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**The Cornucopia of Chilly Winters:
Ocean Quahog (*Arctica islandica* L., Mollusca) Master Chronology
Reveals Bottom Water Nutrient Enrichment
during Colder Winters (North Sea)**

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A b s t r a c t

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We studied variations in annual shell growth rates of ten live-collected *Arctica islandica* specimens from three localities at the Dogger Bank in the central North Sea. Synchronous growth curves from contemporaneous specimens enabled the construction of a 65-year multi-locality master chronology. Stepwise multiple linear correlation analysis indicated a highly significant ($p < 0.01$) negative relationship between annual shell growth and winter sea surface temperatures (SST) during the period of 1953 to 1995. Up to 27.5% of the variation in the annual shell growth is explained by winter temperature. We explain the higher growth levels in colder winters by higher food supply. During warmer winters both the stratification and bottom water currents in the study area seem to be stronger and prevent downward-mixing of nutrients as well as settlement of food on the sea floor. During colder winters, however, the stratification weakens and phytoplankton produced in the cold surface layer reaches the sea floor. Long-term changes in shell growth rates are thus directly connected to hydrographic changes in the North Sea, which in turn are related to fluctuations of the North Atlantic Oscillation (NAO).

Our study demonstrates the usefulness of *Arctica islandica* for long-term, high-resolution environmental reconstructions and contributes to further understanding natural and anthropogenic variability in the environmental history of the North Sea.

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