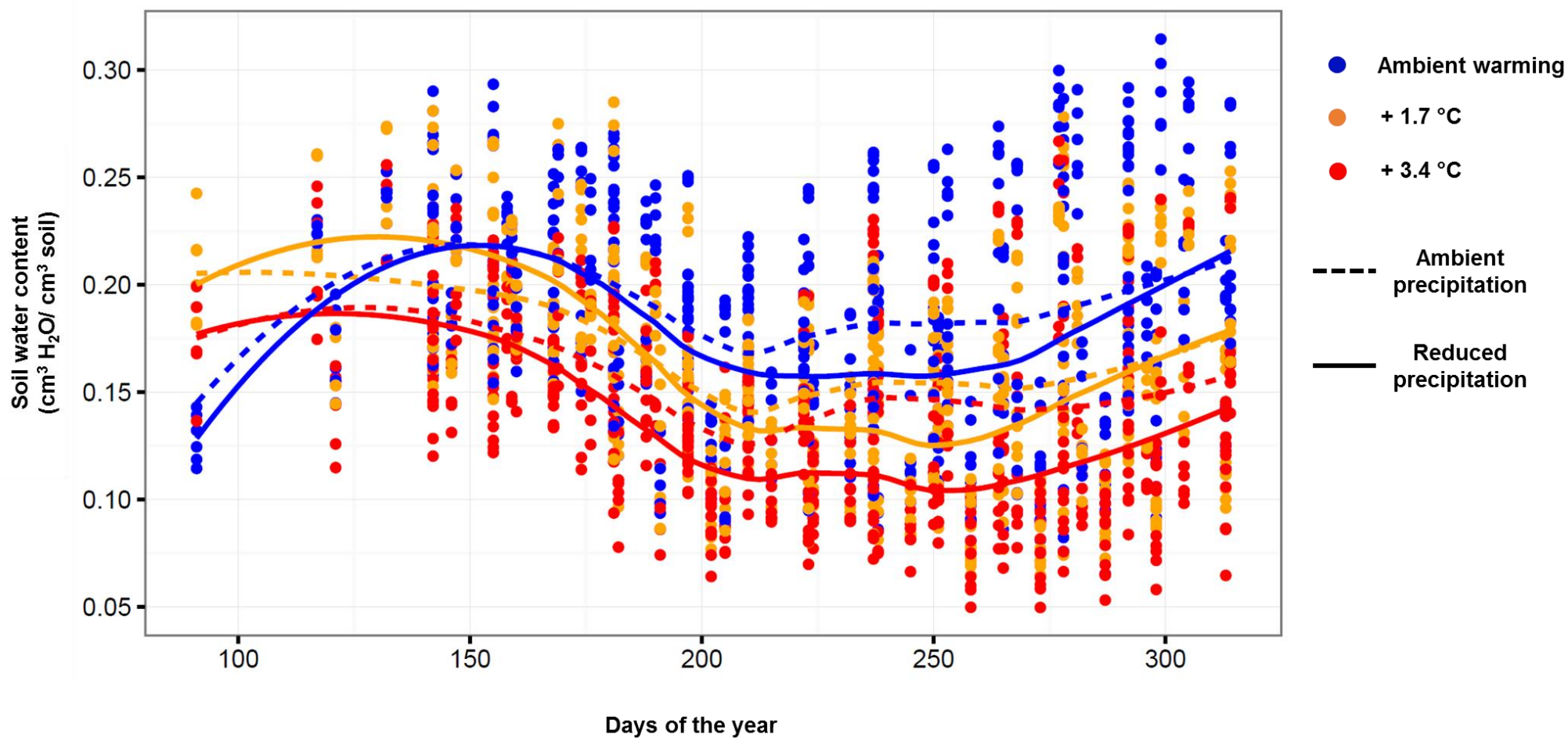
Supplementary figure 2: Association between soil microbial respiration ($\mu\text{mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$) and detritivore feeding activity for the study period of 2012 to 2015 across two boreal forest sites (Cloquet and Ely) and the climate treatments. The correlation is based on the data points taken on the same or closet sampling dates for soil microbial respiration and detritivore feeding activity (not exceeding the difference of nine days). The regression line is to show the overall pattern and not intended to infer any causal relationship between the two variables. The shaded region around the regression line is the standard error. Conditional R^2 is based on a mixed-effects model where year (independent), site and blocks (blocks nested in sites) were used as random effects.

