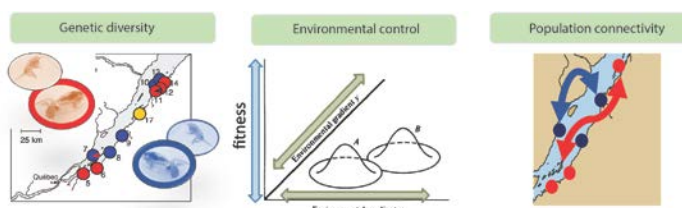
Secondary production and landscape genetics of zooplankton in the changing St. Lawrence Estuary

Backround: Biological impacts of global warming are already under way, and changes in plankton will have ecological consequences for higher trophic levels, such as fish. Thus, a pressing challenge is to increase our understanding of how organisms and populations, especially at the base of the food web, will cope with these environmental changes. To increase our ability to predict future zooplankton communities and secondary production, we need to understand their adaptation potential. In the case of estuarine zooplankton, which are already living in a highly dynamic physical and biological environment, physiological adjustment is common. Only a few species are able to thrive under the environmental constraints of the estuarine transition zone (ETZ), which is why zooplankton diversity is low, and the high productivity of these ETZs is mostly supported by a single keystone species. In the St. Lawrence Estuary, the copepod species complex *Eurytemora affinis* is predominant. Interestingly, genetically divergent sibling species exhibit distinct habitat preferences and/or divergent life history traits. Although we reported on the importance of genetic diversity in the *E. affinis* complex in relation to its distribution and differential feeding strategies, the influence of *E. affinis* genetic diversity on a range of ecosystem functions, such as productivity, remains unknown.

Project: The main objective is to disentangle the relationships between spatio-temporal production patterns, plasticity, genetic diversity, and connectivity of populations of the sibling species complex *Eurytemora affinis*. In this project, we will determine how differential eco-physiological tolerance of the two ancestral clades influence phenology and seasonal population dynamics, including phenotypic traits and biological processes such as egg production rates and mortality, throughout the environmental gradients of the estuarine transition zone. We will elucidate the connectivity (gene flow) among populations of the *E. affinis* species complex, evaluating recent connectivity or isolation among these populations, and landscape genetics will couple polymorphism with purely spatial and major environmental features.



Perspective: Since *Eurytemora* is the predominant calanoid copepod in the estuarine transition zone, the anticipated results on the spatial and temporal variability of population dynamics across an environmental mosaic may help us understand mechanisms supporting secondary production of this key zooplankton species. Better understanding of the intraspecific diversity and plasticity is likely to have general ecological implications on the overall understanding of transition zones and will lead to a new and broader mechanistic understanding of estuarine ecosystem functioning. This is an important component of predicting future estuarine populations, especially in view of potential adaptation to the changing environment, due to anthropogenic pressure and climate change.

Additional information and thesis supervision: Gesche Winkler, Supervisor.