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LINKAGE BETWEEN PHOTOTROPH COMMUNITY STRUCTURES AND THE PHOTOSYNTHESIS OF DIFFERENTLY PIGMENTED GROUPS OF BIOLOGICAL SOIL CRUSTS IN A HIGH ARCTIC GLACIER FORELAND, SVALBARD

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The biological soil crusts (BSC) consist of pioneer organisms such as cyanobacteria, algae, lichens, mosses, fungi, and bacteria, that colonize the soil surface and subsurface. BSC are known to serve important functions for ecological processes, for example nitrogen-fixation, considerable photosynthetic potential and carbon sink, etc. These are also of large significance under primary succession in the High Arctic tundra where the bare ground were exposed by glacier retreat. BSC serve nutrients and moisture in the soil for the following colonization of the other mosses and vascular plants. In addition to these, some studies have suggested that arctic ecosystems are particularly sensitive to climatic change. Therefore, the previous studies were carried out with the focus on the overall BSC regarding nitrogen-fixation and photosynthesis to evaluate the carbon cycling. However, the function of each phototrophs contributing to the photosynthesis of the overall BSC and linking to the community structure along the succession stages have not been revealed yet.

In this study, we tried to distinguished photosynthetic characteristics of differently pigmented three groups in BSC such as cyanobacteria, green algae and mosses, diatoms and brown algae, derived from fluorescence of phycobilin, chlorophyll *b*, chlorophyll c, respectively. To do so, we measured Light—rETR (relative electron transport rate) curves using a multi-fluorescent photosynthesis analyzer (Phyto-PAM, Walz) for collecting samples from the four sites corresponding to different stages of succession at the front of East Brøgger Glacier in Ny-Ålesund, Svalbard in July 2014, and one site is on the glacier terminal. The community compositions of differently pigmented groups were analyzed by HPLC (high-performance liquid chromatography), and the community structures were measured by 16S rRNA and 18S rRNA gene analysis.

The photosynthetic activities of the communities collecting from on the glacier terminal (Site-BSC0) were below detection limit, so that there are not remarkable phototrophs in the communities on the glacier contributing to photosynthetic production. Signals of chlorophyll c algae were not shown in the all samples. The both cyanobacteria and green algae/mosses were shown similar rETR in the closest BSC to the glacier terminal (Site-BSC1), however, the rETR derived from green algae/mosses decreased in order of Site-BSC2, Site-BSC3, Site-BSC4 with the distance from the glacier terminal. This suggests that the community structures of the BSC change with the elapsed time after deglaciation. We discuss on the relationship between photosynthetic characteristics and community structures from the pigments composition data and gene analysis of the BSC.