

Supplementary Materials

**Enhancement of photosynthetic carbon assimilation efficiency  
by phytoplankton in the future coastal ocean**

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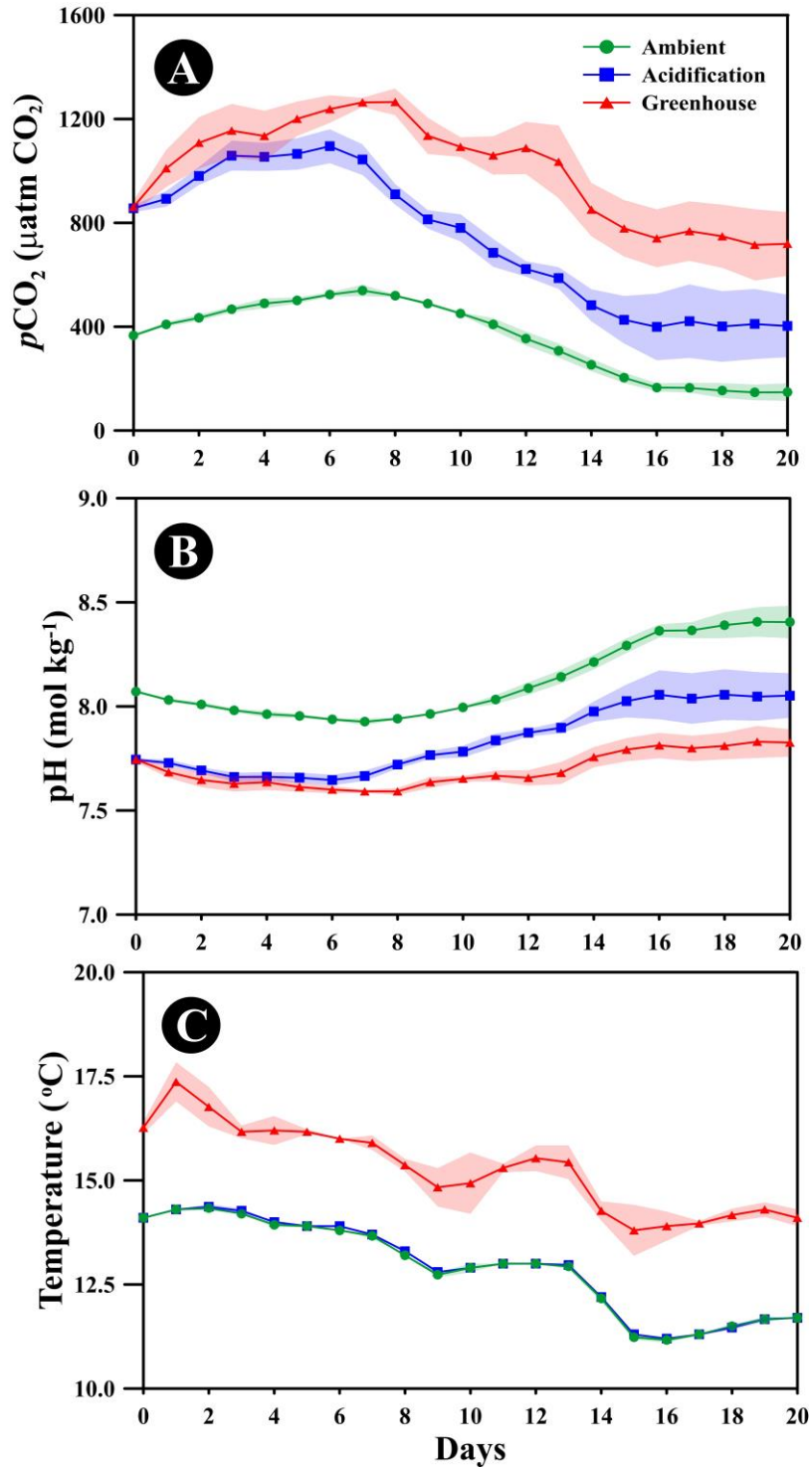


Fig. S-1. Experimental conditions of seawater  $p\text{CO}_2$  (A), pH (B) and temperature (C) during the experiment period under the ambient (green), acidification (blue), and greenhouse (red) conditions. Error bars represent the standard deviation from the mean of replicate enclosures ( $n=3$ ) (source: Kim *et al.*, 2010).

