

# Supporting Information

Kamenos10.1073/pnas.1006141107

## SI Materials and Methods

**Analytical Technique Validation.** The porous nature of coralline algal skeletal material dictates that the surface is not always flat leading to potential analytical error. To assess the presence of such error, material resembling coralline algae was artificially created. Polished calcite (from Floddigary, Isle of Skye, Scotland; record number 134382 Hunterian Museum, University of Glasgow) was analyzed using the same electron microprobe conditions as those used in Mg/Ca time series construction. Mg/Ca in the polished calcite varied between areas indicating it to be zoned (Fig. S1). The same sample was crushed (grain size ~ 3  $\mu\text{m}$ ) and mixed in resin (Buehler Epoxyure) at the same proportion (mean 75%) as resin to calcite in the *Lithothamnion*

*glaciale* honeycomb structure of analyzed samples. The calcite-resin composite was also analyzed using the same experimental conditions. Mg/Ca (molar) and count totals were compared (Fig. S2). There was no significant (Kruskal–Wallis:  $H = 4.57$ ,  $p = 0.102$ ,  $df = 2$ ) difference in molar Mg/Ca of intact calcite (100% calcite) or two batches of structural standards [23 and 46% calcite (mean)]. This was to be expected as crushing the zoned calcite distributed the Mg producing mean Mg/Ca compositions in the calcite–resin composite. Thus, down to 23% calcite composition, this analytical technique using electron microprobe analysis produces accurate results.

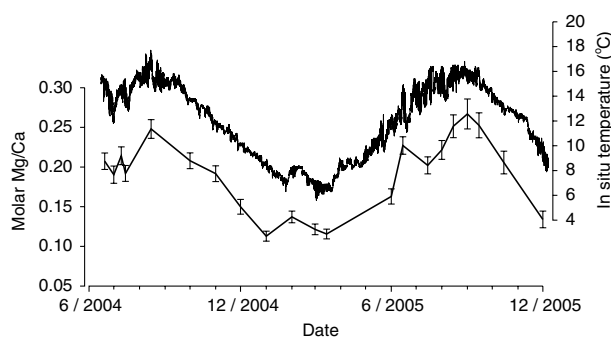


Fig. S1. Mg-temperature calibration time series. In situ temperature (IST) recorded in Loch Sween at hourly resolution and mean ( $n = 2$ ) molar Mg/Ca  $\pm$  SD measured along a transverse section through a *L. glaciale* thallus (adjacent to the IST data logger) using electron microprobe analysis. Distance was converted to time using Alizarin red staining of *L. glaciale* as in (1).

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Kamenos NA, Cusack M, Moore PG (2008) Red coralline algae are global paleothermometers with bi-weekly resolution. *Geochim Cosmochim Acta* 72:771–779.

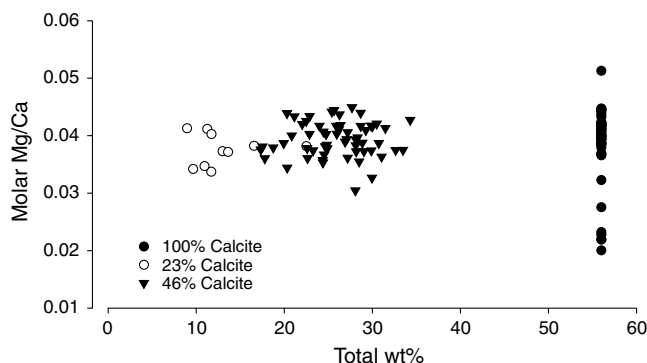


Fig. S2. Molar Mg/Ca and total weight % (wt %) (electron microprobe) observed in natural (100% calcite) and artificially created samples (23 and 46% calcite) composed of calcite (from Floddigary, Isle of Skye, Scotland; record number 134382 Hunterian Museum, University of Glasgow).