

Palaeoclimatology potential of the  
Australian floodplain mussel,  
*Velesunio ambiguus*

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## **PALAEOCLIMATOLOGY POTENTIAL OF *VELESUNIO AMBIGUUS***

### **ABSTRACT**

A study of the Australian floodplain mussel, *Velesunio ambiguus*, from Lake Alexandrina, South Australia, was conducted to assess its suitability as a palaeo-climate and -environment indicator. Using 57 shell samples from two sites, the study was based upon the analysis of the macro-structure, micro-morphology and elemental geochemistry of growth increments of the aragonitic shells. Light microscopy and scanning electron microscopy (SEM) analysis of resin-impregnated cross-sections revealed the nature of shell growth increments. Measurements of growth increment frequency and width, with comparison to instrumental temperature and water chemistry data, were used to decipher the environmental controls over mussel growth rate. These comparisons also provide a validation of annual growth periodicity, and ages of shells were estimated to be between four and 15 years. Micro-morphology measurements from SEM analysis of three samples revealed 67 to 374 micro-increments (tabular aragonitic crystallites) per growth increment that may imply a daily periodicity. Micro-increment widths commonly exhibit a bimodal pattern, with overall increase, across growth increments. Laser-ablation inductively-coupled-plasma mass-spectrometry (LA-ICP-MS) analysis of a suite of elements revealed a variety of signals. Although strong patterns were not observed for established palaeo-climate and -environmental indices such as Mg/Ca (temperature) and Sr/Ca (salinity), Ba/Ca and Mn/Ca ratios often exhibited bimodal oscillations, similar to micro-increment widths, with concentrations increasing over the course of the growing year. Ba/Ca and Mn/Ca ratios were suggested to reflect intra-annual fluctuations in primary productivity in the lake, which is an indirect function of regional hydrology and climate. This interpretation is supported by the similarity of micro-increment widths, as growth rate of the primary consumer (the mussel) varies with food availability. This study highlights the potential of *Velesunio ambiguus* as a recorder of intra-annual lake productivity and hydrology, however further studies are necessary to improve the interpretation of data before application to the fossil record.

### **KEYWORDS**

Sclerochronology, bivalves, environment, *Velesunio ambiguus*, micromorphology, geochemistry, growth increments, aragonite

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