Spatio-temporal variation in trophic interactions of plankton communities during a high Arctic summer

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Aim

Test how trophic interactions in Arctic freshwaters are shaped by temperature and run-off from terrestrial catchments.

Background

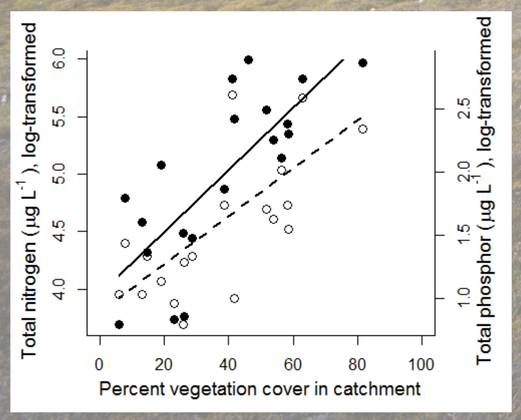
Terrestrial vegetation has a major impact on aquatic production and biodiversity through its influence on run-off patterns, nutrient and carbon fluxes. Climate driven changes in terrestrial primary productivity may modify the influx of nutrients to aquatic systems and alter primary production and trophic interactions. Temperature directly affects physiological performance in heterothemic organisms, and temperature changes due to climate change are thus predicted to have both direct and indirect effects on trophic interactions and ecosystem productivity.

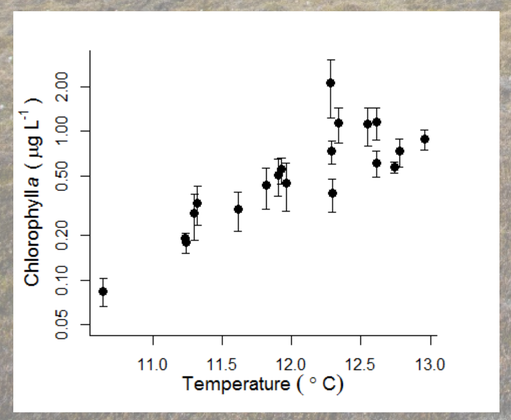
Methods

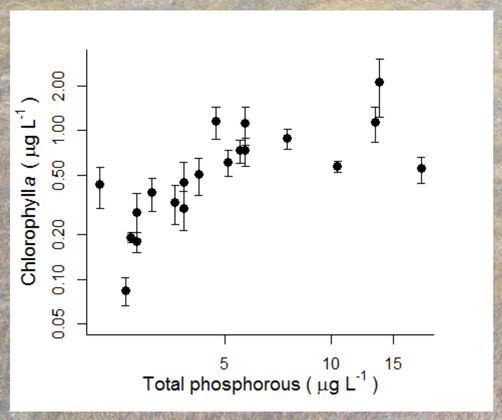
Using a space-for-time approach, the impact of terrestrial vegetation on pond water chemistry and trophic interactions was studied. A total of 21 ponds / small lakes were sampled four times with weekly intervals during the summer of 2013 at Zackenberg Research Station, Northeast Greenland. Data on water chemistry (total nitrogen, phosphorous and carbon), zooplankton and chlorophyll *a* (used as a proxy for phytoplankton biomass) were collected at each visit to the ponds. Vegetation coverage and composition in the catchments of each pond was quantified.

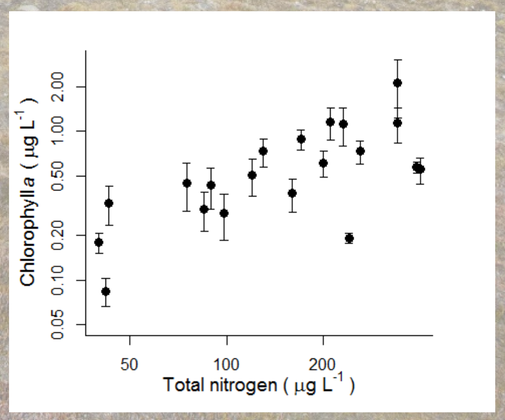
Results

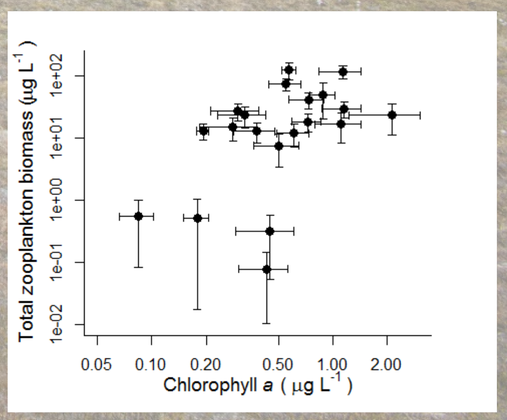
Analyses show a positive correlation between the percentage of vegetation cover in the surrounding terrain of the lakes / ponds and total nitrogen and phosphorous as well as total organic carbon. Phytoplankton biomass where positively correlated with water temperature, total phosphorous and nitrogen. Total zooplankton biomass increased with phytoplankton biomass. Results indicate that changes in vegetation composition and cover caused by climate change can alter water chemistry at a local scale and consequently impact phytoplankton biomass. This in turn may impact trophic interactions in the ponds.











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