ARCTIC 2023 – PROJECTS SELECTED FOR IMPLEMENTATION

Drivers of trophic interaction structures in Arctic environments

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ABSTRACT

The overall objective of this project is to quantify the structures of trophic networks in the Arctic, and evaluate how these network structures vary along latitude gradients. In addition, we will investigate how the structures are related to abiotic and biotic factors. Climate change is one of the key threats to current biodiversity, and climate driven biodiversity declines may have serious consequences for humanity. Arctic environments require special attention when evaluating effects of climate change on biodiversity, partly since they heat up faster than other regions, partly because they are likely to see the most dramatic effects of climate change, and partly because the Arctic holds many endemic species of high values. Arctic areas are therefore in dire need of fast and effective mitigation measures to halt climate driven biodiversity declines. In Arctic environments, climate induced range shifts are likely to cause serious ecological perturbations. A warmer climate will influence Arctic biodiversity both by altering abiotic living conditions but also by altering the structures of ecological communities. Hence, reliable estimations of climate effects on biodiversity require an understanding of the relative importance of abiotic and biotic community regulation. Most studies investigating the consequences of human induced environmental change have focused on its potential to alter species richness or species diversity. However, information about the diversity and magnitude of species interactions is critical for our ability to predict the ecological consequences of environmental change. Species interactions can easily be summarized into trophic networks, and the structures of such networks may have strong ecological consequences. We propose to combine data from these cruises with data previously collected on north Greenland, northern Ellesmere Island (Canada) and in northern Scandinavia to evaluate how trophic network structures relate to latitude and local environmental characteristics. We will work with networks describing antagonistic trophic interactions between vertebrate herbivores and consumed plants and vertebrate predators and prey. We will specifically test if we observe a shift from nested to modular network structures going from north to south in our latitude gradient, if such shifts are consistent among the two pairs of organism groups, and if there appear to be a shift in the importance of abiotic and biotic conditions for network structures along the latitude gradient. We justify the project with its high relevance for interpreting and predicting the ecological consequences of climate change in northern environments. Our study would include several unique components of Arctic biodiversity, and the team members hold significant knowledge of several charismatic species, e.g., large mammals such as muskoxen and Arctic foxes. We therefore think our project could generate a substantial interest among passengers.