Impact of Atlantic Water on zooplankton TAXonomical and FUNctional structure in Arctic fjords: spatial, seasonal and interannual assessment (Tax4Fun)

Arctic is the region regarded as particularly vulnerable to contemporary climate change. Since the 90s, a constant increase in intensity of transport and temperature of warm and salty Atlantic Water flowing to the Arctic is observed. In spite of the documented changes in environmental conditions, their impacts on living biota is still poorly investigated.

The main objective of this project is to answer the question, how do the zooplankton taxonomical and functional structures change, due to changes in environmental conditions, which take place because of an increasing inflow of warm Atlantic Water into the Arctic Ocean, as a consequence of climate change. Zooplankton occupy a key place in the marine food webs, therefore the changes in ecological structures of the zooplankton communities will affect the functioning of both pelagic and benthic ecosystems, with consequences for the biogeochemical cycles. The project will be based on the research in the fjords of west Spitsbergen, the area in which the state of the marine environment is shaped by a dynamic balance between cold Arctic waters, flowing over the shelf, and warm Atlantic Water, flowing alongside the continental slope as the West Spitsbergen Current. Setting of the study in this particular area gives a chance for capturing early evidence of alterations in the ecosystems as a result of climate change.

To understand how the zooplankton communities are modified following changes in environmental conditions, and what will be the effects of zooplankton modification to the ecosystem, it is necessary to know the community taxonomical and functional variability both spatially and temporarily. The project will be based on study materials collected hitherto within studies on the zooplankton ecology in the Nordic and Arctic seas, carried out by the Department of Marine Ecology IO PAN, as well as on the materials planned to be obtained during the additional project field work. The examination of zooplankton variability in the spatial dimension will be carried out based on data collected along the environmental gradient from the open sea to the fjord, and on the local, fjord scale. This will allow to unveil the relationships between the occurrence of zooplankton and characteristics of water masses, and will serve to identify potential mechanisms modifying the structure of the communities along the pathway of their transport with the water masses. The examination of zooplankton variability in the temporal dimension will be based on previously published and new data collected in the fjords of west Spitsbergen in the spring, summer and autumn in the years 2002, 2006 and 2007, and based on data collected inter-annually in the period of 2001-2016. The results of the seasonal study will serve, first of all, to identify changes in the structure of the zooplankton community in relation to the natural, seasonal dynamics. The results of the interannual study will allow to identify the changes in the structure of zooplankton taking place a result of long-term variability in hydrographic factors, caused, most probably, by the ongoing climate change. Zooplankton will be examined both in terms of taxonomical composition and abundance, and from the point of view of zooplankton species functional traits. The species functional traits include, first of all, characteristics relating to morphology (size, body structure), physiology (trophic position, nutritional demands) or ecology and behavior (habitat preferences, feeding mode, reproductive strategy).

This project will result in new, unique knowledge of the roles of zooplankton and, consequently, of functioning of marine ecosystems in the Nordic and Arctic Seas. Knowledge of the ecological structures of zooplankton, and their variability in relation to variability in environmental factors, will allow for better predicting of changes in Arctic ecosystems as a result of climate change. The results of the project will be presented during scientific conferences and will be published in peer-reviewed journals. They will also be of practical importance when preparing the basis for administrative decisions that should include environmental data.