Supplementary table 1: Results from linear mixed-effects models for treatment effects on total soil respiration and microbial respiration. The denominator degrees of freedom are based on the Satterthwaite approximation. Variance and standard deviations (in brackets) are given for the random effects used in models. Bold F-values are statistically significant (***: $p < 0.001$, **: $p < 0.01$, *: $p < 0.05$.)

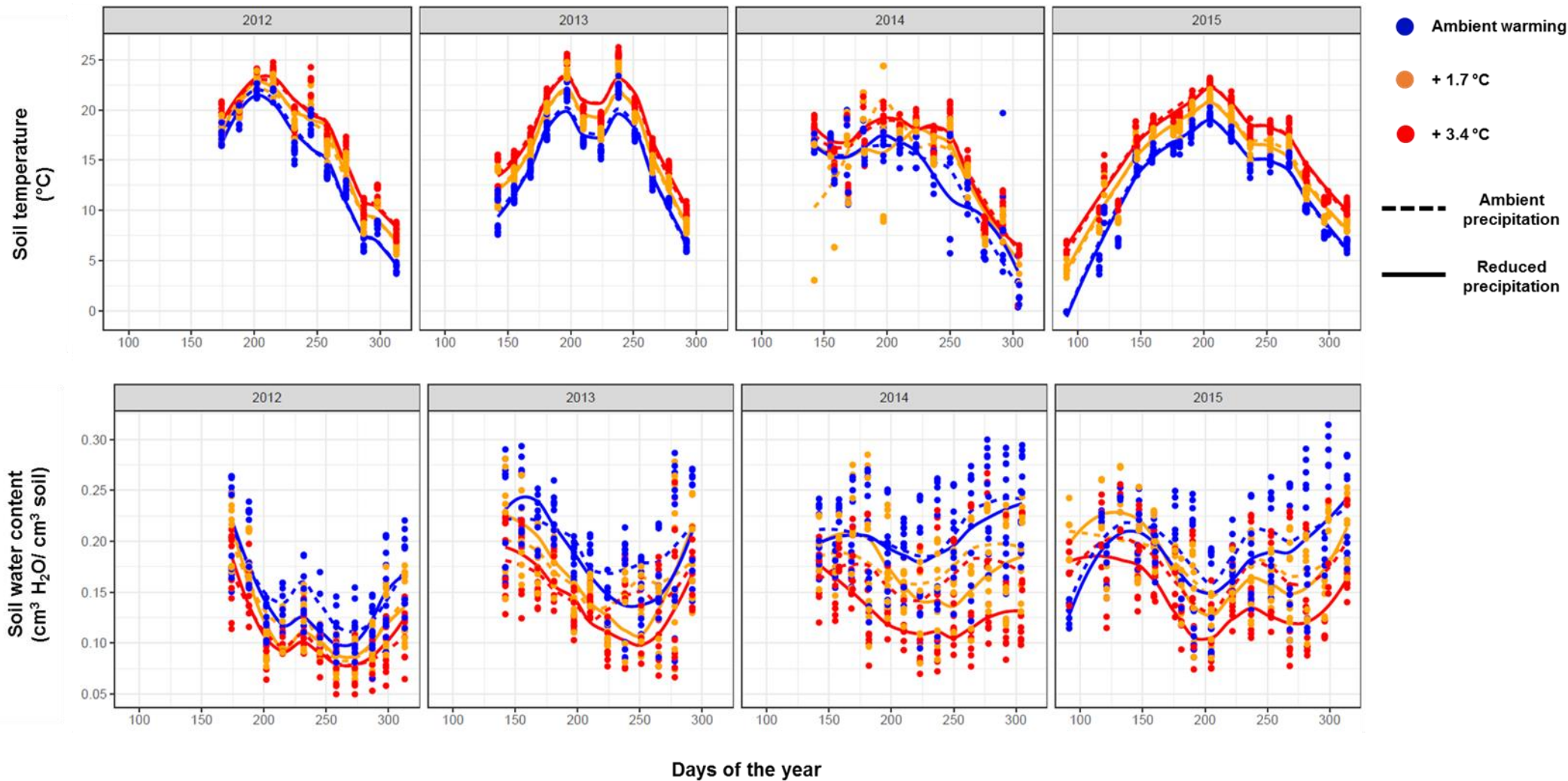
Treatments	Total soil respiration	Soil microbial respiration
Experimental warming (W)	$F_{1, 2843.8} = 0.21$	$F_{1, 1689.1} = 4.57^*$
