

BIVALVES AS ENVIRONMENTAL ARCHIVES

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The chemical or isotopic composition of calcareous skeletons have long been recognised as archives of past and present environmental conditions. Although many methods have been developed, only recently has the potential of in-situ ultra-high resolution analysis of elements using Laser Ablation ICP-MS and micro-milling been evaluated. Recent studies have revealed that bivalves have the potential to be a high-resolution proxy of sea surface temperature (SST), precipitation, phytoplankton biomass (productivity), pH and heavy metal contamination. Oxygen isotopes ($\delta^{18}\text{O}$) of biogenic carbonates are a powerful proxy of SST, however salinity (SSS) significantly affects the oxygen isotopic signal recorded in the carbonate. This has led researchers to explore new proxies, which are independent of SSS. These 'new' proxies must be at least as reliable as $\delta^{18}\text{O}$. To be sure an environmental forcing is dominant in these signals, they should be reproducible between coexisting specimens.

To test the robustness of these proxies we are analyzing the shell material from many species bivalves including *Mytilus edulis*, *Modiolus modiolus*, *Mercenaria mercenaria*, and *Saxidomus giganteus*. Initial results show that expected temperature proxies are not straightforward; however, more work is needed on this topic. Barium signals in all shells analyzed to date have reproducible sharp peaks, apparently synchronized with the spring phytoplankton bloom. Through controlled laboratory experiments we are currently testing the link between both particulate and dissolved Ba and the signal recorded in the shell. Heavy metal pollution in estuaries is widespread. We are currently analyzing shells that grew along a strong pollution gradient in a Norwegian fjord. To ascertain the atmospheric and direct lead pollution to the coastal environment we are also analyzing a >70 year chronology of carbonate produced by clams along the East Coast of the US. We will present preliminary results from the experiments listed above.