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2.3 - TRACE ELEMENTS IN THE ANTARCTIC SCALLOP ADAMUSSIUM COLBECKI AS SEA-ICE PROXIES

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Summary

In coastal Antarctica, sea ice is critical in structuring marine ecosystems, where it can melt annually or persist for multiple years. Sea ice regulates disturbance to benthic communities and attenuates light, affecting productivity and thus growth and longevity of marine organisms. However, variability in sea-ice duration is poorly understood prior to satellite images and understanding that past variability could illuminate the future of Antarctic marine communities in a warming world. We posit that the Antarctic scallop *Adamussium colbecki*, an ecosystem engineer, may be an important proxy for past sea-ice duration. Previous work on bulk samples or small samples from juvenile *A. colbecki* has tentatively linked some trace elements to ice melt, productivity, and metabolism. Further, growth bands (striae) form ~ fortnightly in juveniles and growth increments between striae (interstrial distances, ISDs) may vary seasonally. Thus, trace elements archived in growth increments may provide a high-resolution proxy for sea-ice melt vs. persistence during austral summer. We therefore compared concentrations of trace elements linked to sea ice (Mn/Ca, Fe/Ca, Pb/Ca), metabolism(Mg/Ca), and primary productivity (Ba/Ca, Li/Ca) in adult *A. colbecki* valves from two sites in western McMurdo Sound: Explorers Cove (EC) has multiannual sea ice and Bay of Sails (BOS; 30 km north of EC) has annual sea ice. We predict that trace elemental concentrations for sea ice and productivity should cycle annually at BOS, but not at EC. Scallops were haphazardly collected live in 12 m of water from each site in 2008. Trace elements were sampled from ISDs using an LA-ICP-MS along the central axis from umbo to last striae for three scallops from both sites. Wavelet coherence was used to analyze the strength of relationships between ISDs and each trace element and among pairs of trace elements over scallop ontogeny. Trace elemental concentrations display cyclic behavior in scallops from BOS but not EC, according to our predictions. Additionally, trace elements linked to productivity and metabolism cohere strongly in scallops from BOS but not EC, though ISDs and trace elements cohere weakly at both sites. Mean Pb/Ca was > 3X higher at EC than BOS; we interpret this to reflect higher detrital consumption under multi-annual sea ice. We therefore found that *A. colbecki* records a trace element signature for sea-ice duration. Because the genus *Adamussium* has a fossil history to the Oligocene, this scallop has the potential to be a successful proxy for sea-ice dynamics through the Cenozoic.

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E-Poster Sessio

2 - Student E-Poster Session, Saturday - Pod 2 Env & Ecology

Saturday, February 15, 2020

12:30 PM - 4:00 PM EST