

Supplement

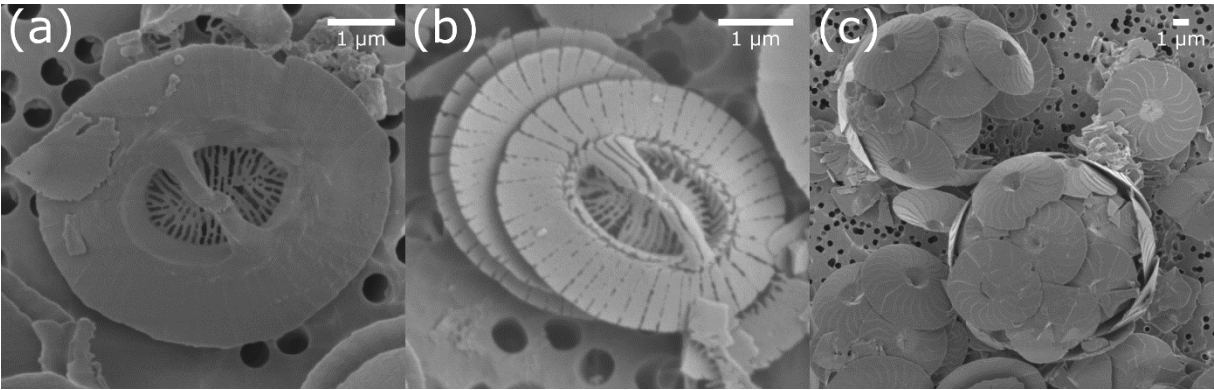


Fig. S1. Scanning electron microscope pictures of A) non-oxidised *G. oceanica* coccoliths, B) oxidised *G. muellerae* coccoliths, and C) *C. leptoporus* coccospheres. Scale bars are 1 µm.

