

Copepods from genus *Calanus* are the key marine mediators in the northern hemisphere. Due to their high lipid content they constitute important food source for the higher trophic levels of Arctic ecosystems (marine mammals, fish, seabirds). They are particularly important prey for to the most abundant in the northern polar region seabirds - little auks, for which they constitute the primary source of energy during breeding season and the most demanding chick-rearing period.



Preliminary observations have shown that the colour of lipids in *Calanus* varies from transparent to intense orange depending on the sampling site/predominance of different water masses or even within one sample. We assume that the lipid colour variation is related to the different content of carotenoids from their herbivorous diet. So far, the variability of carotenoids in the lipids of two *Calanus* species (*C. glacialis* and *C. finmarchicus*) in relation to the demands of its main predator has not been investigated. There are also no studies on the variability in carotenoids and their importance for the little auks. While carotenoids play an important role in colour expression in birds, which does not apply to monochromatic little auks, their significant impact on the functioning of birds organisms and immune response may be of particular importance for these birds and their chicks during the most demanding period. What is more, the proven impact of carotenoids on vision and colour perception may contribute to a more effective searching for high-quality feeding grounds by these visually oriented birds.

The aim of the ORANGE project is to investigate the variability of carotenoids in the key Arctic zooplankton species (*Calanus* copepods) and its impact on diet quality and condition of their main avian predators – planktivorous seabirds (little auks) during their breeding season. The project involves a multi-level study of the variability of carotenoids from protists through copepods to birds in various hydrographic regimes (Arctic, Atlantic and Frontal) in places where largest colonies of little auks are located – Svalbard Archipelago, Bear Island and Greenland.

Due to the differences in environmental conditions, the varying exposure to Atlantification and the slightly different diet of birds in these areas, we hypothesize that carotenoids content will differ at each level in the pathway from protists through *Calanus* copepods to little auks. We assume these differences to be differently pronounced in various hydrographic regimes and between research areas with an expected higher values in locations affected by cold water masses and in the frontal zone. As both *Calanus* species (*C. glacialis* and *C. finmarchicus*), due to their ecological plasticity, show different feeding, lipid accumulation and reproductive strategies whether they occur in their optimal conditions, we assume that the carotenoid content will be a species-specific trait and will vary depending on the prevailing environmental conditions. We expect that these differences will have a direct impact on the carotenoid content in the birds' blood and consequently their condition and survival, especially that *Calanus* copepods may act as the only source of carotenoids for these highly selective predators. The project will be a pioneering step towards determining the variability and importance of carotenoids in the prey-predator relationship on the example of key species for the functioning of vulnerable Arctic ecosystems affected by the climate oscillations.