

RECONSTRUCTION OF ENVIRONMENTAL CONDITIONS AT THE BELGIAN COASTAL AREA OVER THE PAST 700-800 YEARS USING *MYTILUS EDULIS* SHELLS

Meert Ivy, David P. Gillikin and Frank Dehairs

Department of Analytical and Environmental Chemistry, Vrije Universiteit Brussel
Pleinlaan 2, B-1050 Brussels, Belgium
E-mail: imeert@vub.ac.be

It is generally accepted that mollusc shells are precipitated in oxygen isotopic equilibrium with the surrounding environment and that their isotopic signature is set by the prevailing environmental conditions such as temperature and salinity. This fact ensures that molluscs have the potential to be recorders of their environment. Mollusc shell $\delta^{18}\text{O}$ has been shown to be influenced by temperature and salinity. The correlation between mollusc shell $\delta^{13}\text{C}$ and environmental conditions is more complex, and has been shown to be related to environmental parameters such as salinity, as well as to physiological parameters. We made use of these characteristics to investigate whether mussel shells are potential archives for reconstructing climate change over the last millennium in NW Europe. Our aim was to answer the following questions: (i) What is the temperature, salinity and precipitation trend throughout the last 700-800 years for the Belgian coastal area, based on the $\delta^{18}\text{O}$ record of *Mytilus edulis* shells? (ii) Can the $\delta^{13}\text{C}$ signal of *M. edulis* shells give an indication of salinity variation over the past 800 years? (iii) Do trace and/or minor elements in archaeological *M. edulis* shells record temperature and salinity? and (iv) Did *M. edulis* shells record pollution events? Archaeological *Mytilus edulis* shells were collected from Oostkerke (Monnikerede) and Brugge, Belgium and recent *M. edulis* shells from Knokke, Belgium. The dating of the archaeological shells was done by assigning them the same age as the archaeological that were in the same stratigraphic layer. They are between ~ 800 to ~ 100 years old. They probably originated from the close by eastern coast of Belgium (The Zwin), since in this area long distance importation of mussels was not commonly done until the 19th century AD. Before proceeding with isotope analysis, it was safe to verify whether the isotopic signal of the archaeological shells underwent diagenesis. This was done by (i) a cooking experiment with modern shells, (ii) comparing of the oxygen and carbon isotopic signals of calcite and aragonite within single archaeological shells and (iii) comparing the minor and trace element contents of archaeological shells with those observed in modern shells. These experiments indicated that pre-recrystallisation diagenesis occurred, affecting the original trace element composition, but not the original stable oxygen and carbon isotope composition. Therefore, we could make use of the oxygen and carbon stable isotope compositions of the calcitic layer of the archaeological *Mytilus edulis* shells as proxies for environmental variables. Based on the $\delta^{18}\text{O}$ and the $\delta^{13}\text{C}$ records we conclude that there is an overall trend throughout the past 700-800 years of decreased salinity, increased precipitation and increased temperature. However, the relative contribution of the salinity change is larger than the one of the temperature change and there is no sign of anomalous warming during the last century.