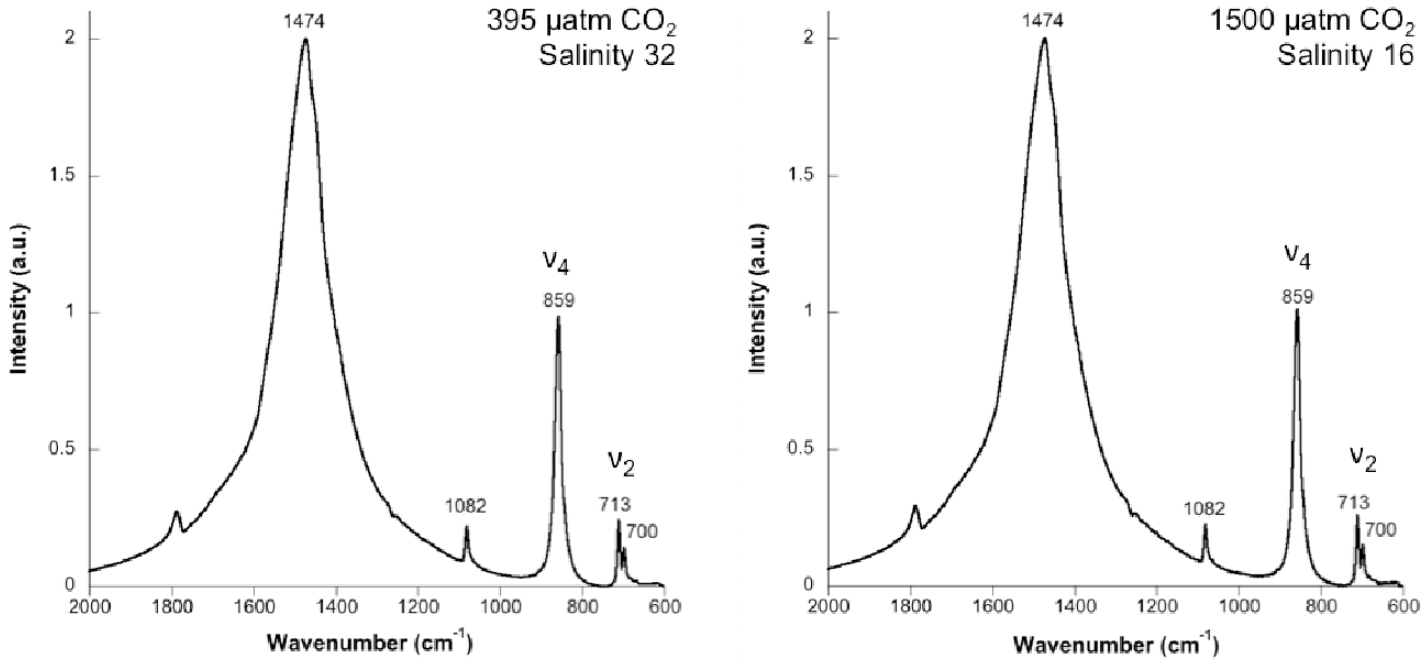


**Fig. S1.** Representative transmittance FTIR spectra of *Mercenaria mercenaria* shells after 21 weeks exposure to experimental conditions. Because no variation in peak position or intensity was observed among any of the experimental treatments, only spectra for the 395 µatm, salinity 32 (left) and 1500 µatm, salinity 16 (right) treatments are shown.

Table S1. Results of Pearson correlation test of $M_{ti}$ *versus* $M_{sh}$ at two latest time points (16 and 21 weeks of exposure) conducted for individual clams within each experimental treatment group

| Experimental group | Exposure time (weeks) | *R* | σ |
|---|---|---|---|
| Sal 32, [$CO_2$] 395 ppm | 16 | **0.81** | 1.90E–06 |
| Sal 32, [$CO_2$] 800 ppm | 16 | **0.81** | 4.41E–06 |
| Sal 32, [$CO_2$] 1500 ppm | 16 | **0.85** | 6.74E–08 |
| Sal 16, [$CO_2$] 395 ppm | 16 | 0.33 | 0.29107 |
| Sal 16, [$CO_2$] 800 ppm | 16 | **0.44** | 0.03608 |
| Sal 16, [$CO_2$] 1500 ppm | 16 | 0.27 | 0.28251 |
| Sal 32, [$CO_2$] 395 ppm | 21 | –0.04 | 0.86218 |
| Sal 32, [$CO_2$] 800 ppm | 21 | **0.96** | 8.44E–14 |
| Sal 32, [$CO_2$] 1500 ppm | 21 | **0.90** | 4.66E–15 |
| Sal 16, [$CO_2$] 395 ppm | 21 | **0.56** | 0.00876 |
| Sal 16, [$CO_2$] 800 ppm | 21 | **0.63** | 4.58E–04 |
| Sal 16, [$CO_2$] 1500 ppm | 21 | 0.33 | 0.15065 |

Significant correlations ($P$<0.05) are shown in bold.