Reduced precipitation (P)	$F_{1, 2844} = 79.70^{***}$	$F_{1, 1688.3} = 38.04^{***}$
W × P	$F_{1, 2847.2} = 47.03^{**}$	$F_{1, 1691.1} = 0.02$
Random effects		
Year	0.009 (0.09)	0.003 (0.06)
Day of the year/Site	0.020 (0.17)	0.019 (0.14)
Day of the year/Site/Block	0.007 (0.08)	0.015 (0.12)



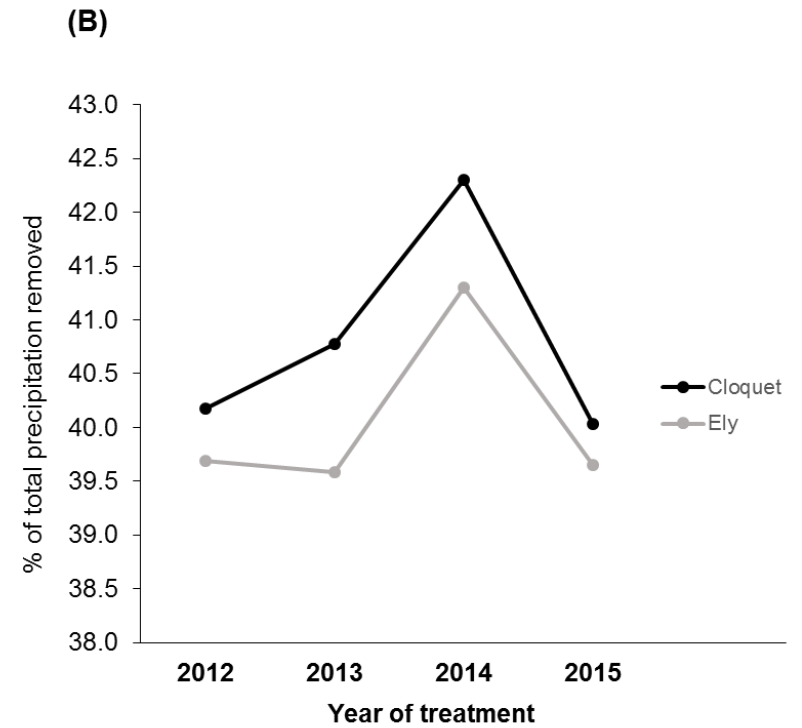
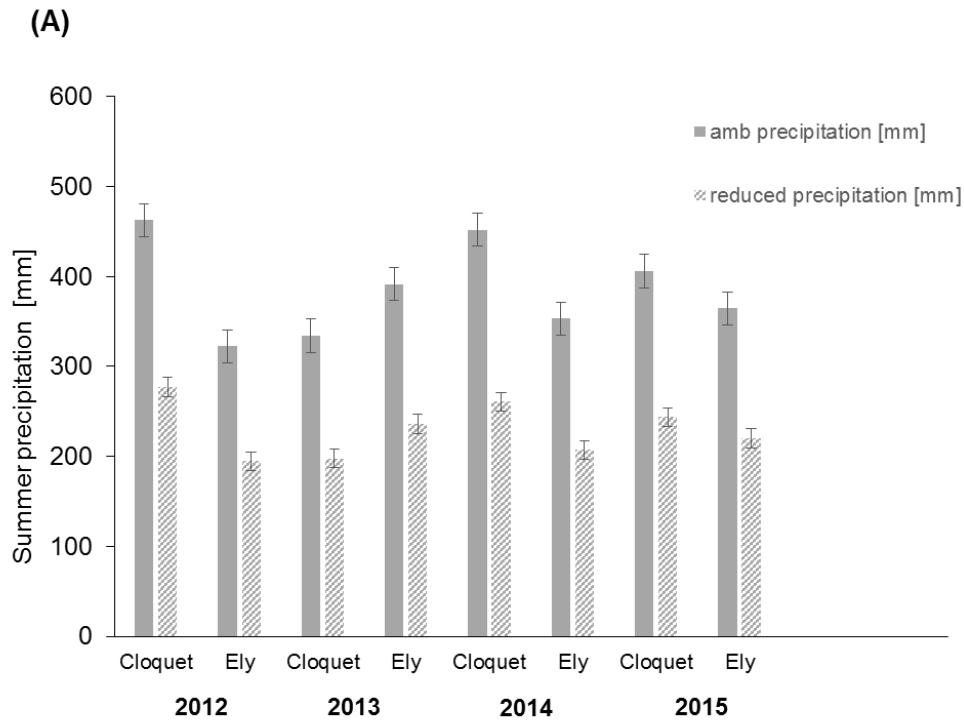
Supplementary figure 3: Temporal pattern of soil temperature in the different global change treatments from the four years of measurements (2012-2015) across two forest sites (Cloquet and Ely). The curves are based on “loess” smoothing function with lambda=0.5 from the “ggplot2” package.



