Paleoclimate reconstruction of the Gulf of Maine during the recent Holocene (past 5000 years) using archaeological mollusk shells

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We examined the paleoclimate of the Gulf of Maine (GOM) during the recent Holocene through archaeological shell middens in Maine (Turner Farm) and on Nantucket Island, MA. Specifically, we reconstructed the ocean conditions across the Holocene occupation at these sites (~ 5000 years) using the trace element and stable isotopic chemistry of Soft-shell and Hard-shell clams (*Mya arenaria and Mercenaria mercenaria)* and Eastern oyster (*Crassostrea virginica)*. Study sites represent the extreme north and south of the GOM; providing boundary conditions for the ocean chemistry of this region across this time period. Sea surface temperatures, based on $\delta^{18}O$, show a significant difference between archaeological samples from the third Turner Farm site occupation and the other occupations. Mean $\delta^{18}O$ values for each occupation from triplicate measurements of individual shells ranged from -0.1 to -0.5 (‰ VPDB). Preliminary results indicate a significant difference in inferred temperatures during the third occupation leading up to the MWP ($\delta^{18}O$ of occupation 3 = -0.533; $p<0.05$). In addition, trace element variation in the shells reflected both local and global events associated with increasing/decreasing sediment input into the GOM.

Paleoenvironmental reconstruction and the study of events associated with human-environment interactions can shape our understanding of future climate change. This research helps further our understanding of long term trends in shellfish population distributions and the interactions between humans and natural resources. Given the significant economic value of marine bivalve species, understanding the longer-term trends in shellfish population distributions and the environment will provide much needed data for the management of these species in future scenarios.