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Latitudinal Trends in Stable Isotope Signatures of Northeast Atlantic Rhodoliths

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Rhodoliths are free-living calcifying red algae that form extensive beds in shallow marine benthic environments (< 200 m) that provide important habitats and nurseries for marine organisms and contribute to carbonate sediment accumulation. There is growing concern that these organisms are sensitive to global climate change, which will have important consequences for coastal productivity and stability. Despite their significance and sensitivity, their basic photosynthetic and calcification mechanisms are not well understood. The goal of this study was to determine the plasticity of dissolved inorganic carbon (DIC) uptake mechanisms of rhodoliths along a latitudinal gradient in the Northeast (NE) Atlantic using natural stable isotope signatures. The delta 13C signature of macroalgae can be used to provide an indication of the preferred inorganic carbon source (CO_2 vs. HCO_3-). Here we present the total and organic delta 13C signatures of NE Atlantic rhodoliths with respect to changing temperature and light along the latitudinal gradient from the Canary Islands to Spitsbergen. A decreasing trend in delta 13C signatures with increasing latitude suggests that rhodoliths rely solely on CO_2 as an inorganic carbon source at mid latitudes, while those at low latitudes may be able to utilize HCO_3-. Polar rhodoliths deviate from this trend, suggesting they may have unique physiological mechanisms related to inorganic carbon acquisition and assimilation, which may have important implications for calcification in an environment undergoing rapid changing ocean chemistry.