Supplementary figure 4: Temporal pattern of soil water content in the different global change treatments from the four years of measurements (2012-2015) across two forest sites (Cloquet and Ely). The curves are based on “loess” smoothing function with lambda=0.5 from the “ggplot2” package.



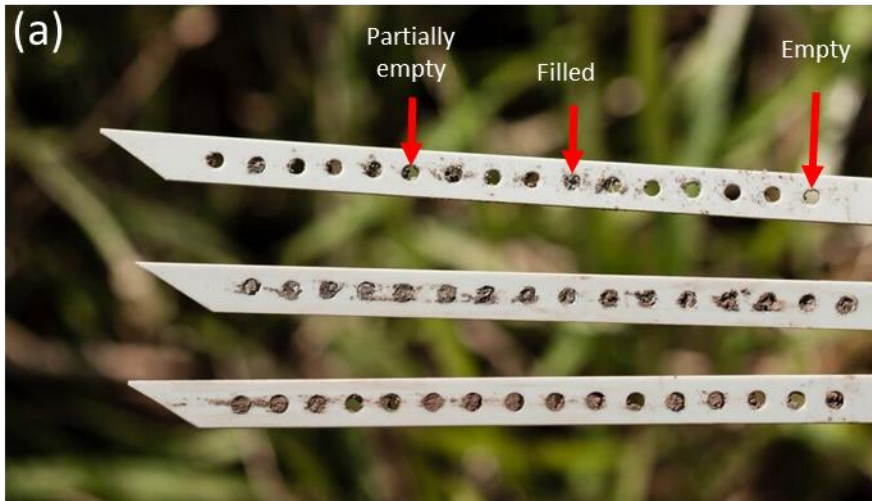
Supplementary figure 5: Annual patterns of soil temperature and soil water across the growing period in the different global change treatments across two forest sites (Cloquet and Ely). The curves are based on “loess” smoothing function with lambda=0.5 from the “ggplot2” package.



