

Response of phytoplankton biodiversity to climate change in the Saint Lawrence Estuary: a palaeogenomic study

Description: We are looking for a motivated student to complete a two-year MSc research project in palaeogenomics on the variations of marine phytoplankton diversity in relation to Holocene climate change in the Saint-Lawrence Estuary.

Background: Recently, ancient sedimentary DNA (seda DNA) has revolutionized our understanding of the responses of pelagic biodiversity to past environmental change. The estimation of species richness in the environment has been facilitated by new high-throughput sequencing technologies. Considering the diversity of primary producers (phytoplankton), there are very few species leaving fossil traces (e.g. frustules, thecae, coccoliths) in the sediments attesting to their existence in the past. This leads to a lack of observations, which hampers the reconstruction of ancient aquatic environments. However, some of the DNA of these organisms seems to accumulate, and be preserved over time in the sediments of lakes, rivers and oceans. These palaeogenetic fingerprints are proving to be an original way of measuring changes in phytoplankton species richness over time in order to empirically reconstruct past pelagic ecosystems. The Saint-Lawrence Estuary is a unique and original environment. Although it is currently subject to the consequences of human activity (global warming and abnormal nutrient enrichment (eutrophication)), it is by far one of the most productive estuaries in the world, as well as being one of the most diverse in terms of phytoplankton. Moreover, the sediments are formed in a low oxygen layer, which preserves more effectively the organic matter of pelagic organisms, including their DNA, which is deposited there.

Project: This Master's project proposes to generate environmental libraries of seda DNA from sediment cores collected in the St-Lawrence Estuary. These libraries will allow to characterize and evaluate the impact of climate and nutrient changes following the last ice age and those related to human activity.

Framework: The internship will be carried out as part of a Master's degree in oceanography at Institut des sciences de la mer de Rimouski (ISMER) de l'Université du Québec à Rimouski (UQAR). Throughout this internship, the student will work in a dynamic, multidisciplinary environment, where they will develop their knowledge and skills in bioinformatics, palaeogenomics, plankton ecology, marine geology and Quaternary geology. The candidate will also have the opportunity to complete training in oceanography through fieldtrips at sea. The laboratory of Prof. Bendif puts forward a mode of supervision that supports the originality of research work and the personalization of ideas. In order for all students to develop their full academic potential, the supervisory teams wish to provide an equitable, diverse and inclusive environment that inspires students to explore the functioning and evolution of aquatic systems in relation to their global importance.

Funding: A two-year scholarship is available for the successful candidate. Research costs are fully covered by the project. Other funding opportunities may be available for dissemination activities, through UQAR student support funds and the Québec-Océan research cluster.

Research areas: Biology, molecular ecology, Quaternary geology, metagenomics, oceanography

Requirements and conditions:

- Bachelor's degree in biology, ecology, geology or other disciplines related to the project
- Demonstrate a strong interest for research in oceanography
- Those with atypical academic backgrounds are encouraged to detail what they learned from their experiences in their cover letter;
- Experience in computer science or molecular biology would be an asset.

Application: Please send your CV, transcripts and a letter of motivation including the contact details of two referees, to the attention of El Mahdi Bendif, elmahdi_bendif@uqar.ca, before the 1st of February 2023.

Please note that ISMER is able to offer assistance during the recruitment process. We invite you to share your needs with us if necessary. ISMER places great importance on the diversity of its student community where individual differences are recognized, appreciated, respected and valued, in order to develop the full potential of each person and to take advantage of their talents and strengths. For more information on possible assistance, we invite you to contact Maxence St-Onge, Equity, Diversity and Inclusion Research Officer, maxence_st-onge@uqar.ca

For more information: Feel free to contact Prof. El Mahdi Bendif, ISMER-Université du Québec à Rimouski, elmahdi_bendif@uqar.ca