Concentrations of sunscreens and antioxidant pigments in Arctic Calanus spp. in relation to ice cover, ultraviolet radiation, and the phytoplankton spring bloom - DTU Orbit (18/01/2019)

Concentrations of sunscreens and antioxidant pigments in Arctic Calanus spp. in relation to ice cover, ultraviolet radiation, and the phytoplankton spring bloom: MAAs and astaxanthin in copepods

Arctic zooplankton ascend to shallow depths during spring to graze on the yearly occurring phytoplankton bloom. However, in surface waters they are exposed to detrimental ultraviolet radiation (UVR) levels. Here, we quantified concentrations of substances known to have UVR-protective functions, namely mycosporine-like amino acids (MAAs) and the carotenoid astaxanthin, from March to May in Calanus finmarchicus, Calanus glacialis and Calanus hyperboreus. Ice cover was 100% in the beginning of March, started to break up during April and was gone by the end of May. UVR-exposure in the water column was tightly linked to the ice conditions and water UVR-transparency was up to 6 m (depth where 1% radiation remains). Concentrations of MAAs in C. finmarchicus and C. glacialis increased sharply during ice break-up and peaked concurrently with maximum chlorophyll a (Chl a) levels. MAA-concentrations in C. hyperboreus increased later in accordance with its later arrival to the surface. The concentration of astaxanthin increased in all three species over time but there was no synchrony with ice conditions or the phytoplankton bloom. Even though only the upper 6 m of the water column was affected by UV-radiation, MAAs in the copepods were tightly correlated to the UV-threat. Hence, changes in ice cover are projected to have a large impact on the UVR-exposure of zooplankton emphasizing the importance of the timing of zooplankton ascent from deep waters in relation to the phytoplankton bloom and the ice break-up

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