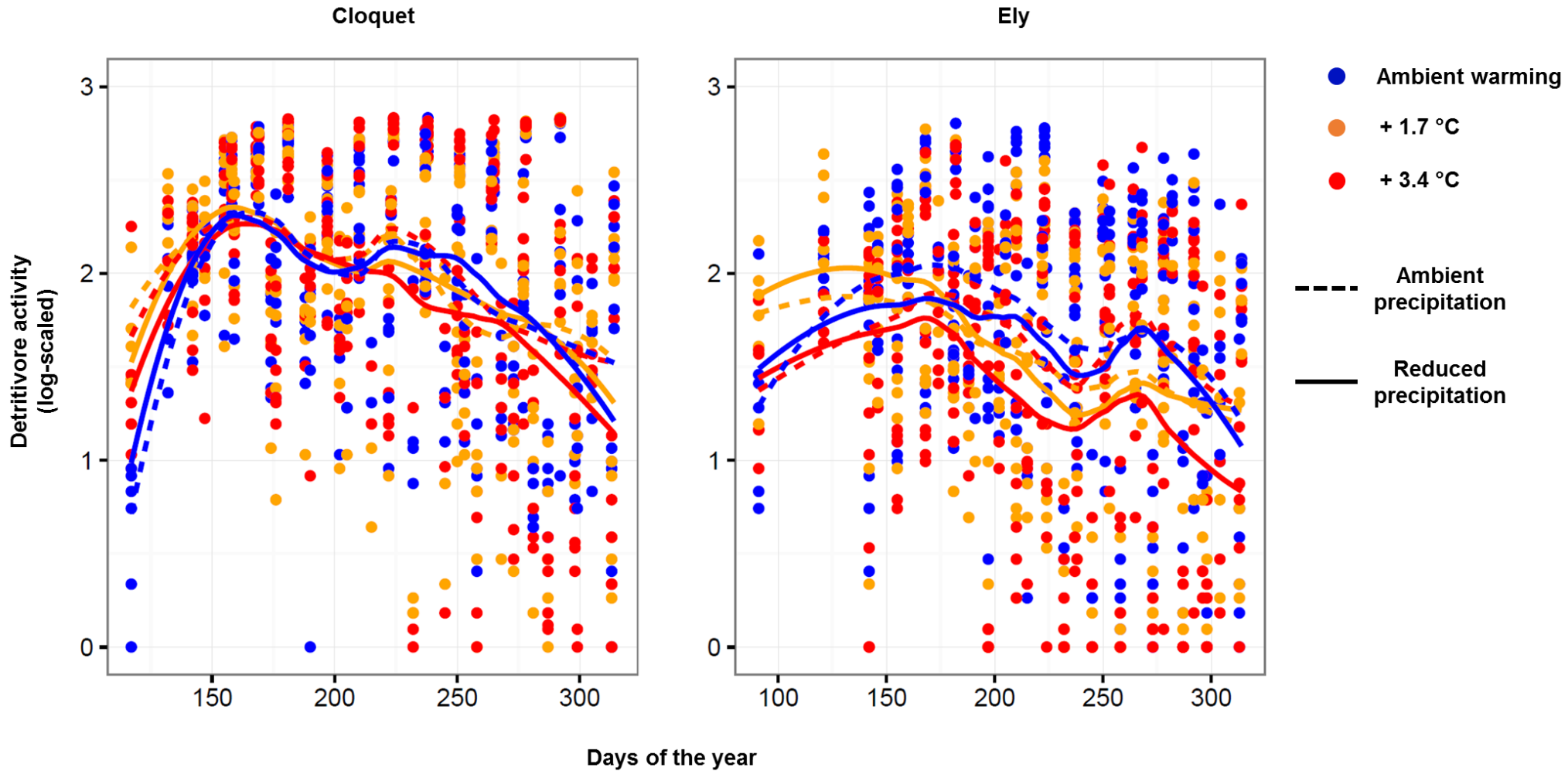
Supplementary figure 6: (A) Total precipitation from June to September (summer precipitation) across four years of study in ambient precipitation and reduced precipitation treatments of two study sites (Cloquet and Ely). (B) Average precipitation removed (%) in reduced precipitation treatments at two experimental sites (Cloquet and Ely) across four years.



