



Preservation of environmental signals within fossil body size distributions

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When compiling about 6000 interval-to-interval changes in marine taxa across spatio-temporal scales, shelled cephalopods prove to be particularly strong responders compared to many other taxa. As evidenced by individual case studies, the underlying mechanisms for decrease in size can still be multifold: extinction of large species at the assemblage level, increase of the proportion of juveniles at the population level or reduction of individual adult size.

If we study size fluctuations in belemnite assemblages across the Pliensbachian-Toarcian crisis, we see the largest size decrease in belemnite assemblages in Peniche across the boundary where their strong evidence for rapid warming and volcanism. It seems to be mainly driven by decrease in adult size of the most common belemnite taxon. However, no major taxonomic turnover is observed which happens across the TOAE in other regions which also correspond with a bottleneck in size distribution.

If we go further back to Late Devonian, we see that environmental differences play an important part in controlling size distribution of individual ammonoid species. Black shales often yield the smallest specimens. In the case of Gephuroceratinae, it seem be driven by dominance of juveniles rather than stunted adults. This might be a true pattern rather than a taphonomic artefact as both anaptychi and conchs indicate similar maximum sizes. In the case of Sporadoceratidae, lithology explains more of the size distribution than taxonomy or type of collecting. Marls also typically yield larger specimens within particular species than limestones. It is tempting to attribute this to environmental differences but further work need to be done to rule out preservational or collection biases.