



Supplementary Information: Reproducibility

Overlapping Mg/Li records from high-resolution trace element profiles V and VI showing how the chemical composition of different contemporaneously mineralized parts of the *T. sanchezi* shell compare. Proxy records from both profiles reflect the same variation even on the scale of 10s of micrometers. The fit is not perfect and profile VI has higher values showing that there is some lateral variability within the shell. Note that small errors in aligning the records result in large variations in the correlation statistics between the records, owing to the difficulty of aligning records on the micrometer scale. Furthermore, measurement error (see error bar) and small differences in the alignment of the rectangular LA-ICP-MS spot may also result in differences between the records.