BIOMETRIC BOREDOM IN THE GENUS *GLOTTIDIA* (BRACHIOPODA): IMPLICATIONS FOR THE FOSSIL RECORD OF LINGULIDE DIVERSITY

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The family Lingulidae (Brachiopoda) is a group of inarticulate, organophosphatic shelled brachiopods that has undergone little morphological change since the Paleozoic. Throughout its evolutionary history, the group has had low taxonomic diversity. Is this observed bradytely an evolutionary phenomenon or a side-effect of uniformity in shell morphology? We analyzed shell biometry in four extant species of the genus *Glottidia (G. albida, G. audebarti, G. palmeri, G. pyramidata)* to evaluate how many morpho-species can be distinguished using only the fossilizable hard parts.

We analyzed 151 complete specimens (*G. albida,* n=11; *G. audebarti,* n=27; *G. palmeri,* n=83; *G. pyramidata,* n=30), including our own collections and loans from the Smithsonian Institution and the Los Angeles County Museum of Natural History. For each specimen, we measured 6 morphological characters including 3 external shell dimensions (ventral valve length, dorsal valve length, and shell width) and 3 internal features (left ventral septum, right ventral septum, and median dorsal septum). The data were log-transformed to standardize variances (but preserve allometries) and the resulting matrix was analyzed using multivariate techniques supplemented with randomization tests.

Shell morphology in the four species is very uniform. For all species, the ventral valve is longer than the dorsal valve, the dorsal septum is shorter than the ventral septa, and, except for one species *(G. pyramidata),* the left septum is longer than the right septum. Principal Component Analysis allows for partial discrimination of species along PC1. However, given that PC1 accounts for 97.9% of variation in the data and that the correlation coefficients of variables with PC1 are all above 0.95, the discrimination only reflects size-variation among the species. Size-Free Discriminant Analysis further confirms that the species cannot be discriminated in terms of their shell shape. Except for one species *(G. palmeri),* all taxa are characterized by isometric growth: allometric coefficients for all variables do not differ significantly from 1 ($p > 0.05$, even without a Bonferroni correction!). Allometric differences between populations of the same species *(G. palmeri)* collected from two different substrates exceed those among the species.

These results indicate that interspecific variation in the biometry of the *Glottidia* shell is very limited. If the analyzed data were collected from the fossil record, we would most likely identify only one morphotype -- especially given the high proportion of substrate-related variation in shell allometry. The taxonomic diversity of *Glottidia* is underestimated four-fold when using shell morphology alone. This suggests that bradytely in the Lingulidae may reflect biometric boredom *and not* necessarily slothful evolution.