

Local adaptation of freshwater bacteria communities to environmental conditions

Over the last century, the level of atmospheric CO₂ has increased to the highest concentrations on Earth within the past 800'000 years. Current predictions anticipate that the effects of greenhouse gases will lead to a rise in air temperature ranging between 1.4 and 5.8°C. Oceans and freshwater ecosystems absorb large quantities of CO₂, but are sensitive to global climate change that directly influences water temperature and pH. Specifically, phytoplankton accounts for approximately 50% of the total photosynthesis on Earth, and contributes to the mobilization of CO₂ through sinking or transferring fixed carbon to deeper water layers and sediments. Bacteria are among the most abundant entities in plankton and play a major role on the biological pump for the cycling of carbon and other elements.

In order to understand and anticipate the response of aquatic ecosystems to climate change, we need to characterize how planktonic organisms respond and adapt to environmental change. In this project, we will merge microbial ecology and genomics with the ultimate goals of (i) characterizing current ecological niches of the operational taxonomic units highlighted in bacteria populations of Lake Geneva, (ii) identifying candidate adaptive genes responsible for adaptation of freshwater bacterial communities to contrasting freshwater habitats, (iii) projecting current bacteria distributions as a function of the expected change and (iv) identifying possible alterations in ecosystem functioning and services as a function of climate change. By doing this, we expect to contribute expanding our ability to characterize ecological niches using genetic data and sensitizing society about the importance of protecting freshwater ecosystems.

We are looking for an enthusiastic student interested in conducting a field sampling using the LÉXPLORE platform (<https://wp.unil.ch/lexplore/>) and learning to detect and characterize bacterial communities in the aquatic ecosystems. The candidate will be trained in basic microbiology techniques, molecular biology tools and nucleic acid sequencing. For more information, please contact Dr. Anna Carratalà (anna.carratala@epfl.ch).