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## A glimpse into the past with foraminifera

The last interglacial, the Eemian, represents the climate 130 thousand years before present. It is impossible for us to directly measure and reconstruct the environment from that time, and that is why the study of environmental proxies, that can indirectly tell us more about the past, is important. With the use of geochemistry of fossil bottom-dwelling foraminifera, we can indirectly recreate the living conditions of their past. Our climate today is changing, with those changes come different factors to be considered, and it is believed that the reconstruction of the past can improve the understanding of our future climate.

Material from three stations in the Baltic Sea region was derived from older studies and represent the island of Anholt in Kattegat, Ristinge in the Danish straits and Obrzynowo in the coast of Gdańsk. Sediment samples from these stations have been picked for specific species of a microorganism with calcareous shell, the foraminifera, the species are *Bulimina marginata* and *Hyalinea balthica* for Anholt and *Ammonia batava* and *Elphidium clavatum* for Ristinge and Obrzynowo. The samples have been analysed for the elements: Magnesium, Barium, Manganese, and the major element Calcium, these have been incorporated in the foraminifera's calcitic shell during their growth. The data are presented as ratio between Element/Ca. This was done with ICP-OES. The stable isotopes of oxygen and carbon in the shells were analysed with a mass spectrometer.



A SEM image of *Bulimina marginata*

With calibrations generated from modern-day foraminifera, the Mg/Ca was used to reconstruct absolute temperatures of the bottom water conditions that prevailed under the Eemian interglacial. Whereas the Mg/Ca can result in temperature, the Ba/Ca can indicate salinity and the Mn/Ca, possible oxygen content. The results from carbon isotope can complement the Mn/Ca element measurements as they indicate the grade of oxygenation of the bottom waters. The oxygen isotope can help with the estimation of the degree of river water input and an indication of apparent glacial or interglacial conditions when coupled with the Ba/Ca measurements.

What the results of this thesis showed is that during the Eemian, the bottom water temperatures were generally higher, although some contradicting results were present. A plausible explanation could be the seasonal response and preference of foraminifera of different species. The comparison between the three stations (Anholt, Ristinge and Obrzynowo) showed a gradual change from more saline to the more brackish environment following the three stations Anholt, Ristinge and Obrzynowo, respectively. The oxygen conditions imply a strong stratification and relatively low oxygen levels. An exception to the stagnant conditions, Ristinge station showed that the sea level rise and passage of water through the Danish Straits resulted in relatively oxygenated bottom waters as opposed to the other stations.

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