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Stable isotope and sr/ca profiles from the marine gastropod *Conus ermineus:* Testing a multiproxy approach for inferring paleotemperature and paleosalinity

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ABSTRACT

This study tests the fidelity of shallow-water gastropod skeletons as multiproxy archives of paleoenvironmental change by comparing isotopic and trace-metal analyses of specimens of *Conus ermineus*. Four adult specimens were collected live from Stetson Bank in the northwestern Gulf of Mexico during the summer of 2003. Shells were sampled along axes of growth to produce time-series profiles spanning up to 8 years. $\delta^{18}O$ and Sr/Ca profiles show seasonal cyclicity modified by fast summer and slow winter shell growth. The profiles were combined to estimate paleosalinity. This yields variable results that overestimate salinity range; nevertheless, annual salinity minima and maxima are still evident. The overestimates are attributed to interspecimen Sr/Ca variability and error in the $\delta^{18}O_{sw}$-salinity regression. Profiles of $\delta^{13}C$ show seasonal variation superimposed on a decreasing ontogenetic trend, the latter ascribed to decreasing metabolic efficiency also reflected by an ontogenetic increase in Sr/Ca. Seasonal $\delta^{13}C$ variation reflects changes in the $\delta^{13}C$ of dissolved inorganic carbon ($\delta^{13}C_{DIC}$). Salinity and $\delta^{13}C_{DIC}$ at Stetson Bank strongly correlate ($R^2 = 0.80$, $p < 0.0001$), and shell $\delta^{13}C$ minima coincide with local salinity minima following times of peak river discharge. These $\delta^{13}C$ minima terminate during annual shelf current reversals. Low-salinity waters directly account for less than half the variability in shell $\delta^{13}C$ but enhance summer stratification and trap respired CO_2 from sediment pore waters. Specimens from this study show mean $\delta^{13}C$ values 1‰ lower than *C. ermineus* collected from Stetson Bank in 1971, reflecting the decrease in $\delta^{13}C_{DIC}$ from fossil fuel burning.