



Ba/Ca, P/Ca, Li/Ca and Mn/Ca ratios in the deep-sea bivalve *Acesta excavata*: Valuable tools to reconstruct plankton dynamics in cold-water coral ecosystems?

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Phytoplankton is one of the most important producers of oxygen, and plays an important role in the export of large amounts of carbon to the deeper ocean. Since phytoplankton is also the basis of most food webs in the ocean, understanding the dynamic system of phytoplankton is a crucial part to understand past carbon- and nutrient cycles and paleoclimatic changes. The export of nutrients is also an important factor impacting cold-water coral (CWC) reefs and may play a role in controlling their distribution. Here we present laser ablation inductively coupled mass spectrometer (LA-ICP-MS) Element/Ca measurements from *Acesta excavata*, a file clam, often associated with cold-water coral reefs along the European continental margin. Environmental parameters were recorded with lander systems directly deployed in the CWC reefs, which allows us to compare our geochemical data to in-situ ocean data.

Our results reveal, that Ba/Ca ratios show stable baseline values with intermittent sharp peaks. The location of these peaks in between major growth lines and temperature reconstructions with Mg/Sr ratios (Schleinkofer et al., submitted) show that these peaks occur during Winter and are repeatable between samples from the same location. This indicates a strong external forcing mechanism and allows cross-dating of different bivalve shells. While the occurrence of Ba/Ca peaks correlates with phytoplankton maxima, the absolute Ba/Ca ratio does not correlate with the phytoplankton abundance.

Mn/Ca ratios show similar trends as Ba/Ca ratios but the peaks are phase shifted and occur slightly delayed. These peaks could be triggered by decreasing oxygen concentrations in the water caused by the decomposition of organic material.

As *A. excavata* does not show easily distinguishable growth lines under the light microscope despite of Mutvei staining or fluorescence microscopy, we hypothesize that P/Ca ratios might be usable to locate highly phosphorylated shell areas that usually correlate with major growth lines. P/Ca ratios show no perceivable features in the vicinity of major growth lines. Instead we recognize that Ba/Ca peaks follow a minimum in P/Ca which is possibly caused by the uptake of

phosphor by plankton.

These results suggest that *A. excavata* have potential as a promising tool for high resolution paleoenvironmental reconstructions of both intermediate and overlying surface water masses.

References

Schleinkofer N, Raddatz J, Evans D, Gerdes A, Flögel S, Voigt S, et al. Elemental to calcium ratios in the marine bivalve *Acesta excavata*: an archive for high-resolution paleoceanographic reconstructions of intermediate water masses. PLoS One. Submitted