Effect of Salinity on the Shell Formation of Eastern Oysters at Different Climactic Regions

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Rapid environmental changes are predicted to impact shellfish abundance and their commercial value. The Eastern Oyster, *Crassostrea virginica*, a key foundation species with high environmental and commercial value has dramatically declined due to climate and anthropogenic impacts over the last century. Our current understanding of oyster vulnerability mostly stems from laboratory-based experiments but lacks studies in natural systems. Here, we investigated how shell production and composition of *C. virginica* are affected by natural salinity gradients under different temperature regimes. We studied variations in oyster shell shape, production, structure, composition, and organic matrix content in oysters from a temperate, Hudson River (NY), and subtropical, Galveston Bay (TX), estuary. Parameters such as weight, area, density, chalk production, and organic matrix were measured to see how the shells varied based on salinity and temperature. Our findings showed that Eastern oysters produced shells with higher chalk content under calcification-limiting environments (i.e., low temperature and low salinity). In comparison, shells with lower chalk content were produced in high predation environments (i.e., high temperatures and salinity). Temperate oyster's shell structure preferentially favored chemical protection against dissolution while subtropical oysters preferentially favored mechanical protection against predation. Oyster's shell showed a strong capacity for protective responses under calcification- and predation-controlled environments.