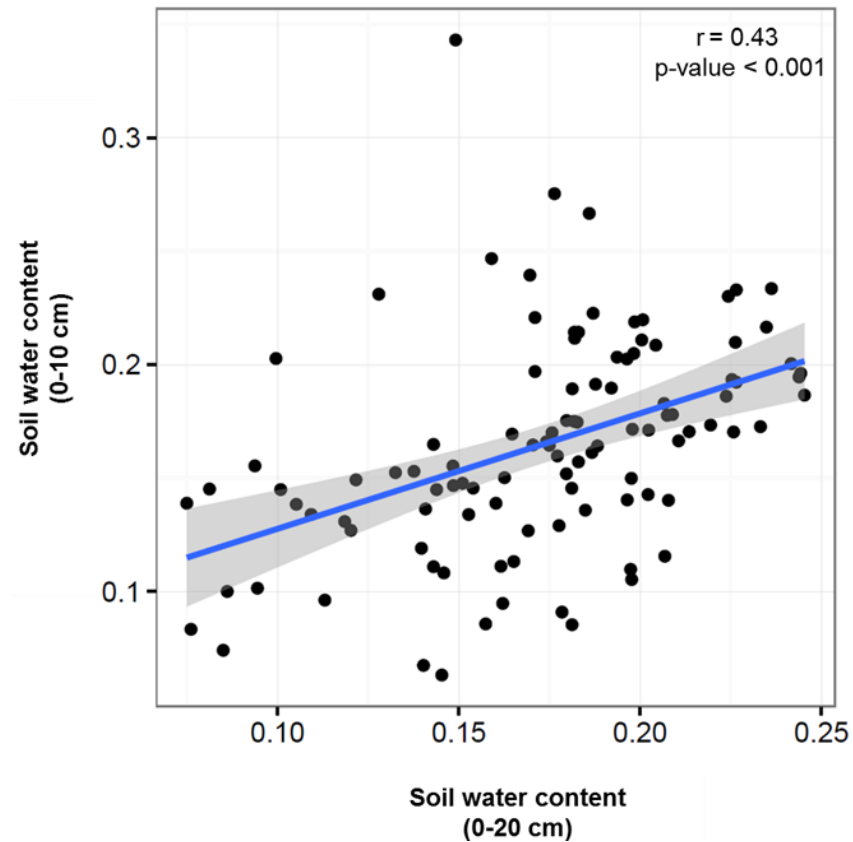
Supplementary figure 7: Images of some common detritivore species. (a) Millipede, (b) Isopoda, (c, d) Collembola, (e,f) Oribatid mites (Photos: Sarah Zieger).



