Natural variability or climate change impacts on Arctic plankton communities?

Tove M. Gabrielsen, Anna Vader, Ragnheid Skogseth, Janne E. Søreide

Arctic plankton communities show strong seasonal changes in abundance, community composition and timing of life cycle events. These changes are strongly driven by light, nutrients, prey-predator interactions, temperature and hydrography. West Spitsbergen fjords have recently experienced increased heat content from inflowing warm and saline Atlantic Water originating from the West Spitsbergen Current, due to more frequent and prolonged flooding events of the West Spitsbergen Shelf. To study the effects of hydrographical conditions as well as seasonal and interannual variability on Arctic plankton communities we established a high-Arctic time series station in Isfjorden, West Spitsbergen (the IsA time series station) which has been sampled regularly since 2011. The data obtained include vertical salinity, temperature, light and fluorescence profiles as well as depth-stratified water and plankton net samples for determination of different size groups of plankton as well as metagenetic and metatranscriptomic analyses. Our analyses of the first three years of data showed high interannual variability in hydrography and in the timing and magnitude of the spring bloom which again impacted the zooplankton community. Particularly meroplankton abundances were strongly correlated with the phytoplankton biomass. The community composition of the microbial eukaryotes also displayed strong seasonality with large shifts during spring and summer. In contrast, during the light-limited polar night period, highly similar communities were observed during the three sampled winters. In spite of large interannual differences in hydrography, timing of the bloom and plankton community composition throughout spring and summer, our analyses suggest the existence of a rather resilient system that re-sets every winter. The potential influence of southern immigrants into the West Spitsbergen fjords may thus be limited by the extreme winter light conditions. Long-term time-series are essential to disentangle the effects of natural variability from climate change impacts on these high-Arctic systems.