Anthropo-Proxy Data In Bivalves From Middens To Modern Embayments And Tropical To Temperate Systems

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Considerable attention has been given to bivalves as recorders of paleoproxy data through analyses of inorganic elements (stable isotopes, trace metals). Organic material preserved in bivalve shell, however, also provides important information on the chemical environment and changes in organic matter sources on geological timescales across a range of coastal environments. We found organic N and C were preserved in bivalve shells from ancient middens and coral reefs dating back 5k – 126k years BP, before human alteration of watersheds. These values served as a baseline to trace the legacy effects of human activities on coastal ecosystems by comparison to organic N and C stable isotope ratios (via IRMS) in modern bivalves. Organic N and C stable isotope ratios in modern bivalve shell detected different forms of wastewater and changes in hydrology associated with urbanization, spatially and temporally. Organic anthropo-proxy data also were aligned with trace element analyses (LA-ICPMS) to provide a dual proxy approach to further assess human influences on temperate, subtropical, and tropical coastal systems. The large-scale spatial and temporal responses to anthropogenic change were detectable regardless of locally and regionally-specific variation in elemental ratios due to organic matter quality and environmental attributes. When aligned with sclerochronological data, the combination of organic anthropo-proxy and inorganic paleo-proxy data from bivalves has high potential to improve understanding of organic matter sources, define legacy effects of anthropogenic alterations, and distinguish natural from anthropogenic forcings on aquatic systems through time.