Biological Soil Crust Diversity and Variability of the Artic and Antarctic

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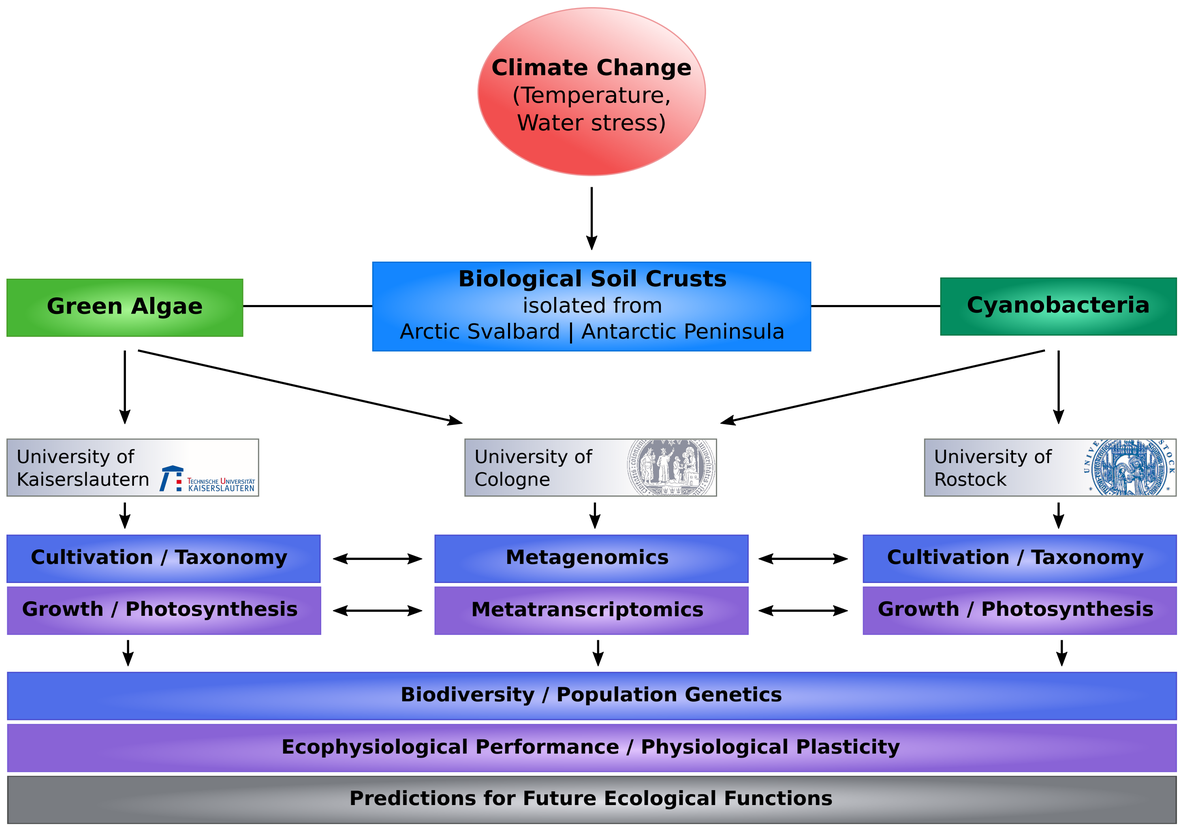
Objectives of the Polar Crust Project

The project aims for a precise evaluation of the eukaryotic green algae and cyanobacteria found in Biological Soil Crusts (BSC) sampled from the Arctic Svalbard and Antarctic Peninsula.

