

Using funding from the Antarctic Science Bursary my research group and I have explored the paleoceanographic proxy capabilities of cold-water corals living the Southern Ocean. The Li/Mg, Sr/Ca and oxygen isotopic ($\delta^{18}\text{O}$) compositions of many marine biogenic carbonates are sensitive to seawater temperature, thus corals represent ideal hosts for these geochemical proxies. By measuring these elemental and isotopic ratios in live-collected aragonitic scleractinian corals and for the first time both aragonitic and high-Mg calcitic stylasterid genera we show that Li/Mg ratios covary most strongly with seawater temperature, both for aragonitic and high-Mg calcitic taxa. This makes for reliable and universal seawater temperature proxies capable of paleo-temperature reconstruction to better than $\pm 3.4^\circ\text{C}$ across biogenic aragonites, regardless of taxon (Stewart et al., 2020). Future work will implement these refined temperature calibrations on fossil coral samples to reconstruct intermediate water temperature in sub-polar regions over the last 20 thousand years.

Paleoceanographic changes in the Southern Ocean during the last deglaciation have been further explored using benthic foraminiferal assemblage data combined with radiometrically dated fossil cold-water coral abundance and geochemistry. We find major changes in biogeochemistry, circulation and productivity in the Southern Ocean, with the most notable anomalies occurring during the Antarctic Cold Reversal that was associated with a pause in the rise of atmospheric pCO_2 and Antarctic temperature. Here, we find an absence of corals at depth and further south suggesting a shift in productivity, stratification, and poorly oxygenated bottom water at 14 ka. We suggest that expanding sea ice, suppressed ventilation, and shifting centres of upwelling drove changes in planktic and benthic ecology, and were collectively instrumental in halting CO_2 rise in the mid-deglaciation (Stewart et al., in review).

Stewart, J.A. et al., in review. Productivity and dissolved oxygen controls on the Southern Ocean deep-sea benthos during the Antarctic Cold Reversal. *Paleoceanography and Paleoclimatology*.

Stewart, J.A. et al., 2020. Refining trace metal temperature proxies in cold-water scleractinian and stylasterid corals. *Earth and Planetary Science Letters*, 545: 116412.