

## **The sea ice-algae research project during LOMROG III expedition to the Arctic Ocean in August-September 2012**

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Sea ice plays a very fundamental role in the Arctic ecology and climate. The extension in terms of square kilometer of sea ice in the Arctic Ocean is decreasing and reached a minimum of about 4 million km<sup>2</sup> in 2012 since these satellite recording started about 30 years ago. The minimum summer ice extension in the Arctic has dramatically increased the political, economic, and sovereignty interests in the area with easier access to natural resources as oil and gas in the summer ice-free areas, as well as opening of new shipping routes through the Northeast and the Northwest Passages between Europe and Asia. It must be emphasized that the winter extent of the sea ice of about 11 million km<sup>2</sup> remains stable. The reasons for these changes are multiple and complex with a focus on global warming, increased inflow of warm Atlantic water, and changed wind and current systems in the Arctic. Two persons from our research group joined the LOMROG III expedition to the Arctic Ocean in August-September 2012 on board the Swedish icebreaker ODEN. The title of our research project was "Structuring of the sea ice environment by dynamic ice-algae activity". Ice-algae are specialized phytoplankton that lives inside the sea ice and especially at the bottom of the ice. Ice-algae are microscopic plants which require light and nutrients for their growth in terms of photosynthesis. Though this environment is dark and cold, ice-algae contribute with 15-25 percent of the total production of carbon in the Arctic Ocean, and establish the first and very important part of the Arctic food chain. It is known that ice-algae can excrete chemical substances as polysaccharides and that these substances can alter and change the physical structure of the sea ice, but the ecological role of the substances is unknown. The purpose of the project was to sample ice-algae, extract and analyses the quality and quantity of these substances along with other parameters as sea ice temperature, salinity, density, nutrients, and chlorophyll-a etc. Another purpose of the project was also to measure the ice-algae photosynthesis as how much carbon can they produce for the next level in the Arctic food chain as well as their photosynthetic parameters in relation to nutrients and light. We applied for and were granted free of charge two berths with full accommodation including laboratory facilities,

helicopter transport for sampling on the ice etc. Samples of ice-algae were collected on the ice and brought back to laboratory and preserved for later and now ongoing analyses in the home laboratories. Our participation (transport, equipment, chemicals etc.) was supported by Aarhus University, the Brother Hartmann's Foundation and the Carlsberg Foundation. The research group consists of researchers from universities in Denmark, New Zealand, and Germany. Please visit our website - Sea Ice Algae Photobiology: <http://bios.au.dk/videnudveksling/fagligt/formidling/siap-sea-ice-algae-photobiology/>

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The figure shows our sampling stations (30) in the Arctic Ocean in August-September 2012 with the North Pole in the center. Station numbers are number of day in the year. The photo shows sampling on the ice with ODEN in the background.

