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# Light-dependent calcification in Red Sea giant clam *Tridacna maxima*

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## S1 – Seawater carbonate chemistry

**Table S1.1** Seawater carbonate chemistry conditions at start of incubations under moderate light conditions (530, 358, 244, 197 µmol photons $m^{-2}$ $s^{-1}$) and during the dark. Total alkalinity (TA) and dissolved inorganic carbon (DIC) were measured, while the inorganic carbon speciation , including pH, partial pressure of carbon dioxide ($_pCO^2$), carbon dioxide$_{aq}$ ($CO_{2(aq)}$), bicarbonate ($HCO_3^-$), carbonate ($CO_3^{2-}$) as well as the aragonite ($\Omega_{Arag}$) and calcite ($\Omega_{Calc}$) saturation state were calculated using R package Seacarb. Values are means ± SD (n = 10).

| Treatment [µmol photons $m^{-2}$ $s^{-1}$ ] | TA [µmol $kg^{-1}$] | DIC [µmol $kg^{-1}$] | pH | $_pCO_2$ [$\mu_{atm}$] | $CO_{2\ (aq)}$ [µmol $kg^{-1}$] | $HCO_3^-$ [µmol $kg^{-1}$] | $CO_3^{2-}$ [µmol $kg^{-1}$] | $\Omega_{Arag}$ | $\Omega_{Calc}$ |
|---|---|---|---|---|---|---|---|---|---|
| 530 | 2,387 ± 4 | 2,059 ± 5 | 8.01 ± 0.01 | 445 ± 12 | 11.7 ± 0.3 | 1,815 ± 8 | 232 ± 40 | 3.64 ± 0.07 | 5.47 ± 0.10 |
| 358 | 2,295 ± 8 | 1,966 ± 24 | 8.02 ± 0.03 | 412 ± 37 | 10.8 ± 1.0 | 1,726 ± 34 | 229 ± 12 | 3.59 ± 0.18 | 5.38 ± 0.27 |
| 244 | 2,242 ± 149 | 1,966 ± 143 | 7.95 ± 0.07 | 501 ± 117 | 13.5 ± 3.2 | 1,760 ± 138 | 192 ± 29 | 3.00 ± 0.44 | 4.51 ± 0.67 |
| 197 | 2,331 ± 5 | 2,028 ± 4 | 7.97 ± 0.01 | 477 ± 13 | 12.6 ± 0.3 | 1,802 ± 7 | 213 ± 40 | 3.33 ± 0.06 | 5.01 ± 0.10 |
| Dark | 2,368 ± 13 | 2,035 ± 10 | 8.02 ± 0.02 | 422 ± 22 | 11.3 ± 0.6 | 1,790 ± 15 | 233 ± 90 | 3.64 ± 0.14 | 5.47 ± 0.20 |

**Table S1.2** Total alkalinity (TA) at start of each incubation under high light conditions (1061, 959, 561 µmol photons $m^{-2}$ $s^{-1}$) and during the dark. Values are means ± SD (n = 8).

| Treatment [µmol photons $m^{-2}$ $s^{-1}$ ] | TA [µmol $kg^{-1}$] |
|---|---|
| 1061 | 2,502 ± 8 |
| 959 | 2,450 ± 8 |
| 561 | 2,537 ± 71 |
| Dark | 2,468 ± 5 |

## S2 – Statistics for depth – dependent abundances of *T. maxima*

### S2.1 Sheltered reef

**Table S2.1.1** ANOVA – sheltered reef

| **Summary.aov (Model1)** | | | | | |
|---|---|---|---|---|---|
| | DF | Sum Sq | Mean Sq | F value | Pr (>F) |
| AbundanceReef1$depth | 5 | 2.848 | 0.570 | 35.6 | 9.63 e-12 *** |
| Residuals | 30 | 0.480 | 0.016 | | |