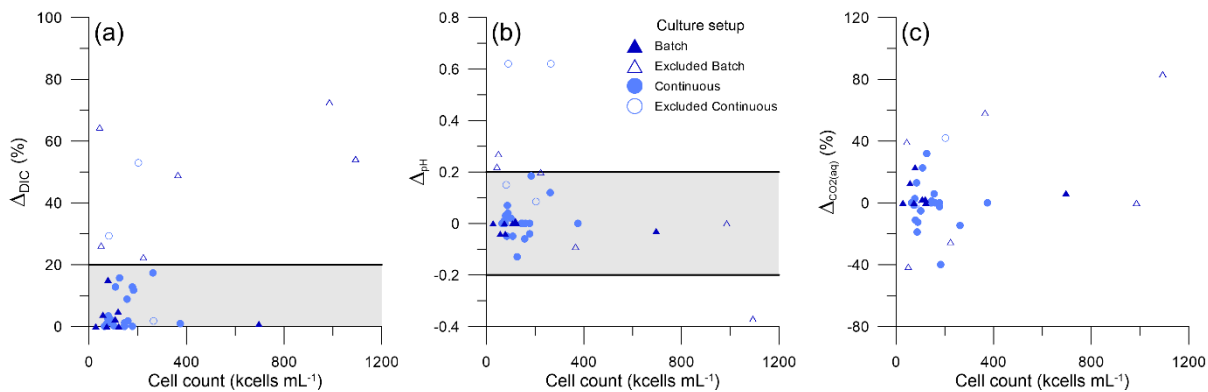
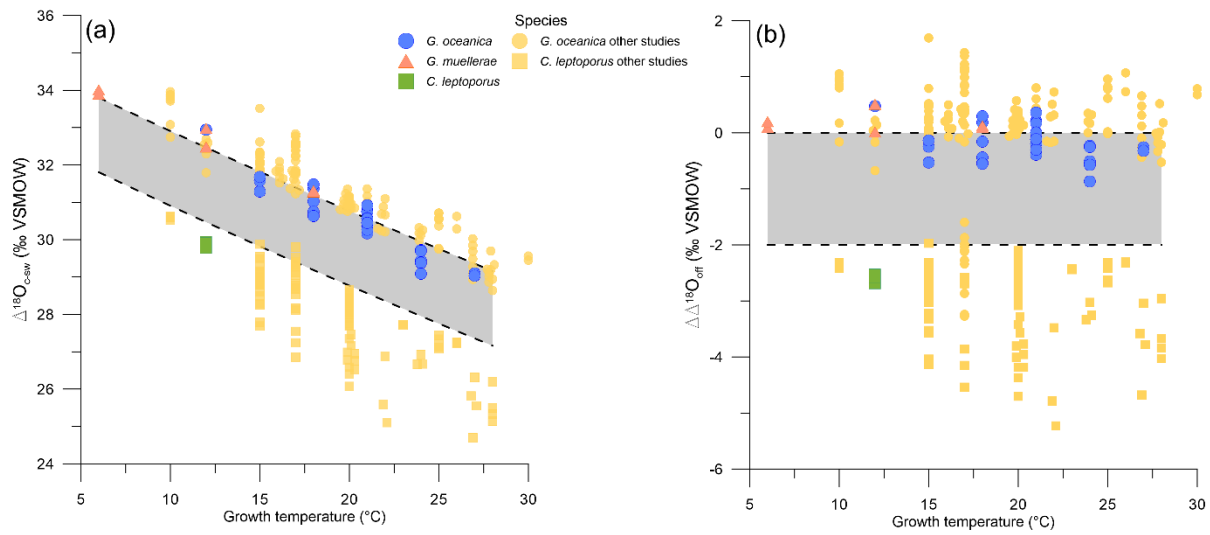
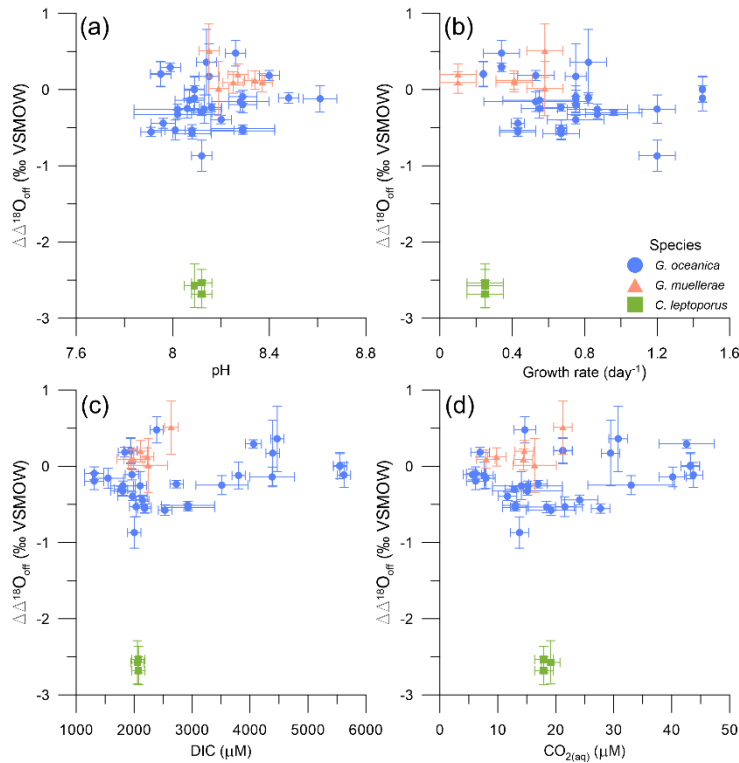


Fig. S2. Stability of the carbon chemistry for all setups and conditions. A) Percentage of DIC offset from initial DIC ( $\Delta_{DIC}$ ) against the cell count at time of harvest, B) pH offset from initial pH ( $\Delta_{pH}$ ) against cell count at time of harvest, C) Percentage of CO<sub>2(aq)</sub> offset from initial calculated CO<sub>2(aq)</sub> versus cell count at time of harvest. Included was defined by the light grey area. Continuous culture datapoints are given by blue circles. Batch culture datapoints are given by blue triangles. Excluded datapoints are hollow circles and triangles for continuous and batch culture setups respectively.