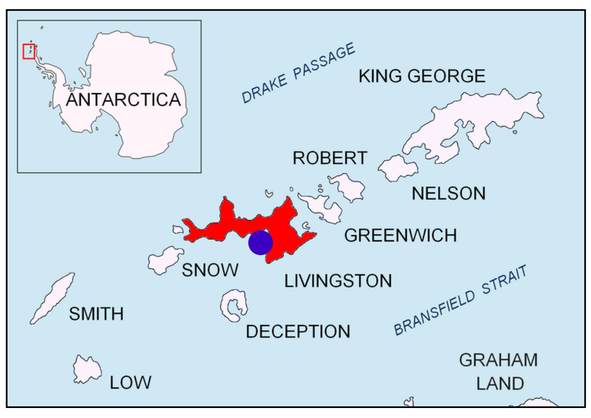
Apart from cultivating the species, which comprise the isolated BSC, and investiganting their photosynthesis tolerance metatranscriptomic as well as metagenomic analysis are performed. The generated data will enable a deeper understanding of the organisms' adaption to temperature and dessication stress. To enable comparison between material collected in Arctic and Antarctic we will analyse BSC dominated by *Nostoc* and BSC dominated by green algae (e.g. *Klebsormidium*) from each region. Furthermore, the impact of climate change events on these communities will be investigated. To complement our results we will analyse transcriptomic data of *Nostoc* and *Klebsormidium* clutures which will be exposed to similar stress conditions.



Sampling BSC

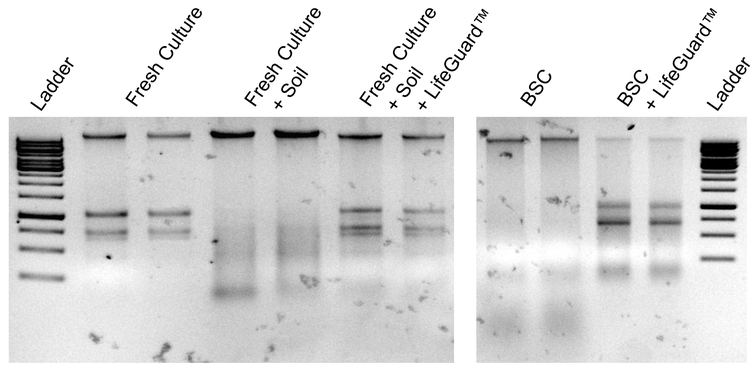
Sampling Location

BSC samples were collected during two expeditions, one to Spitsbergen (Arctic, 79° N) in August 2014 and one to Livingston sland (Antarctic, 62° S) in January 2015. Sampling locations (●) are indicated on the maps.



Sample Preservation

Nucleic acids were preserved by using MO Bio Laboratories LifeGuard™ Soil Preservation Solution. The effectivity was evaluated by extracting RNA from fresh cultures, fresh cultures blended with soil and BSC samples each treated and untreated with the agent. The results indicated a better nucleic acid quality as observable on the agarose gel below.



Nucleic Acid Extraction

CTAB-based Method

Spectrum™ Plant RNA Kit
Sigma Aldrich

Precellys Plant RNA Kit
peqlab

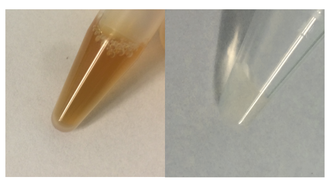
	DNA	RNA	High Humus Content	High Yield	High Quality
CTAB	+	+	+	-	+
Spectrum™	-	+	-	+	+
Precellys	+	+	+	+	-

Challenges isolating Nucleic Acids from BSC

Nucleic Acid Extraction from BSC Samples is difficult due to exo-nuclease activity, contamination with humic substances, adsorption of RNA by soil particles and low overall yields and quality [1,2].

Removal of Humic Substances

As previously described by Wang et al. (2012, 2009), a gel filtration using a MicroSpin S400 HR column (GE Healthcare) can remove a large part of the humic and fulvic acids. A nucleic acid solution before (left) and after (right) the treatment is shown below.



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[1] Wang, Y., Hayatsu, M., Fujii, T. 2012. Extraction of Bacterial RNA from Soil: Challenges and Solutions. *Microbes Environ.* Vol. 27, 2:111-121. doi:10.1264/jsme2.ME11304

[2] Wang, Y., Morimoto, S., Ogawa, N., Oomori, T., Fujii, T. 2009. An improved method to extract RNA from soil with efficient removal of humic acids. *Applied Microbiol* 107:1168-1177. doi:10.1111/j.1365-2672.2009.04298.x