

Spatial and temporal variability of the hidden Arctic meroplankton diversity as a key for understanding rapidly progressing environmental changes

(HIMERO)

Meroplankton is a part of the plankton (usually small aquatic organisms freely floating in the water and transported by water movements, e.g. sea currents, waves), which spends only part of its life cycle as plankton and consists mostly of larval forms, mainly of benthic but also nektonic and littoral organisms. Meroplanktonic larvae can constitute a large portion of the zooplankton community. During spawning time (spring and summer in the Arctic) they can even outnumber the holoplankton (constant part of plankton), both in terms of abundance and biomass. These organisms are concerned to be a potential link in the pelagic food webs as an important food source for juvenile stages of fish and other zooplankton organisms. Studies also point out that meroplankton diversity may be used as an indicator of climate change. Marine benthic invertebrate larvae, are exposed to many environmental factors, such as temperature, salinity, light and food availability, and predation, because of their limited ability to move. Environmental conditions determine larval development and impact their success of settlement and colonization of new areas. Thus influence the distribution of species and impact the mutual interactions between organisms and their habitats.

The Arctic is concerned as the fastest-warming area with a double than the global increase of average sea surface air temperature over the last two decades. Therefore, sea ice and snow cover decline is observed. During the last two decades in the Arctic, the increasing inflow of warm Atlantic Water (AW) on the route of West Spitsbergen Current and further north into the Arctic Ocean has been noticed, which is responsible for the phenomenon called “Atlantification”. As a result spatial shifts of boreal and subarctic marine species far north are observed, which will escalate the pressure on indigenous species by changing their ranges of occurrence as well as will affect their species biodiversity, phenology, and functioning of the ecosystem.

The aim of the research is the identification of the temporal and spatial distribution of meroplankton and their variability within the West Spitsbergen Current and between West Spitsbergen fjords (Svalbard Archipelago) as a model system of distinct hydrological conditions and under the pressure of rapid climate changes. The project will be based on archival data collected over the decade (years 2001 – 2014), about the abundance of meroplankton occurring along with the influence of warm Atlantic waters inflow. Based on them the temporal changes under the impact of ongoing warming will be traced. Additionally, new samples will be collected for the application of advanced genetic methods which more likely reveal the hidden diversity of meroplankton. Traditional methods of meroplankton analysis based on morphological features can lead to many identification errors due to similarities between taxa from the same Phylum or Class. As a result, meroplankton diversity is underestimated. The recent studies showed that with the use of genetic methods, detailed information about the taxonomic composition of organisms is possible to obtain. In the project, the metabarcoding (high-throughput DNA sequencing) technology will be used as an accurate and fast method of analyzing the marine meroplankton assemblages for biodiversity assessment.

This study will be the first one involving long-term changes of meroplankton (over 10 years) and investigating its spatial variability of taxonomic composition over such a wide area of the Arctic. This will bring a solid knowledge about their spatial distribution and hidden diversity and the influence of environmental conditions on the formation of meroplankton assemblages. Using both traditional identification methods and modern genetic ones, we will obtain data about the abundance, types of larvae, and the so-far hidden species diversity of meroplankton.