Significant codes <0.001 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

**Table S2.1.2** Tukey Post-hoc test - sheltered reef

Tukey multiple comparisons of means
95% family-wise confidence level

**Fit: aov(formula = Abundance_Reef1$clams ~ Abundance_Reef1$depth)**

$`Abundance_Reef1$depth`

| | **diff** | **lwr** | **upr** | **p adj** |
|---|---|---|---|---|
| 1.5 m – 0.5 m | 0.0283 | -0.0194 | 0.2504 | 0.9987 |
| 3 m – 0.5 m | 0.4133 | 0.1912 | 0.6354 | <0.0001 *** |
| 5 m – 0.5 m | -0.2183 | -0.4405 | 0.0038 | 0.0562 |
| 8 m – 0.5 m | -0.3717 | -0.5938 | -01495 | <0.0001*** |
| 11 m – 0.5 m | -0.4117 | -0.6338 | -0.1895 | 0.0001 *** |
| 3 m – 1.5 m | 0.3850 | 0.1629 | 0.6071 | 0.0001 *** |
| 5 m – 1.5 m | -0.2467 | -0.4688 | -0.0245 | 0.0227 * |
| 8 m – 1.5 m | -0.4000 | -0.6221 | -0.1779 | <0.0001 *** |
| 11 m – 1.5 m | -0.4400 | -0.6621 | -0.2179 | <0.0001 *** |
| 5 m – 3 m | -0.6317 | -0.8538 | -0.4100 | <0.0001 *** |
| 8 m – 3 m | -0.7850 | -1.0071 | -0.5629 | <0.0001 *** |
| 11 m – 3 m | 0.8250 | 0.6029 | 1.0471 | <0.0001 *** |
| 8 m – 5 m | -0.1533 | -0.3755 | 0.0688 | 0.3145 |
| 11 m – 5 m | 0.1933 | -0.0288 | 0.4155 | 0.1168 |
| 11 m – 8 m | 0.0400 | -0.1821 | 0.2621 | 0.9936 |

## S2.2 Exposed reef

**Table S2.2.1** ANOVA – exposed reef

**Summary.aov (Model1)**

| | DF | Sum Sq | Mean Sq | F value | Pr (>F) |
|---|---|---|---|---|---|
| Abundance_Reef2$depth | 5 | 0.018 | 0.004 | 3.813 | 0.027 * |
| Residuals | 12 | 0.012 | 0.001 | | |

Significant codes <0.001 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

**Table S2.2.2** Tukey Post-hoc test - exposed reef

Tukey multiple comparisons of means
95% family-wise confidence level

**Fit: aov(formula = Abundance_Reef2$clams ~ Abundance_Reef2$depth)**

$`Abundance_Reef2$depth`

| | **diff** | **lwr** | **upr** | **p adj** |
|---|---|---|---|---|
| 1.5 m – 0.5 m | <0.0001 | 0.0751 | 0.0973 | 0.9976 |
| 3 m – 0.5 m | <0.0001 | -0.0084 | 0.1640 | 0.0861 |
| 5 m – 0.5 m | <0.0001 | -0.0862 | 0.0862 | 1.0000 |
| 8 m – 0.5 m | <0.0001 | -0.0973 | 0.0751 | 0.9976 |
| 11 m – 0.5 m | <0.0001 | -0.1084 | 0.0640 | 0.9478 |
| 3 m – 1.5 m | <0.0001 | -0.0195 | 0.1529 | 0.1711 |
| 5 m – 1.5 m | <0.0001 | -0.0973 | 0.0751 | 0.9976 |
| 8 m – 1.5 m | <0.0001 | -0.1084 | 0.0640 | 0.9478 |
| 11 m – 1.5 m | <0.0001 | -0.1195 | 0.0529 | 0.7804 |
| 5 m – 3 m | <0.0001 | -0.1640 | 0.0084 | 0.0861 |
| 8 m – 3 m | <0.0001 | -0.1751 | -0.0027 | 0.0420 * |
| 11 m – 3 m | <0.0001 | 0.0138 | 0.1862 | 0.0202 * |
| 8 m – 5 m | <0.0001 | 0.0973 | 0.0751 | 0.9976 |
| 11 m – 5 m | <0.0001 | 0.0640 | 0.1084 | 0.9478 |
| 11 m – 8 m | <0.0001 | -0.0751 | 0.0973 | 0.9976 |

## S3 – Statistics for gross primary production (GPP) of *T. maxima* under 561, 959 and 1061 µmol quanta $m^{-2}$ $s^{-1}$

**Table S.3** ANOVA – Gross Primary Production (GPP) at three different light level

| **Summary.aov (Model1)** | | | | | |
|---|---|---|---|---|---|
| | DF | Sum Sq | Mean Sq | F value | Pr (>F) |
| GPPStats$PAR | 1 | 2.734 | 2.734 | 4.982 | 0.039 * |
| Residuals | 17 | 9.331 | 0.549 | | |

Significant codes <0.001 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1