

Experimental calibration of the oxygen-isotope palaeotemperature proxy in the shells of the bivalves *Mytilus edulis* and *Pecten maximus*

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The shells of bivalves may serve as important archives of palaeoenvironmental information and can provide high-resolution records of past and present ocean climate. Species-specific experimental calibrations allow for improved accuracy in palaeoenvironmental reconstructions through a better constrain on the uncertainties and variability in the oxygen-isotope palaeotemperature proxy associated with the deposition of biogenic carbonate. Stable oxygen-isotopes were determined in the shell calcite of the bivalves *Mytilus edulis* and *Pecten maximus*, as part of a study on the experimental evaluation and validation of geochemical proxies in bivalves, particularly on the validation of Mg/Ca as a palaeotemperature proxy. Animals were grown under constant temperatures (10°C to 20°C) in a laboratory culture experiment and under *in situ* conditions in a one-year field culture experiment. Environmental and biological parameters such as seawater temperature, salinity, $\delta^{18}\text{O}_{\text{water}}$, shell growth rate and metabolic activity were monitored for the duration of the experiments. No trend of $\delta^{18}\text{O}_{\text{calcite}}$ with shell size, growth rate or respiration rate was observed for the shell calcite of *Mytilus edulis* and *P. maximus*. Comparison of the stable oxygen-isotope data obtained in the present study for *M. edulis* and *P. maximus* to published inorganic calcite as well as to species-specific equilibrium equations, confirms deposition of shell calcite at or close to isotope equilibrium with ambient seawater. Nevertheless, species-specific equations for *M. edulis* are able to better reconstruct measured temperatures than the inorganic calcite equation, which is not the case for *P. maximus*. The broad modern and palaeogeographic distribution of these two bivalve species and of related species (e.g. *Mytilus galloprovincialis* and *Pecten jacobaeus*), the lack of intra-species biological effects and the precipitation of shell calcite at or near oxygen isotope equilibrium make it an ideal nearshore palaeotemperature proxy in much of the North Atlantic Ocean and Mediterranean Sea, *namely reconstructions studies using shell middens which include these bivalve species*.