**Supporting information**

**Materials and methods**

The parameters of the seawater carbonate system (Table S1) were calculated from pH and pCO2 measurements with CO2 SYS software (Lewis and Wallace, 1998), using the values for the equilibrium constants K1 and K2 for carbonic acid dissociation from Roy et al. (1993) and that for KB for boric acid of Dickson (1990). The pH change was determined with a pH meter (pH510, OAKTON) which was calibrated with standard National Bureau of Standards (NBS) buffer solutions (Hanna).

The primers of the target genes used in quantitative reverse transcriptase-polymerase chain reaction are shown in Table S2.

**Results**

The light levels, including the maximal and mean daytime PAR values during the experiments are shown in Supplementary Fig.1.

**Table S1** Carbonate chemistry parameters of the growth medium for ambient (390 μatm; LC) and elevated CO2 (1000 μatm; HC) cultures. TA stands for total alkalinity. The values are means ± SD, n = 3. Different superscripted letters represent significant difference between the ambient and acidified conditions.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| pCO2 | pHNBS | DIC  (μmol kg-1) | HCO3-  (μmol kg-1) | CO32-  (μmol kg-1) | CO2  (μmol kg-1) | Total alkalinity  (μmol kg-1) |
| LC | 8.19±0.02a | 2025.4±85.8a | 1809.5±70.0a | 203.3±15.6a | 12.6a | 2319.3±104.1a |
| HC | 7.83±0.02b | 2208.9±92.6b | 2072.5±84.2b | 104.0±8.4b | 32.3b | 2336.9±102.8a |

**Table S2** Nucleotide sequences of primers used in the real-time quantitative PCR

|  |  |  |  |
| --- | --- | --- | --- |
| Gene | Primer name | Sequences(5’-3’) | Amplicon size (bp) |
| Histone H4 | H4-F | AGGCAAAGCGTGGTGTTCTTA | 156 |
| H4-R | TCTGGGGAGCCTCAGTCAATA |
| Synthase of mitochondrial ATP synthase | SM-F | AGGACAATACCAGCCCTACGAACCG | 147 |
| SM-R | ACCTTGGAGTGGACACCCTTGACAT |
| Nitrite reductase | NR-F | ATTGGGTGATTTCGCTTGAGAG | 182 |
| NR-R | CACCTCACTCGTCCCTTGTTCT |
| Fucoxanthin chlorophyll *a*/*c* protein, lhcf type | FC-F | CGGCTGGGACACCTTTGACG | 197 |
| FC-R | ATCTTGGAAACGACGGCAGTATC |
| Carbonic anhydrase | CA-F | TGGGAACTGAGGCTGGAACC | 162 |
| CA-R | AAGCACGGACACCACCACATT |
| NADH dehydrogenase subunit2 | NADH-F | TATTGGTTGCGGTGTTAGGTC | 155 |
| NADH-R | GAAATACTTAATACCCGCCTCA |
| Peroxisomal membrane protein-related | PMP-F | ATCTTGGTGGTGTAATCGTCC | 205 |
| PMP-R | GTTCCTTTGGTTTCCTCCTG |
| Ribulose-1,5-bisphosphate carboxylase/oxygenase large subunit | Rbcl-F | TCAATACTTCGCTTTTATCGCAT | 176 |
| Rbcl-R | CAGTAGCAGGACCTTGGAACG |

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**Fig. S1** Light conditions during the experiments.

**Reference**

Dickson, A. G.: Standard potential of the reaction: AgCl (s) + 1/2 H2 (g) = Ag (s) + HCl (aq), and the standard acidity constant of the ion HSO4ˉ in synthetic seawater from 273.15 to 318.15 K. J. Chem. Thermodyn., 22, 113-127, 1990.

Lewis, E., and Wallace, D. W. R.: Program Developed for CO2 System Calculations, ORNL/CDIAC-105, Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, US Department of Energy, 1998.

Roy, R. N., Roy, L. N., Vogel, K. M., Porter-Moore, C., Pearson, T., Good, C. E., Millero, F. J., and Campbell, D. M.: The dissociation constants of carbonic acid in seawater at salinities 5 to 45 and temperature 0 to 45ºC, Mar. Chem., 44,249-267, 1993.