Correlation Between Mass, Size, and Preservation of Fossil *Cibicidoides* Shells From the Atlantic and Pacific

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The isotopic and chemical compositions of benthic foraminifera have been used for decades to deduce a broad variety of paleoclimate information. However, there has been little research as to what extent quantitative physical characteristics of benthic foraminifer shells such as their size and mass are related to the quality of their preservation. We used a large data set containing detailed information about individual shell weights, shell sizes, and preservational quality of fossil benthic foraminifera of the genus *Cibicidoides* from the Pacific ODP Site 846 and the Atlantic ODP Sites 929 and 1089, spanning the last deglaciation (~0-25 ka). We found that during both MIS 1 (~0-8 ka) and 2 (~18-25 ka), smaller and lighter *Cibicidoides* shells from Pacific Site 846 were typically better-preserved than shells from larger size fractions. Poorly-preserved shells from ODP Site 846 feature a higher mass/size ratio than their better-preserved counterparts that cannot be attributed to the filling of chambers by clay or other contaminant phases. Interestingly, opposite trends were observed at both Atlantic sites, where larger and heavier shells and shells exhibiting higher mass/size ratios are among the best-preserved. These findings point towards minute differences in the ontogenetic development of *Cibicidoides* shells from Atlantic and Pacific waters, allowing for a better presentation of certain size-ranges, and/or different mechanisms controlling preservation and diagenesis in Atlantic and Pacific deep waters. In addition to these mass/size metrics, we also examine the progression of diagenesis through internal wall structures via SEM images of shell cross sections, as well as the impact on trace metal concentrations measured via LA-ICPMS.