Oceanographic and Biogeochemical Changes along the Labrador Shelf: Evidence from Nitrogen Isotopes in a Six-Hundred-Year-Old Coralline Alga

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The Labrador Sea region has experienced unprecedented changes in sea-ice extent, primary productivity and ocean circulation over the last century. While these changes should have also intuitively had consequences for nutrient availability in the region, modern oceanographic observations are limited to the very recent past and thus hinder our ability to appropriately document such changes. Here, we present nitrogen (N) isotope data derived from a six-hundred-year-old crustose coralline alga, *Clathromorphum compactum*, to investigate past and present drivers of ocean nutrient chemistry along the Labrador Shelf. Our record reveals five phases during which N was nearly completely consumed, with the most recent and anomalously-long phase corresponding to the onset and duration of the industrial era. We attribute this to reduced nitrate input, which would be expected from the ongoing weakening and migration of the Labrador Current. By contrast, we argue that the briefer historical phases of nearly-complete consumption were modulated by oceanographic conditions favorable for simultaneous phytoplankton growth and reduced N input. Due to the potential effects of marine nutrient distributions on socioeconomically-important fisheries and oceanic carbon uptake, such biogeochemical changes in the North Atlantic may have additional implications for numerous environmental challenges facing us in the twenty-first century. Our study thus adds to the growing body of literature demonstrating the intense sensitivity of the high-latitude North Atlantic to modern warming.