Table S2. Pearson correlation coefficients and the corresponding σ values for the experimental conditions and biological parameters of the clams

| | | Exposure Time | Salinity | pCO2 | Arg Saturation | shellmass | tissuemass | Resp |
|---|---|---|---|---|---|---|---|---|
| "Exposure Time" | Pearson Corr. | 1 | 1.83773E-16 | -1.35269E-17 | 4.17204E-17 | 0.037 | -0.17461 | 0.15595 |
| | Sig. | -- | 1 | 1 | 1 | 0.84611 | 0.35609 | 0.46682 |
| "Salinity" | Pearson Corr. | 1.83773E-16 | 1 | 2.94432E-17 | 0.73396* | 0.64004* | 0.50092* | -0.26491 |
| | Sig. | 1 | -- | 1 | 3.91646E-6 | 1.39588E-4 | 0.00481 | 0.21094 |
| "pCO2" | Pearson Corr. | -1.35269E-17 | 2.94432E-17 | 1 | -0.57962* | -0.09547 | 0.05438 | 0.02041 |
| | Sig. | 1 | 1 | -- | 7.88718E-4 | 0.61578 | 0.77532 | 0.9246 |
| "Arg Saturation" | Pearson Corr. | 4.17204E-17 | 0.73396* | -0.57962* | 1 | 0.38754* | 0.24605 | -0.14509 |
| | Sig. | 1 | 3.91646E-6 | 7.88718E-4 | -- | 0.03435 | 0.18996 | 0.49876 |
| "shellmass" | Pearson Corr. | 0.037 | 0.64004* | -0.09547 | 0.38754* | 1 | 0.62391* | -0.37672 |
| | Sig. | 0.84611 | 1.39588E-4 | 0.61578 | 0.03435 | -- | 2.29563E-4 | 0.06959 |
| "tissuemass" | Pearson Corr. | -0.17461 | 0.50092* | 0.05438 | 0.24605 | 0.62391* | 1 | -0.18506 |
| | Sig. | 0.35609 | 0.00481 | 0.77532 | 0.18996 | 2.29563E-4 | -- | 0.38665 |
| "Resp" | Pearson Corr. | 0.15595 | -0.26491 | 0.02041 | -0.14509 | -0.37672 | -0.18506 | 1 |
| | Sig. | 0.46682 | 0.21094 | 0.9246 | 0.49876 | 0.06959 | 0.38665 | -- |

2-tailed test of significance is used
*:Correlation is significant at the 0.05 level

Asterisks identify significant correlations.

Table S3. Pearson correlation coefficients and the corresponding σ values for the experimental conditions and biological parameters of the clams grown at salinity 32

| | | Exposure Time | pCO2 | shellmass | tissuemass | Resp | Arg Saturation |
|---|---|---|---|---|---|---|---|
| "Exposure Time" | Pearson Corr. | 1 | -5.41075E-17 | -0.12916 | -0.53677* | 0.32716 | 1.39625E-16 |
| | Sig. | – | 1 | 0.64641 | 0.03911 | 0.29926 | 1 |
| "pCO2" | Pearson Corr. | -5.41075E-17 | 1 | -0.54752* | -0.16868 | 0.17644 | -0.91008* |
| | Sig. | 1 | – | 0.03463 | 0.54788 | 0.58331 | 2.50354E-6 |
| "shellmass" | Pearson Corr. | -0.12916 | -0.54752* | 1 | 0.1878 | -0.42349 | 0.53995* |
| | Sig. | 0.64641 | 0.03463 | – | 0.5027 | 0.17012 | 0.03774 |
| "tissuemass" | Pearson Corr. | -0.53677* | -0.16868 | 0.1878 | 1 | -0.26921 | 0.17773 |
| | Sig. | 0.03911 | 0.54788 | 0.5027 | – | 0.39749 | 0.52628 |
| "Resp" | Pearson Corr. | 0.32716 | 0.17644 | -0.42349 | -0.26921 | 1 | -0.1208 |
| | Sig. | 0.29926 | 0.58331 | 0.17012 | 0.39749 | – | 0.70843 |
| "Arg Saturation" | Pearson Corr. | 1.39625E-16 | -0.91008* | 0.53995* | 0.17773 | -0.1208 | 1 |
| | Sig. | 1 | 2.50354E-6 | 0.03774 | 0.52628 | 0.70843 | – |

2-tailed test of significance is used
*:Correlation is significant at the 0.05 level

Asterisks identify significant correlations.

