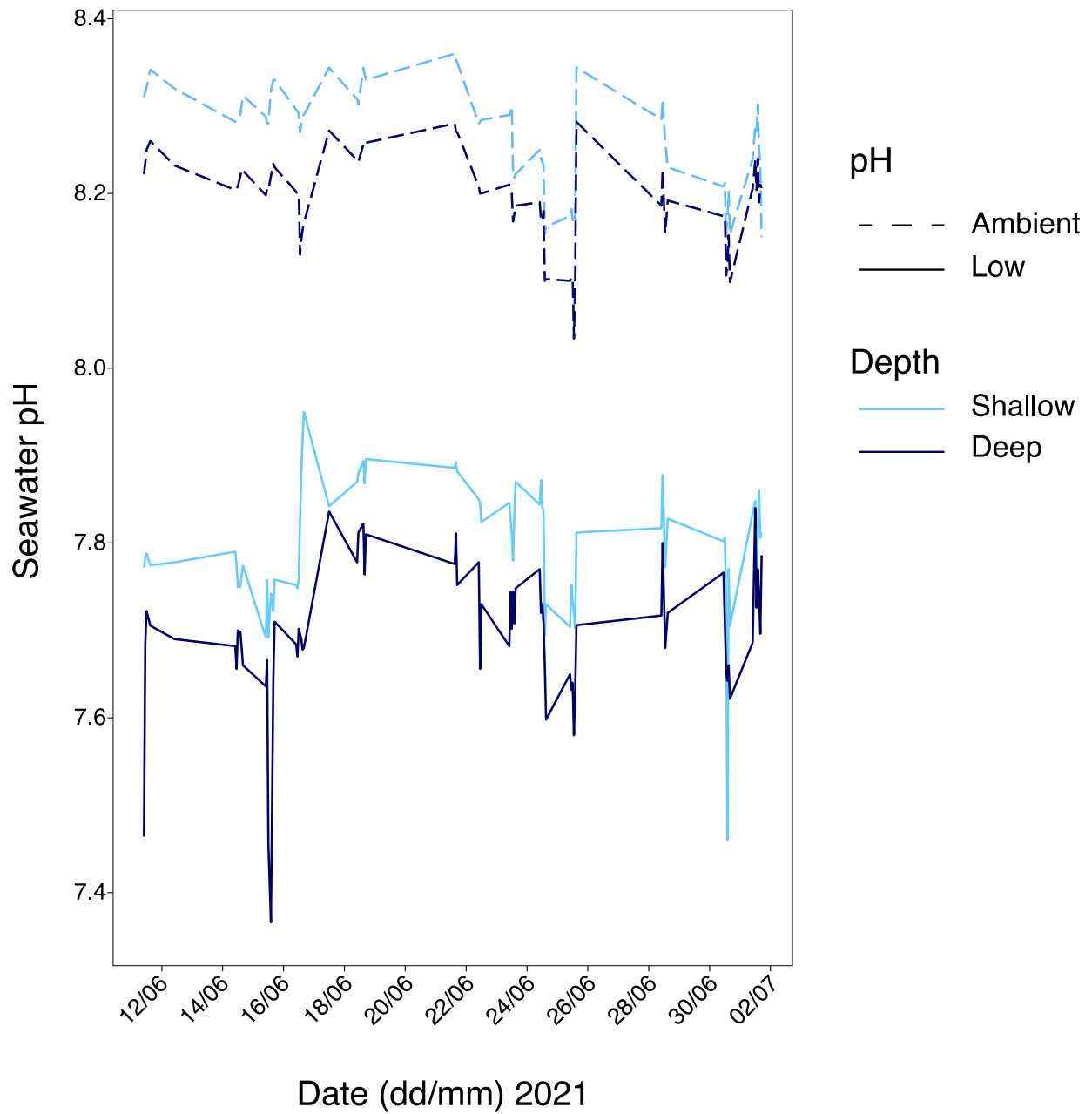


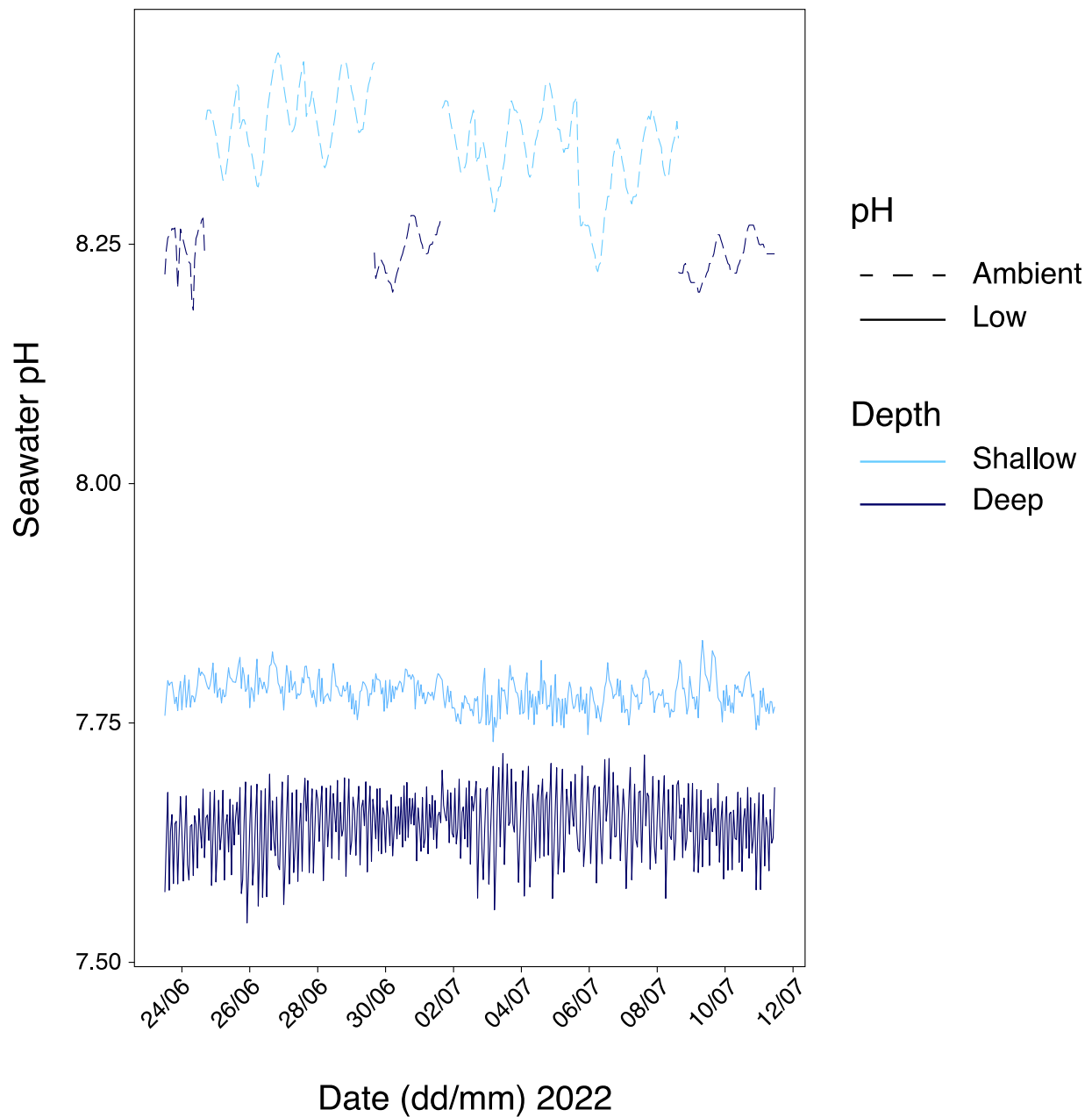
## Supporting information

**Table S1.** Carbonate chemistry variables (mean  $\pm$  SE) measured in each tank exposed to different experimental conditions (Shall = shallow depth, Deep = deep depth, ApH = ambient pH, LpH = low pH), throughout the first year (2021).  $A_T$ : total alkalinity; pH: total hydrogen ion concentration; Temp: temperature; Sal: salinity;  $pCO_2$ : the partial pressure of  $CO_2$  in seawater;  $\Omega_{calc}$ : the saturation state of seawater for calcite;  $\Omega_{Arag}$ : the saturation state of seawater for aragonite;  $HCO_3^-$ : the bicarbonate ion concentration;  $CO_3^{2-}$ : the carbonate ion concentration;  $CO_{2(aq)}$ : dissolved  $CO_2$  concentration.

| Nominal treatment | $A_T$ ( $\mu\text{mol kg}^{-1}$ ) | pH                | Temp ( $^{\circ}\text{C}$ )           | Sal (psu)                               | $pCO_2$ ( $\mu\text{atm}$ )              |
|-------------------|-----------------------------------|-------------------|---------------------------------------|---|--|
