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Global warming is one of the major issues currently confronting mankind, with vital ecological and economic consequences. The climate is changing rapidly, possibly at a faster rate than at any time in the last ten thousand years. To understand this change and predict its impact on ecosystems and biota, we need to analyse the Earth archives where past changes and their consequences were trapped and stored. Lake sediments represent such archives. However, for different reasons, lakes with very long sediment records are rare throughout the world. Here we have a unique opportunity to study a lake of tectonic origin with exceptionally long sediment sequence in Central America. Lake Petén Itzá is located in Guatemala, and its sediment represents more than 200,000 years of climatic history. With the present project, we want to analyse the sediment taken from the lake and reconstruct the climate oscillation over the last 200,000 years. We also want to discover how the environmental changes influenced the biota and biodiversity of the lake. We are interested in how the lake ecosystem as a whole responded on climatic oscillations, if there was a change in its trophic status (i.e. if it was oscillating between nutrient poor and rich states) and how it affected the biota. Last, we want to disentangle the development of one of the most common aquatic organisms (Chironomidae) in the lake.

Because of the lack of instrumental data, i.e. measured environmental variables, in the past, palaeoecologists use proxy data to reconstruct past climate conditions. These proxy data are preserved physical characteristics of the environment that can stand in for direct measurements. By analysing records taken from e.g., tree rings, ice cores, fossil pollen and biota remains, etc., we are able to broaden our understanding of past climate and biota far beyond the instrumental record. In the present project, remains of the Chironomidae family in the lake sediment will be used as proxy to reconstruct past environmental change. Chironomidae is an insect family widely distributed among freshwaters all over the world. Their specific ecological requirements together with the good preservation of their chitinous head capsules in lake sediments make them a perfect tool for palaeoecological studies.

To meet the objectives of the project, we will take sub-samples from the long sediment core of Lake Petén Itzá, process it, mount and identify the chironomid remains, analyse the results statistically and model the climate change in the past 200,000 years. The combination of the length of the sediment core encompassing the last 200 000 years, together with the locality, where such studies are scarce (Central America), and the multi-proxy approach that is going to be used to analyse the environmental changes in the past, makes the project particularly important and unique.