Table S4. Pearson correlation coefficients and the corresponding σ values for the experimental conditions and biological parameters of the clams grown at salinity 16

| | | Exposure Time | pCO2 | shellmass | tissuemass | Resp | Arg Saturation |
|---|---|---|---|---|---|---|---|
| "Exposure Time" | Pearson Corr. | 1 | -5.41075E-17 | 0.20782 | 0.12214 | -0.20945 | 1.56696E-16 |
| | Sig. | -- | 1 | 0.45734 | 0.66456 | 0.51354 | 1 |
| "pCO2" | Pearson Corr. | -5.41075E-17 | 1 | 0.25629 | 0.2867 | -0.37009 | -0.972* |
| | Sig. | 1 | -- | 0.35652 | 0.3002 | 0.23635 | 1.48072E-9 |
| "shellmass" | Pearson Corr. | 0.20782 | 0.25629 | 1 | 0.69006* | -0.09883 | -0.38207 |
| | Sig. | 0.45734 | 0.35652 | -- | 0.00441 | 0.75993 | 0.15991 |
| "tissuemass" | Pearson Corr. | 0.12214 | 0.2867 | 0.69006* | 1 | 0.28327 | -0.35902 |
| | Sig. | 0.66456 | 0.3002 | 0.00441 | -- | 0.37229 | 0.18878 |
| "Resp" | Pearson Corr. | -0.20945 | -0.37009 | -0.09883 | 0.28327 | 1 | 0.3196 |
| | Sig. | 0.51354 | 0.23635 | 0.75993 | 0.37229 | -- | 0.31122 |
| "Arg Saturation" | Pearson Corr. | 1.56696E-16 | -0.972* | -0.38207 | -0.35902 | 0.3196 | 1 |
| | Sig. | 1 | 1.48072E-9 | 0.15991 | 0.18878 | 0.31122 | -- |

2-tailed test of significance is used
*:Correlation is significant at the 0.05 level

Asterisks identify significant correlations.

Table S5. Principal component analysis for all parameters

| Parameter | Coefficients of PC1 | Coefficients of PC2 | Coefficients of PC3 | Coefficients of PC4 | Coefficients of PC5 |
|---|---|---|---|---|---|
| Exposure time | –0.13196 | **0.24594** | **0.73981** | –0.00886 | 0.09012 |
| Salinity | **0.42971** | –0.12826 | **0.30161** | 0.16318 | **–0.51884** |
| $P_{CO_2}$ | **–0.23407** | **–0.55255** | **0.22775** | 0.08182 | **–0.27392** |
| Aragonite saturation | **0.43541** | **0.28835** | 0.07309 | 0.12724 | **–0.4148** |
| pH | **0.32002** | **0.51596** | –0.14429 | –0.02521 | 0.16471 |
| Mortality | **–0.3627** | **0.33353** | **0.38615** | –0.13791 | 0.05686 |
| Shell mass | **0.39105** | –0.16556 | **0.35215** | –0.10242 | **0.36555** |
| Tissue mass | **0.34569** | **–0.31737** | 0.102 | **0.26307** | **0.55383** |
| SMR | **–0.21721** | 0.17036 | –0.01273 | **0.92253** | 0.06979 |

| Principal component | Eigenvalue | Percentage of variance (%) | Cumulative (%) |
|---|---|---|---|
| 1 | 3.45974 | 38.44 | 38.44 |
| 2 | 2.22381 | 24.71 | 63.15 |
| 3 | 1.34317 | 14.92 | 78.07 |
| 4 | 0.88109 | 9.79 | 87.86 |
| 5 | 0.62364 | 6.93 | 94.79 |

Loadings of principal components, eigenvalues and percentage of variance are given for each principal component.

Table S6. Principal component analysis without pH and aragonite saturation

| | Coefficients of PC1 | Coefficients of PC2 | Coefficients of PC3 | Coefficients of PC4 | Coefficients of PC5 |
|---|---|---|---|---|---|
| Exposure time | –0.23 | **0.76** | 0.08 | 0.02 | 0.03 |
| $P_{CO_2}$ | 0.00 | –0.07 | **0.96** | –0.26 | –0.05 |
| Salinity | **0.45** | **0.30** | 0.05 | 0.12 | **–0.74** |
| Mortality | **–0.49** | **0.40** | 0.00 | –0.13 | 0.14 |
| Shell mass | **0.45** | **0.40** | –0.05 | 0.00 | **0.21** |
| Tissue mass | **0.47** | 0.08 | 0.18 | **0.30** | **0.61** |
| Resp | **–0.29** | –0.04 | **0.21** | **0.90** | –0.10 |

| | Eigenvalue | Percentage of variance | Cumulative |
|---|---|---|---|
| 1 | 2.90999 | 41.57% | 41.57% |
| 2 | 1.34704 | 19.24% | 60.81% |
| 3 | 1.02078 | 14.58% | 75.40% |
| 4 | 0.85644 | 12.23% | 87.63% |
| 5 | 0.47371 | 6.77% | 94.40% |

Loadings of principal components, Eigenvalues and % of variance are given for each principal component.