| SD, ApH           | 2675.72 $\pm$ 6.89                | 8.285 $\pm$ 0.007 | 19.76 $\pm$ 0.09                      | 36.6 $\pm$ 0.13                         | 333.53 $\pm$ 7.14                        |
| SD, LpH           | 2741.80 $\pm$ 4.74                | 7.836 $\pm$ 0.008 | 19.46 $\pm$ 0.11                      | 37 $\pm$ 0.11                           | 1136.97 $\pm$ 24.05                      |
| DD, ApH           | 2625.95 $\pm$ 6.47                | 8.204 $\pm$ 0.008 | 19.4 $\pm$ 0.12                       | 37 $\pm$ 0.18                           | 409.62 $\pm$ 10.69                       |
| DD, LpH           | 2806.65 $\pm$ 6.95                | 7.738 $\pm$ 0.012 | 19.26 $\pm$ 0.07                      | 36.8 $\pm$ 0.17                         | 1492.44 $\pm$ 44.6                       |
| Nominal treatment | $\Omega_{calc}$                   | $\Omega_{Arag}$   | $HCO_3^-$ ( $\mu\text{mol kg}^{-1}$ ) | $CO_3^{2-}$ ( $\mu\text{mol kg}^{-1}$ ) | $CO_{2(aq)}$ ( $\mu\text{mol kg}^{-1}$ ) |
| SD, ApH           | 6.43 $\pm$ 0.07                   | 4.18 $\pm$ 0.05   | 2019.68 $\pm$ 10.62                   | 272.03 $\pm$ 2.89                       | 10.77 $\pm$ 0.23                         |
