

# THE EEMIAN BALTIC SEA HYDROGRAPHY AND PALEOENVIRONMENT BASED ON FORAMINIFERAL GEOCHEMISTRY



## Background & Aims

Microfossil records from Anholt (Kattegat), Ristinge (the Danish straits) and Obrzynowo (the Southern Baltic- coast) representing the last interglacial Eem (130- 118 ka B.P) were generated. The geochemistry of benthic foraminifera was investigated to reconstruct the Eemian Baltic Sea hydrography and paleoenvironment. The paleo-environmental proxies were: the trace elements Mg/Ca, Ba/Ca, and Mn/Ca as well as stable oxygen and carbon isotopes ( $\delta^{18}\text{O}$  and  $\delta^{13}\text{C}$ ), coupled with data from previous studies and modern hydrography.

- Contribution of proxy data for the paleoclimatic reconstructions of the Baltic from the Eem interglacial period.
- Reconstruction of environmental conditions with foraminiferal geochemistry
- Absolute bottom water temperatures, oxygen level variations in the bottom waters throughout the Eemian as well as if there is a correlation between Eemian and the present conditions and how it might reflect on increasing low oxygen levels in the modern Baltic Sea.

## Results

### Anholt

*Bulimina marginata* 8.2°C (6.4-9.9°C)

*Hyalinea balthica* 8.5°C (7.9-9.3°C)

→ closely comparable to modern day hydrography

### Ristinge

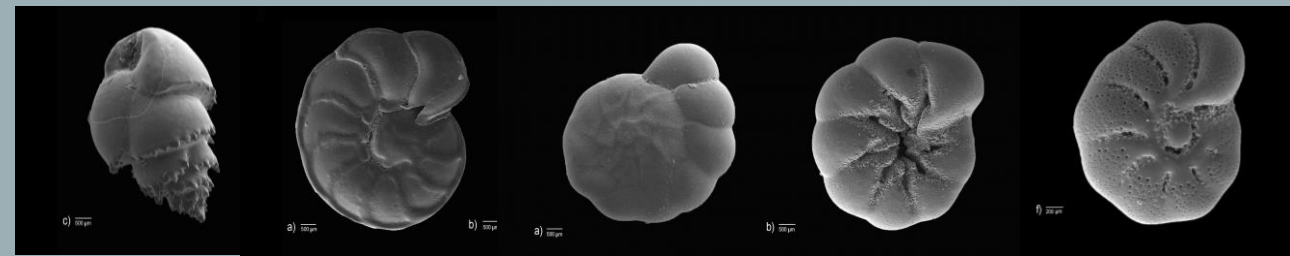
*Ammonia batava* 8.9°C (4.0- 12.7°C) → warmer than present

*Elphidium clavatum* 4.1°C (2.4-7.1°C) → colder (seasonal response)

### Obrzynowo

*Ammonia batava* 12.2°C (10.3-15.7°C) → warmer than present

*Elphidium clavatum* 4.2°C (3.6- 6.2°C) → colder (seasonal response)



## Methods

- Foraminifera picking and cleaning → ICP- OES → (Mg, Ba, Mn) → Species specific temperature calibrations using Mg/Ca → Temperature
- Isotope analysis, mass spectrometer → stable isotopes  $\delta^{18}\text{O}$  and  $\delta^{13}\text{C}$
- Modern hydrographic measurements from Baltic Nest

## Conclusions

The results indicate generally warmer bottom water temperatures than modern data, albeit for *E.clavatum* and *B. marginata* the results are contradictory and could be a result of seasonal response for shell calcification and incorporation of trace elements. The comparison of the three stations (Anholt, Ristinge and Obrzynowo) show a gradient from marine to gradually more brackish environmental conditions. The oxygen conditions imply a strong stratification and relatively low oxygen levels, except in Ristinge where the transgression the of Danish Straits resulted in relatively ventilated bottom waters as opposed to the other stations. The foraminiferal geochemistry is shown to contribute to absolute temperature and tentative paleoenvironment reconstructions that can be used as a past analogue for present changes in the environment.

