

## **Newcomers/neo-natives in High Arctic: sources, routes and dynamics of climate change driven colonisations by macroinvertebrate models with varied dispersal potential**

Recent studies have reported the phenomenon of 'Atlantification' in the High Arctic. The alteration of the local marine ecosystems towards a more temperate state and the appearance/range expansion of subarctic-boreal species at higher latitudes is a complex phenomenon, mainly induced by the warming climate. It includes various organisms with different ecology. Svalbard Archipelago lies in the High Arctic, halfway between Norway and the North Pole. The archipelago is characterized by a great temperature difference between the west and the east coastlines, as these areas are influenced by warm and cold ocean currents, respectively. Nowadays Svalbard undergoes the fastest temperature increases, and the highest sea ice loss, within the High Arctic. Colonizers use various vectors to arrive from lower latitudes to the Arctic. Organisms with highly dispersive larval life stage drift with ocean currents. An effective dispersal for those without a pelagic larval stage can be rafting on floating objects. Drift on wood or algae is natural but recently there has been a rapid increase in the amount of plastic, which can also serve as a surface for rafting. Arctic Ocean has been reported to be the dead end for plastic transferred from Europe by the North Atlantic current. Such plastic items are exposed to encrusting by invertebrates such as bryozoans, barnacles, molluscs etc..

The basic goal of the project is to trace the routes, vectors and population demography of boreal macroinvertebrates (re)colonizing coastal habitats in High Arctic, associated with the global climate warming and rearrangement of sea current regimes. Using single nucleotide polymorphisms as molecular markers and comparative phylogeographic approach I would like to: (1) identify the source areas for the species re(appearing) on the Svalbard Archipelago, (2) define the roles of different vectors such as ocean currents, macroplastic and active dispersal in the transport of macroinvertebrates (3) analyze the level of gene flow between populations of species with different dispersal potential and determine the spatial patterns of their genetic diversity.

My principal hypotheses are: (1) If the coastal colonization of Svalbard is the direct reflection of warm Atlantic water advection, the archipelago will have a higher share of faunal elements from the Faroe- and Shetland Islands and smaller share from Iceland and North America. (2) If other mechanisms (e.g. rafting, active dispersal) play crucial roles in the transfer of macroinvertebrates, the main donor of faunal elements shall be the areas with the shortest distance to travel (northern Norway). (3) Rafting on macroplastic will play a bigger role in the transport of taxa naturally encrusting on floating substrata, while for other macroinvertebrates drifting or anthropogenic transport could be an alternative.

I will use high resolution 2b-RAD DNA sequencing method to compare the population demography, connectivity and spatial genetic structure of species with different dispersal potential. With this novel approach my project will give a comprehensive overview of the colonization processes and will identify the sources and population connectivity with high confidence and resolution even in the case of highly dispersive species. An additional pioneering aspect is genetic identification of organisms rafting/encrusting of macroplastic. So far, there has been no data published on the extent to which the floating plastic debris can contribute to the transfer of boreal organisms into the High Arctic.

The results will elucidate the effects of climate change on the dispersal of marine macroinvertebrates in the North Atlantic-Arctic region. Assessing population connectivity could give implications about what species have already established self-sustaining populations on Svalbard. Considering the role of macroplastic in the transport of macroinvertebrate taxa, my results could partially clarify the amplitude of threats introduced by the floating debris.