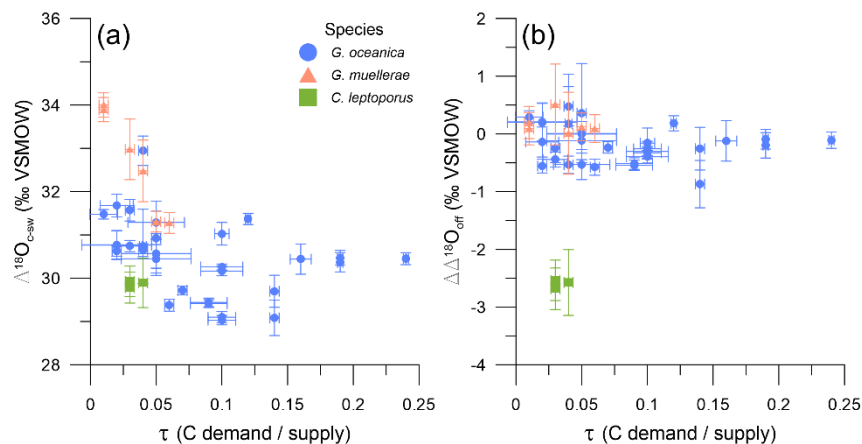


15 **Fig. S3. A)** The fraction of oxygen isotopes in coccolith calcite from seawater ( $\Delta^{18}\text{O}_{\text{c-sw}}$ ), both in VSMOW, in relation to the growth temperature in °C, **B)** The oxygen isotope offset from the equilibrium limit in Watkins et al., (2014),  $\Delta\Delta^{18}\text{O}_{\text{off}}$  in relation to the growth temperature in °C. Blue circles are *G. oceanica*, orange triangles are *G. muelleriae*, and green squares are *C. leptoporus*. Other studies' data are in yellow, circles for *G. oceanica* (Dudley et al., 1986; Ziveri et al., 2003; Hermoso et al., 2014; Stevenson et al., 2014; Hermoso et al., 2016) and squares for *C. leptoporus* (Dudley et al., 1986; Ziveri et al., 2003; 2012; Candelier et al., 2013; Hermoso et al., 2014; Katz et al., 2017).

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25 Fig. S4. A) The oxygen isotope offset from the equilibrium limit in Watkins et al., (2014),  $\Delta\Delta^{18}\text{O}_{\text{off}}$  in relation to external pH. B) The oxygen isotope offset from the equilibrium limit in Watkins et al., (2014),  $\Delta\Delta^{18}\text{O}_{\text{off}}$  in relation to growth rate. C) The oxygen isotope offset from the equilibrium limit in Watkins et al., (2014),  $\Delta\Delta^{18}\text{O}_{\text{off}}$  in relation to DIC at harvest. D) The oxygen isotope offset from the equilibrium limit in Watkins et al., (2014),  $\Delta\Delta^{18}\text{O}_{\text{off}}$  in relation to  $\text{CO}_{2(\text{aq})}$  at harvest. Blue circles are *G. oceanica*, orange triangles are *G. muelleriae*, and green squares are *C. leptoporus*. Error bars are as described in methods.



30 Fig. S5. A) Oxygen isotope fractionation relative to seawater ( $\Delta^{18}\text{O}_{\text{c-sw}}$ ) against the carbon demand vs supply ( $\tau$ ). B) The oxygen isotope offset from the equilibrium limit in Watkins et al., (2014) ( $\Delta\Delta^{18}\text{O}_{\text{off}}$ ) against the carbon demand vs supply ( $\tau$ ). Blue circles are *G. oceanica*, orange triangles are *G. muelleriae*, and green squares are *C. leptoporus*. Error bars are as described in methods.