**Supplemental Material:**

**Tables S1-S2**

**Figures S1-S6**

Table S1: Analysis of variance for Gday, Gnight, and Gnet across the four climate scenario treatments (Figure S3).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | SS | df | MS | F | p | |
| **Gday** |  |  |  |  | |  |
| Treatment | 28.83 | 3 | 9.81 | 3.65 | | **0.030** |
| Error | 52.61 | 20 | 2.63 |  | |  |
| Total | 81.45 | 23 |  |  | |  |
| **Gnight** |  |  |  |  | |  |
| Treatment | 60.39 | 3 | 20.13 | 8.84 | | **<0.0001** |
| Error | 45.53 | 20 | 2.28 |  | |  |
| Total | 105.92 | 23 |  |  | |  |
| **Gnet** |  |  |  |  | |  |
| Treatment | 104.31 | 3 | 34.77 | 8.37 | | **<0.0001** |
| Error | 83.05 | 20 | 4.15 |  | |  |
| Total | 197.36 | 23 |  |  | |  |

Table S2: Analysis of variance for NCPday, NCPnight, and NCPnet versus climate scenario treatments (Figure S4).

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | SS | df | MS | | F | | p | | | |
| **NCPday** |  |  |  | |  | | |  | | |
| Treatment | 6265.3 | | 3 | 2088.4 | | 26.0 | | | **<0.0001** |
| Error | 1603.2 | | 20 | 80.2 | |  | | |  |
| Total | 7868.6 | | 23 |  | |  | | |  |
| **NCPnight** |  | |  |  | |  | | |  |
| Treatment | 4145.2 | | 3 | 1381.7 | | 21.5 | | | **<0.0001** |
| Error | 1283.4 | | 20 | 64.2 | |  | | |  |
| Total | 5428.6 | | 23 |  | |  | | |  |
| **NCPnet** |  | |  |  | |  | | |  |
| Treatment | 1936.8 | | 3 | 6456.0 | | 71.6 | | | **<0.0001** |
| Error | 1803.4 | | 20 | 90.17 | |  | | |  |
| Total | 2117.1 | | 23 |  | |  | | |  |

**Figure Legends:**

**Figure S1:** Feedbacks in seawater chemistry caused by the presence of rubble during the (a) day and (b) night. X-axis is pCO2 in seawater without any rubble and y-axis is pCO2 in seawater with rubble present. Color represents temperature. The black dashed line is a 1:1 line and the blue line is a regression line. The pCO2 conditions drift farther away from the manipulated conditions during the night. The slopes from each regression analysis were both greater than one (Day: , Night:) meaning that the biological feedbacks were greater at more extreme treatments and greater during the night than the day.

**Figure S2**: Boxplots for Gday (a), Gnight (b), and Gnet (c) for the control experiment separated by rack. We used an ANOVA to test for differences across racks and found no significant difference in Gday (F3,23=0.68, p=0.58), Gnight (F3,23=1.52, p=0.24), or Gnet (F3,23=1.38, p=0.28).

**Figure S3:** Means and standard error bars for (a) Gday, (b) Gnight, and (c) Gnet in mmol m-2 d-1 in the four climate scenario treatment categories. There were significant differences between treatments for Gday (p=0.03), Gnight (p<0.0001), and Gnet (p<0.0001) (Table S1).

**Figure S4:** Means and standard error bars for (a) NCPday, (b) NCPnight, and (c) NCPnet in mmol m-2 d-1 across the four climate scenario treatments. There were significant differences across treatments for NCPday (p<0.0001), NCPnight (p<0.0001), and NCPnet (p<0.0001) (Table S2).

**Figure S5:** Net ecosystem calcification (Gday, Gnight, and Gnet) versus ∆Temperature (left panel) and ∆pCO2 (right panel). Lines are best fit lines. Gday has a significant non-linear relationship ∆pCO2 (p=0.04) and ∆Temperature (p=0.01). Gnight, (∆Temp: p<0.001, ∆pCO2: p<0.001) and Gnet (∆Temp: p<0.001, ∆pCO2: p<0.001) both have significant linear relationships with ∆pCO2 and ∆Temperature.

**Figure S6:** Net community production (NCPday, NCPnight, and NCPnet) versus ∆Temperature (left panel) and ∆pCO2 (right panel). Lines are best fit lines. NCPday (∆Temp: p<0.001, ∆pCO2: p<0.001), NCPnight, (∆Temp: p<0.001, ∆pCO2: p<0.001) and NCPnet (∆Temp: p<0.001, ∆pCO2: p<0.001) all have significant linear relationships with ∆pCO2 and ∆Temperature.

**G and NCP calculations:** Below are the specific calculations for G and NCP for Equations 1 and 2 in the text (in mmol C m-2 hr-1). For comparisons with existing literature, G and NCP were both multiplied by 12 hr/day to get mmol m-2 d-1.

Equation 1 (equations modified from Andersson et al. 2009):

(S1)

is the rate of TA flowing into the aquaria in mmol CaCO3 m-2 hr-1:

(S2)

is the rate of TA flowing out of the aquaria in mmol CaCO3 m-2 hr-1:

(S3)

is the change in TA in each aquaria in mmol CaCO3 m-2 hr-1:

(S4)

Each equation is divided by 1000 to convert from µmol of CaCO3 to mmol of CaCO3

Parameters:

TAH,t1 = Total alkalinity in the header tank at the first sampling time point (µEq kg-1).

TAH,t2 = Total alkalinity in the header tank at the second sampling time point (µEq kg-1).

TAaq,t1 = Total alkalinity in the aquarium at the first sampling time point (µEq kg-1).

TAaq,t2 = Total alkalinity in the aquarium at the second sampling time point (µEq kg-1).

∆t = Time between first and second sampling time point (h)

SA = Surface area of the rubble in the aquarium (m-2)

Vol= Volume of water in the aquarium (L)

ρ = Density of seawater (kg L-1)

FlowRateaq = Flow rate of the water coming into the aquarium in kg m-2 h-1 (equal to flow rate of the water leaving the aquarium)

NCP is net community production rate in mmol C m-2 d-1 :

(S5)

, , are calculated in the same way as, , and in Equations S2-S4), replacing Total Alkalinity with Dissolved Inorganic Carbon.