

Daydacna, how old is my clam? A python-based tool to generate internal age models based on (daily) geochemical cycles

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Bivalve shells exhibit incremental, banded growth patterns similar to tree rings. In the shells of giant clams (*Tridacna*), both seasonal (macroscopically visible) and daily (resolvable under a microscope) growth increments can be observed. These increments are accompanied by changes in the shell's chemical composition. Daily cycles in elemental ratios are most clearly developed in Mg/Ca and Sr/Ca.

The Python-based tool Daydacna provides a method for analysing daily variations in growth rates by quantifying the lengths of the daily geochemical cycles using wavelet transformation. This allows for a simple comparison between growth rates and elemental composition of the shell, facilitating the identification of potential (co)dependencies between these parameters.

Daydacna generates an internal age model through automated wavelength detection, with an option for manual correction. Subsequently, the data is converted from a distance-based to a time-based scale. Time-resolved datasets enhance our ability to analyse the timing of seasonal environmental changes that influence the shell's elemental and isotopic composition. Additionally, it enables time series analyses, offering a more reliable basis for studies of seasonal to multi-annual cyclic climate patterns.

Although Daydacna was initially developed for the analysis of daily cycles in Tridacnids, it is also applicable to other archives, datasets, or cyclicities.