**Seawater acidification experiments: carbonate chemistry**

Details of seawater acidification experiments were published in Venn et al. 2019. Seawater pH and carbonate chemistry were controlled with CO2 bubbling in the pH 7.2, 7.4 and 7.8 treatments and bubbling with CO2 free air in the pH 8 treatment. pH electrodes (Ponsel-Mesure, France) which monitored pH and temperature continuously, and controlled CO2 bubbling rates and heating elements. Additionally, weekly pH measurements were also made using the indicator dye m-cresol purple (Acros 199250050) adapted from Dickson et al. 2007; the absorbance was measured using a spectrophotometer (UVmc2; Safas, Monaco). Weekly measurements of total alkalinity (TA) were made according to protocols described in Dickson et al. 2007. TA was measured via titration with 0.03 N HCl containing 40 g NaCl l−1 using a Metrohm Titrando 888 Dosimat controlled by Tiamo software to perform automated titrations of 4-mL samples, and alkalinity was calculated using a regression routine based on Department of Energy guidelines Dickson and Goyet 1994. For each sample run, certified seawater reference material supplied by the laboratory of A. G. Dickson (Scripps Institution of Oceanography, La Jolla, CA) was used to verify acid normality. Parameters of carbonate seawater chemistry were calculated from total scale pH, TA, temperature, and salinity using the free-access CO2SYS package (Pierrot et al. 2006) using constants from Mehrbach et al. 1973 as refit by Dickson and Millero 1987. Mean values and standard errors of parameters of carbonate seawater chemistry in each treatment are given in Table S1.

**Table S1. Carbonate chemistry parameters in the four experimental pH treatments (Venn et al. 2019). (Means ± SD). TA = Total alkalinity. TC = total dissolved inorganic carbon. Parameters of carbonate seawater chemistry were calculated from measured total scale pH (pHT), TA, temperature (25oC), and salinity 38.**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Treatment | Tank | TA | pHT | TC | pCO2 | HCO3- | CO32- | Ω*ar* |
| (µmol/kg-SW) |   | (µmol/kg-SW) | (µatm) | (µmol/kg-SW) | (µmol/kg-SW) |   |
|  |  |  |  |  |  |  |  |  |
| pH 8.0 | 1 | 2438.57 | 8.03 | 2105.15 | 415.91 | 1856.63 | 236.93 | 3.68 |
|  |  | ± 9.81 | ± 0.01 | ± 2.94 | ± 8.99 | ± 1.62 | ± 4.81 | ±0.07 |
| pH 8.0 | 2 | 2433.7 | 8.03 | 2100.58 | 414.72 | 1852.48 | 236.55 | 3.67 |
|   |   | ± 8.45 | ± 0.01 | ± 1.59 | ± 9.44 | ± 2.90 | ± 4.75 | ±0.07 |
| pH 7.8 | 3 | 2438.43 | 7.83 | 2221.28 | 725.37 | 2037.47 | 163.6 | 2.54 |
|  |  | ± 6.69 | ± 0.01 | ± 1.83 | ± 14.58 | ± 0.96 | ± 3.20 | ±0.05 |
| pH 7.8 | 4 | 2437.13 | 7.79 | 2242.44 | 816.67 | 2069.73 | 149.95 | 2.33 |
|   |   | ± 6.93 | ± 0.01 | ± 3.39 | ± 11.51 | ± 1.37 | ± 2.35 | ±0.04 |
| pH 7.4 | 5 | 2458.32 | 7.45 | 2401.39 | 1923.08 | 2271.13 | 76.67 | 1.19 |
|  |  | ± 5.72 | ± 0.02 |  ± 1.09 | ± 80.61 | ± 2.05 | ± 3.21 | ±0.05 |
| pH 7.4 | 6 | 2459.39 | 7.42 | 2415.76 | 2104.62 | 2286.13 | 70.99 | 1.1 |
|   |   | ± 5.67 | ± 0.01 | ± 1.42 | ± 54.32 | ± 0.99 | ± 1.94 | ±0.03 |
| pH 7.2 | 7 | 2462.29 | 7.25 | 2479.63 | 3172.89 | 2341.81 | 49.41 | 0.77 |
|  |  | ± 6.83 | ± 0.01 | ± 2.72 | ± 77.57 | ± 3.49 | ± 1.39 | ±0.02 |
| pH 7.2 | 8 | 2463.76 | 7.22 | 2490.73 | 3378.78 | 2349.87 | 46.72 | 0.73 |
|  |  | ± 5.76 | ± 0.01 | ± 2.20 | ± 71.13 | ± 3.05 | ± 1.13 | ±0.02 |

**References**

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