

Soil fungal responses to warming in polar regions

Supervisors

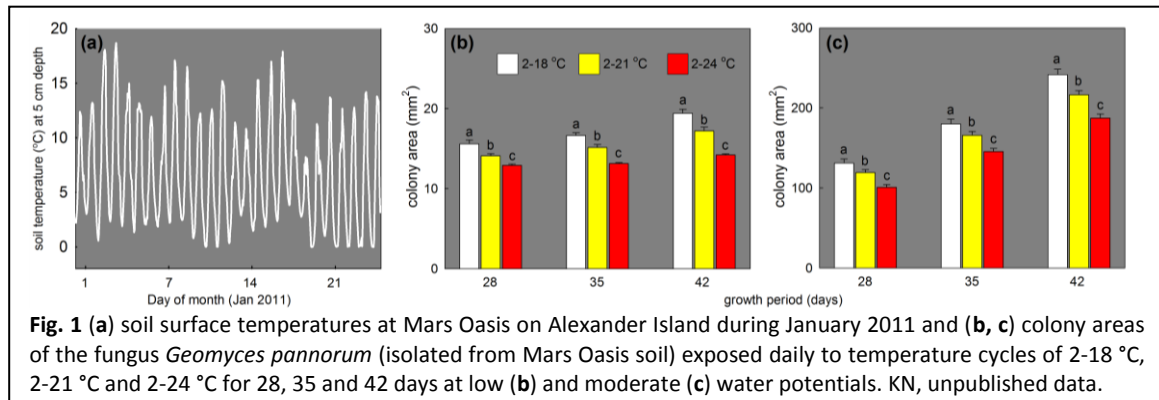
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Project description: Warming in polar regions is negatively affecting top predator species such as the polar bear, and is causing the expansion of higher plant communities¹, but the effects on organisms at the bases of polar food webs such as fungi, which drive vital ecosystem processes (e.g. nutrient cycling), have hitherto been ignored. With soil surface temperatures in polar regions regularly approaching 18–19 °C during summer (Fig. 1a), temperatures rising at 0.2–0.4 °C decade⁻¹ in the Antarctic and Arctic, and many soil fungi in these regions having growth temperature optima of <20 °C, we hypothesize that imminent climate warming will inhibit the growth and activities of polar soil fungi. Recent data from Antarctica support this view (Fig. 1b, c). We propose that a postgraduate student tests this hypothesis by isolating, identifying (sequencing of ribosomal DNA) and growing polar filamentous fungi and yeasts (shown by DNA-based surveys to be frequent soil community members) on soil extract media under realistic summer temperature cycles and water availabilities. Frozen soils from Alexander Island (72 °S) in Antarctica are available from which to isolate fungi. The student will also visit the NERC Arctic station (78 °N) to collect soils for this purpose. S/he will measure the effects of warming and water potentials on fungal growth and the activities of extracellular enzymes (e.g. chitinase and cellulase), which drive polar soil nutrient cycles. The research, which may explain the inhibitory effects of warming on soil microbial activity in Arctic soils², is likely to result in high-profile publications.



References: ¹ Pearson RG *et al.* (2013) *Nature Climate Change* **3**: 673-677; ² Sistla SA *et al.* (2013) *Nature* (doi: 10.1038/nature12129)