| SD, LpH           | 2.78 $\pm$ 0.05                   | 1.81 $\pm$ 0.03   | 2458.54 $\pm$ 7.68                    | 117.93 $\pm$ 1.98                       | 36.89 $\pm$ 0.77                         |
| DD, ApH           | 5.44 $\pm$ 0.11                   | 3.54 $\pm$ 0.07   | 2066.31 $\pm$ 12.60                   | 230.93 $\pm$ 4.90                       | 13.31 $\pm$ 0.37                         |
| DD, LpH           | 2.3 $\pm$ 0.06                    | 1.49 $\pm$ 0.04   | 2573.3 $\pm$ 9.73                     | 97.59 $\pm$ 2.71                        | 48.75 $\pm$ 1.48                         |



**Figure S1.** Time series of daily seawater pH values for different combinations of pH (ambient and low) and depth (shallow and deep), measured along the course of the first year (2021).



**Figure S2.** Time series of hourly seawater pH for different combinations of pH (ambient and low) and depth (shallow and deep), measured along the course of the second year (2022). pH measurements were obtained by using three high-resolution HOBO data loggers, two of which were deployed in the two tanks exposed to low pH treatments (solid lines) throughout the experiment, while the third sensor was alternated between shallow and deep tanks maintained at ambient pH (dotted lines).