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Sclerochronological study of a dog cockle (Glycymeris glycymeris L.) population from the Madeira Islands

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The use of the annual increments in the shell of the abundant dog cockle (Glycymeris glycymeris L.) in sclerochronological studies has been demonstrated to be a valid method to reconstruct oceanographic variability in the North Atlantic region [1,2]. However, the sclerochronological potential of the species has not been investigated at the southern limit of its distribution, at the southern North East Atlantic. Therefore the first aim of our study was to analyse growth patterns of G. glycymeris specimens collected around the Madeira Islands to understand which environmental variable has the strongest limiting effect on their growth. The second aim was to find out whether G. glycymeris could be used to build chronologies for sea surface temperature (SST) reconstruction for the region. In 2013 a group of dead shells were collected near the Desertas Islands, Madeira, at 80-300 m water depth range, together with two living specimens. The live collected shells were relatively young (<37 years) while the dead shells proved to have much higher ontogenetic ages (up to 164 years). All groups showed similar ontogenetic trends, however, the average growth rate in the shallower environment was higher in the first four years of their life compared to the deeper collection sites. Subsets of the Madeira (n=18) samples could be collected into a robust chronology: between 1950 and 2000 the value of the expressed population signal EPS was found to be higher than 0.8. In this time interval their composite chronology exhibited negative correlation ($r=-0.6$, $p<0.1$.) with the averaged February-May SST fields around Madeira. At the same time, it correlated positively ($r>0.8$) with the averaged February satellite derived Chlorophyll (Chl) concentrations in the region, although this data was available only between 1998 and 2012.
Our results suggest that the relationship between shell growth of G. glycymeris and SST is complex and not direct. In contrast with the northern populations the low water temperature was not a limiting environmental factor for the shells. Chl concentration of the surface water around the Madeira Islands usually exhibits a maximum in February or March (spring phytoplankton bloom) when vertical mixing is the most intensive and SST is the lowest during the year. This could explain the negative correlation between the shell growth and SST. The vertical mixing, timing and the intensity of the blooms are controlled by regional atmospheric patterns, such as the North Atlantic Oscillation (NAO) [3].

[1] Brocas, W.M., Reynolds, D.J., Butler, P.G., Richardson, C.A., Scourse, J.D., Ridgway, I.D., Ramsay, K., 2013. The dog cockle, Glycymeris glycymeris (L.), a new annually resolved sclerochronological archive for the Irish Sea. Paleogeogr. Paleoclimatol. Palaeoecol. 373, 133-140.
[2] Reynolds, D.J., Butler, P.G., Williams, S.M., Scourse, J.D., Richardson, C.A., Wanamaker, A.D., Austin, W.E.N., Cage, A.G., 2013. A multiproxy reconstruction of Hebridean (NW Scotland) spring sea surface temperatures between AD 1805 and 2010. Paleogeogr. Paleoclimatol. Paleoecol. 386, 275-285.
[3] Bashmachnikov, I., Belonenko, T.V., Koldunov, A.V., 2013 Intra-annual and interannual non-stationary cycles of chlorophyll concentration in the Northeast Atlantic. Remote Sens. of Environ. 137, 55–68.