### **Tables**

**Table 1.** Seawater carbonate chemistry during larval incubations. Values indicate mean ± SD through time where temperature and salinity were measured daily, and dissolved inorganic carbon (DIC) and total alkalinity (TA) were measured from preserved bottle samples that were collected weekly. Weekly pHSWS and pCO2 were calculated from temperature, salinity, DIC and TA. Reproduced from Slesinger et al. (2024).

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| --- | --- | --- | --- | --- | --- | --- |
| Treatment | pHSWS | pCO2  (µatm) | Temperature  (°C) | Salinity | DIC  (mol/kg) | TA (mol/kg) |
| Control | 8.03  ± 0.11 | 394.28  ± 132.84 | 6.14  ± 0.29 | 29.84 ± 1.48 | 1943.38 ± 105.62 | 2063.08 ± 84.73 |
| Acidified | 7.47  ± 0.03 | 1480.80 ± 126.37 | 6.04  ± 0.51 | 29.36 ± 1.31 | 2078.14 ± 81.47 | 2042.54 ± 84.58 |
| Warm | 8.00  ± 0.03 | 409.60  ± 36.75 | 10.22  ± 0.24 | 29.63 ± 0.67 | 1911.35 ± 22.43 | 2040.80 ± 21.72 |
| Warm + Acidified | 7.40  ± 0.06 | 1780.01 ± 245.48 | 10.20  ± 0.37 | 29.63 ± 0.67 | 2076.27 ± 24.75 | 2038.04 ± 22.15 |
| Cold | 8.12  ± 0.07 | 297.20  ± 65.51 | 3.03  ± 0.39 | 30.21 ± 1.11 | 1936.76 ± 76.24 | 2074.63 ± 65.73 |
| Cold + Acidified | 7.48  ± 0.09 | 1434.95  ± 304.70 | 3.10  ± 0.18 | 29.77 ± 1.30 | 2093.99 ± 76.91 | 2050.55 ± 68.72 |

**Table 2**. Gene expression sampling scheme. For each treatment, gene expression data was generated from 11-14 individual whole-body larvae using separate RNASeq libraries, sampled across four replicate tanks in all but the cold treatment. Larvae from the cold treatment were sampled from one tank (see Methods and Supplemental for more details). Treatment duration from hatch until gene expression sampling are provided in both Julian days and Degree-Days (DD) calculated from average temperatures. Differential expression analysis was performed for all treatments relative to control conditions (6°C, 390 µatm pCO2).

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| --- | --- | --- | --- | --- |
| Treatment  *Mean conditions* | Replicate larvae | Number of tanks sampled for RNASeq | Duration  *Days (Degree Days)* | Larval length *Mean ± SE* |
| Control  *6.1°C, 394 µatm pCO2* | 14 | 4 | 21 (129) | 6.5±0.2 |
| Acidified  *6.1°C, 1,481 µatm pCO2* | 13 | 4 | 21 (127) | 6.7±0.1 |
| Warm  *10.1°C, 410 µatm pCO2* | 11 | 4 | 13 (133) | 5.7±0.1 |
| Warm + Acidified  *10.2°C, 1,780 µatm pCO2* | 12 | 4 | 13 (133) | 6.0±0.1 |
| Cold  *3.0°C, 297 µatm pCO2* | 12 | 1 | 28 (85) | 6.7±0.1 |
| Cold + Acidified  *3.1°C, 1,435 µatm pCO2* | 11 | 4 | 28 (87) | 6.4±0.2 |

**Table 3**. Summary of phenotypic effects of treatments on mortality, growth, and condition during the larval stage, adapted from data previously reported in Slesinger et al. (2024). Phenotypic values represent measurements that were taken on or near (≤2 days) the day of sampling for gene expression (condition factors) or calculated between hatch and sampling date (growth and mortality), and are mean ± SD across three (†) or four replicate tanks. Values with asterisks (✱) indicate pairwise differences among each treatment and the control (6.1°C, 390 µatm). Temperature and pCO2 represent treatment means across four replicate tanks.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Treatment** | **Control** | **Acidified** | **Warm** | **Warm + Acidified** | **Cold** | **Cold + Acidified** |
| Temperature, pCO2 (Mean + SD) | 6.1 ± 0.3°C,  394 ± 133 µatm | 6.0 ± 0.5°C, 1,481 ± 126 µatm | 10.2 ± 0.2°C,  410 ± 37 µatm | 10.2 ± 0.4°C, 1,780 ± 245 µatm | 3.0 ± 0.4°C,  297 ± 66 µatm | 3.1 ± 0.2°C, 1,435 ± 305 µatm |
| Total survival (%) | 23.0 ± 20.8% | 35.1 ± 15.0 ± | 5.7 ± 4.2% | 4.1 ± 2.0% | 12.1 ± 13.3% | 13.5 ± 4.9% |
| Instantaneous daily mortality rate (%) | 0.097 ± 0.06 | 0.053 ± 0.02 | 0.24 ± 0.05 ✱ | 0.25 ± 0.04 ✱ | 0.11 ± 0.07 | 0.074 ± 0.01 |
| Morphometric-based condition factor, KMH | 0.019 ± 0.02 | 0.014 ± 0.018 | 0.002 ± 0.02 ✱ | -0.001 ± 0.019 ✱ | -0.003 ± 0.022 †✱ | -0.007 ± 0.021 ✱ |
| Dry weight-based condition factor, KDW | 1.06 ± 0.08 | 1.05 ± 0.05 | 1.09 ± 0.11 | 1.08 ± 0.13 | 0.96 ± 0.07 †✱ | 1.00 ± 0.08 |
| Growth rate, length-based GL (mm/day) | 0.071 ± 0.005 | 0.075 ± 0.01- | 0.055 ± 0.014 | 0.062 ± 0.003 | 0.041 ± 0.007 †✱ | 0.046 ± 0.005 ✱ |
| Growth rate, mass-based, GM (%/day) | 4.76 ± 0.40 | 4.78 ± 0.25 | 2.72 ± 0.68 ✱ | 3.77 ± 0.54 ✱ | 2.43† ± 0.41 ✱ | 3.37 ± 0.41 ✱ |