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CALIBRATION AND VALIDATION OF THE MUSSEL MYTILUS EDULIS AS AN ENVIRONMENTAL ARCHIVE

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Previous studies on the mussel Mytilus have highlighted the potential of these bivalves as recorders of their environment. The chemical or isotopic composition of calcareous skeletons have long been recognized as archives of past and present environmental conditions. Oxygen isotopes ($\delta ^{18}$O) of biogenic carbonates are a powerful proxy of SST, although usually dominated by SST, salinity (SSS) also significantly effects the oxygen isotopic signal recorded in the carbonate. This has led researchers to explore new proxies independent of SSS. In this study we further investigate the validity of Mytilus edulis as an environmental archive through detailed field and laboratory based experiments. Mussels were grown for more than one year in four sites along the Schelde estuary in Belgium and The Netherlands. The salinity gradient ranged from 15 to 28. Monthly water samples were analyzed for a full suite of oceanographic parameters and temperature was continuously recorded. In the laboratory, mussels were acclimated over one month and grown under varying temperatures in two salinities (25 and 35) for more than one month, while water was monitored two to three times per week. In the calcite layer of the shell, microsamples were milled using a 300 μm drill and reacted in a Kiel III coupled to a Delta+XL IRMS for $\delta ^{18}$O and $\delta ^{13}$C analysis. Laser Ablation ICP-MS was used for precise sampling and analysis of B, Mg, Ca, Sr, Ba and Pb.
Preliminary stable isotope data illustrate the importance of a salinity independent temperature (or salinity) proxy in estuarine bivalves. All four sites experienced similar temperature regimes, but shells from the two extreme sites had large discrepancies in

$\delta ^{18}$O. The more marine shell ranged from -1.6 per mille to $+1.6$ per mille, whereas the shell from the brackish site had $\delta ^{18}$O values ranging from -3.7 per mille to -1.0 per mille. $\delta ^{13}$C ranged from near zero to -3.8 per mille in the marine shell and from -6.2 per mille to -9 per mille in the brackish shell. Although $\delta ^{13}$C has been proposed as an indirect salinity proxy, recent studies have shown that $\delta ^{13}$C signals in bivalves are heavily complicated by vital effects. Ongoing elemental analysis should reveal if any of the elements listed above are reliable proxies of either salinity or temperature (or other environmental conditions) and will be compared with the controlled laboratory experiment.