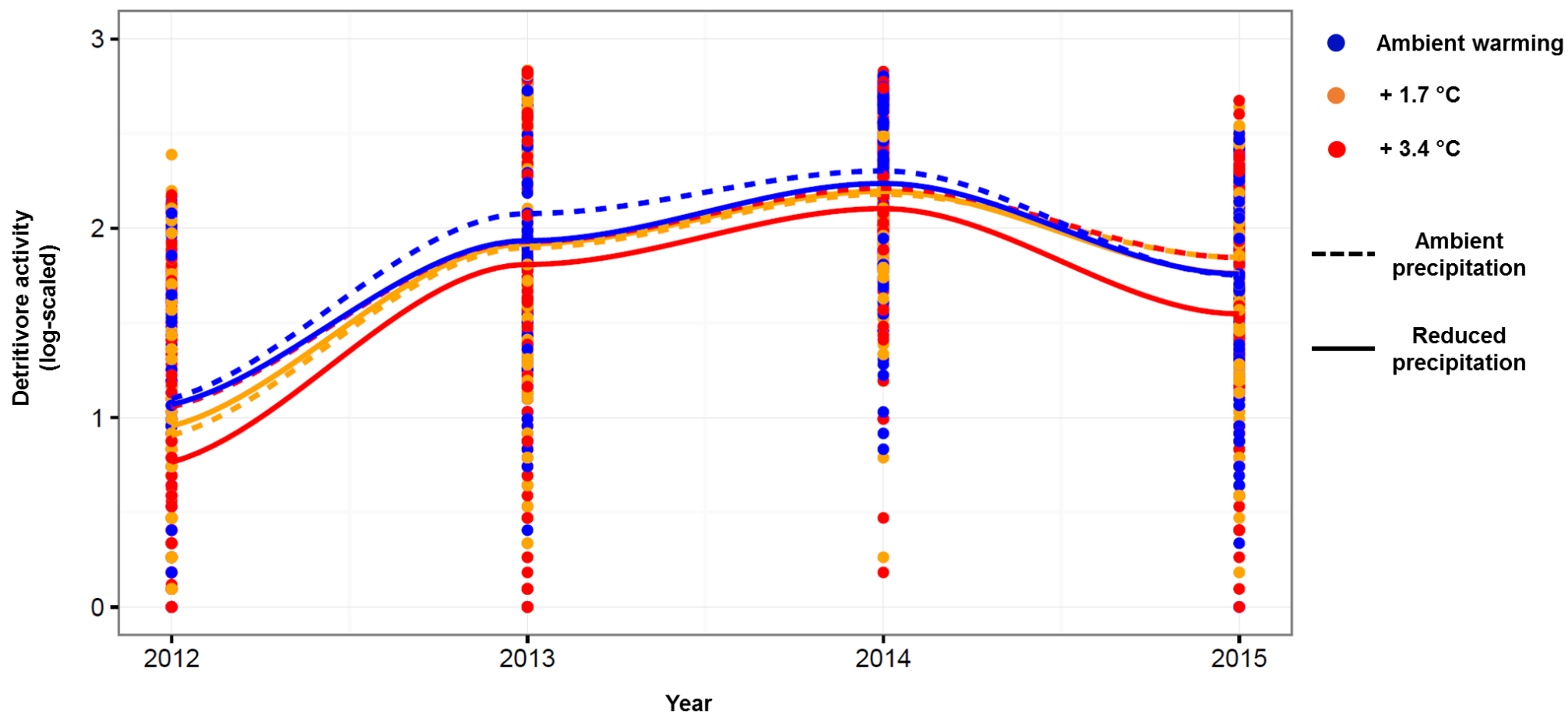
Supplementary figure 8: Bait lamina stripes (a) ready for the assessment of holes (empty, partially-empty, and filled) (Photo: Julia Siebert), (b) inserted in one of the B4WarmED plots (Photo: Artur Stefanski).



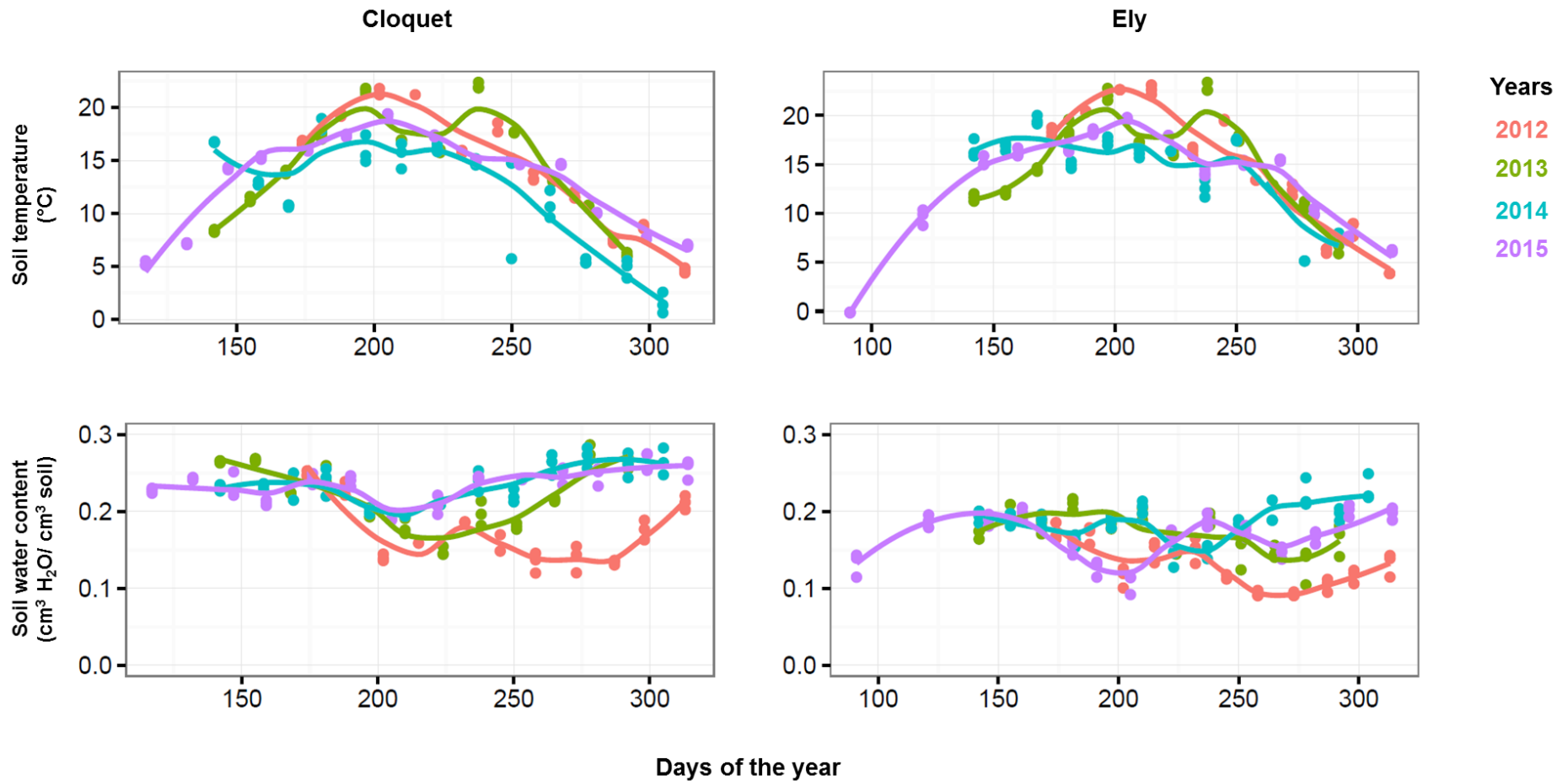
Supplementary figure 9: Detritivore feeding activity in the different global change treatments from the four years of measurements (2012-2015) at the two forest sites (Cloquet and Ely). The curves are based on “loess” smoothing function with lambda=0.5 from the “ggplot2” package.



Supplementary figure 10: Correlation between soil water content measured at a depth of 20 cm and soil water content measured at 10 cm soil depth. Please note that soil water content of the top 10 cm of the soil was obtained ex-situ using the differences in soil weight between the fresh and dry soil. The water content at 20 cm depth were obtained using in-situ measurements. The comparisons are based on ex-situ measurements taken in 2013 (August), 2014 (May), and 2015 (August) in the same plots. The reported correlation coefficient is based on Pearson correlation test. The shaded area around the blue line is based on standard error.



Supplementary figure 11: Annual pattern of detritivore feeding activity in the different global change treatments across two forest sites (Cloquet and Ely). The curves are based on “loess” smoothing function with lambda=0.5 from the “ggplot2” package.



Supplementary figure 12: Ambient soil temperature and soil water across the growing period of the four years of measurements (2012 to 2015) at both experiment sites (Cloquet and Ely). The curves are based on “loess” smoothing function with lambda=0.5 from the “ggplot2” package.