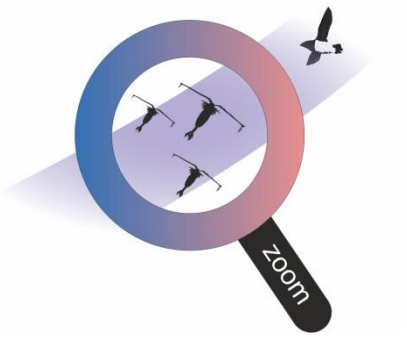
Zooming in on the mercury cycle: zooplankton in seabird diets as an indicator of contamination in Arctic ecosystems (ZOOM)



Mercury is a highly dangerous pollutant that poses serious risks to both the environment and human health worldwide. Even small amounts of mercury can be harmful, and in marine environments, it transforms into its **most toxic form, methyl mercury**. This toxin builds up in the food chain, posing a significant threat to top predators like predatory fish, seabirds, and mammals.

Arctic regions, despite having lower levels of industrial activity, face **exceptionally high mercury contamination**. This is exacerbated by global warming, which causes glaciers to melt and release large amounts of heavy metals into the marine ecosystem.

In the marine food chain, the buildup of toxins like mercury starts with tiny organisms in the plankton-rich waters. So, what happens to phytoplankton and zooplankton directly affects how much and how harmful mercury becomes as it moves up to big predators like whales, polar bears, and even humans. In the Arctic, *Calanus* copepods are key players in the food web because they're packed with fats that many fish, mammals, and birds rely on. But these copepods also carry pollutants, which predators absorb and pass on to their young and the environment.

Seabirds, are **important indicators** of environmental contamination globally. In the High Arctic, little auks (*Alle alle*) are ideal for studying bioaccumulation and biomagnification because of their large populations, specific diet of *Calanus* copepods, and high position in the food chain.

Despite existing studies on mercury contamination in seabirds like little auks, there's a significant gap in research focusing on the primary vector of contamination—zooplankton. The **ZOOM** project aims to fill this gap by investigating mercury contamination in Arctic ecosystems, focusing on **zooplankton as indicators and vectors of methyl mercury** for higher trophic levels. The study will explore how mercury moves through the food web, from tiny protists to copepods and eventually to avian predators, across different hydrographic regions influenced by Atlantification and climate change.

Our preliminary findings suggest higher mercury levels in little auks nesting in Greenland compared to those in Svalbard. This difference is likely due to varying mercury content in their diet of *Calanus* copepods, which depends on geographic location. The project will use advanced tools like **total mercury and methyl mercury analyses, genetic studies, lipid composition analysis, and stable isotopes**. It will also analyse historical data on diet and blood samples from little auks across the Arctic, crucial for understanding how mercury levels change with decreasing sea ice coverage.

By focusing on zooplankton as a key part of the mercury cycle and investigating its impacts on higher trophic levels, especially planktivorous seabirds like little auks, the **ZOOM** project aims to provide comprehensive insights into mercury pollution in Arctic ecosystems. This knowledge will help us better understand the environmental and health risks associated with mercury contamination in these remote and sensitive environments.