The Effects of the 1982-1983 El Niño Mega-Event on Bivalve Mollusk Biomineralization

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Marine bivalve mollusks are valued as climate change recorders due to predictable growth rates and the recording of the ambient seawater environment into their shells (e.g., temperature, DIC). Bivalves that endure extreme environmental perturbations also exhibit alteration of the shell microstructure in response to the stress. Numerous studies demonstrate correlations between shell isotopic values and environmental parameters, such as $\delta^{18}O$ and temperature, but the possibility of confounding isotopic signatures between shell layers and microstructures in a single organism, induced by environmental stress factors, has not been sufficiently studied.

Three bivalve species (*Trachycardium procerum*, *Argopecten purpuratus*, *Chione subrugosa*) collected from the Peruvian coast after the 1982-1983 ENSO exhibit microstructural alterations in the shell in correlation with the sea surface temperature (SST) anomaly during the event. Common biomineral alterations include changes in the relative thickness of certain microstructural types and the loss of intercrystalline organic matrix components.

$\delta^{18}O_{shell}$ and $\delta^{13}C_{shell}$ data show no significant changes in correlation with the El Niño growth scar in any shell layers of *T. procerum* or *A. purpuratus*. *C. subrugosa*, an intertidal species, shows $\delta^{13}C_{shell}$ and $\delta^{18}O_{shell}$ depletion in the affected area. These data indicate that biomineralization changes are not synchronized with isotopic signatures. Furthermore, bivalve biogeochemical proxies may not be sufficiently sensitive to detect rapid fluctuations in SST, but potentially useful in detecting other localized El Niño associated events such as flooding.