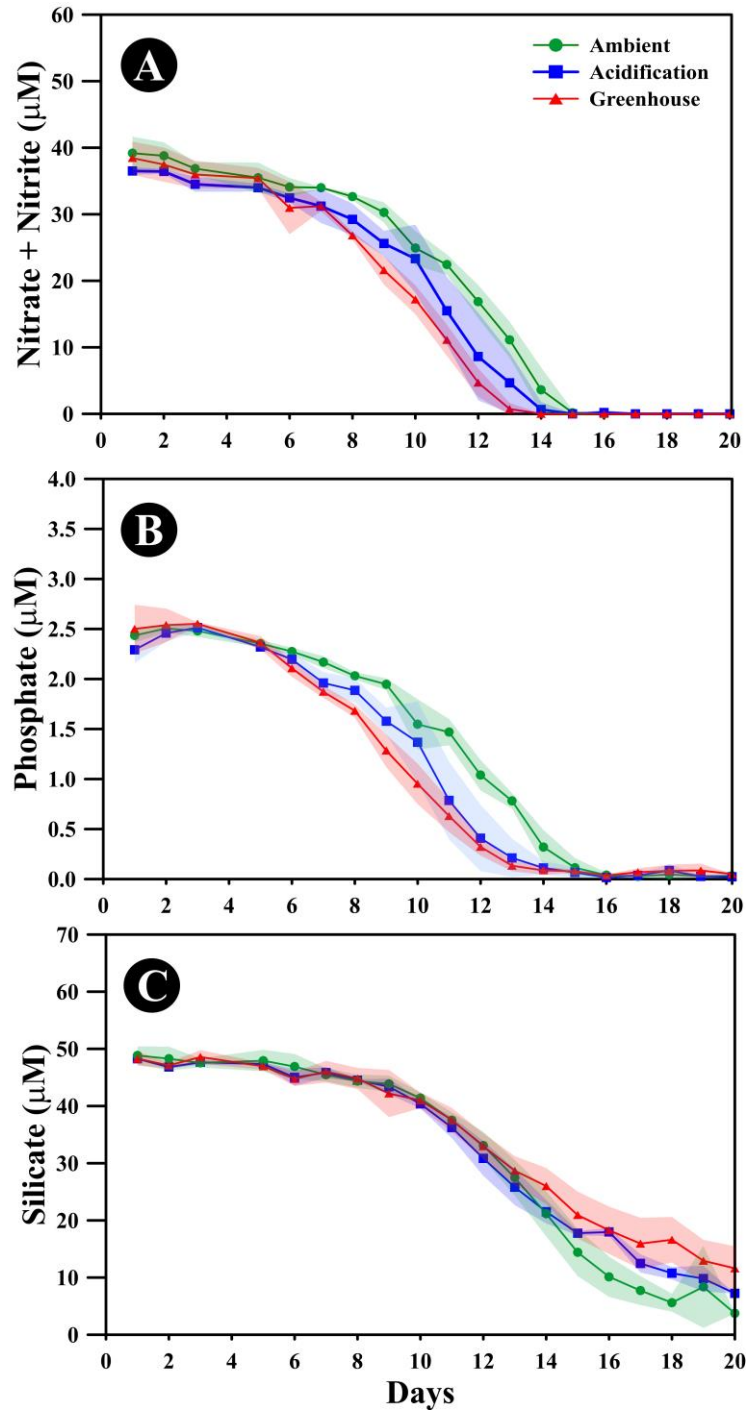


Fig. S-2. Nutrients concentration (nitrate + nitrite, A; phosphate, B; and silicate, C) during the experiment period under the ambient (green), acidification (blue), and greenhouse (red) conditions. Error bars represent the standard deviation from the mean of replicate enclosures (n=3) (source: Kim *et al.*, 2011).

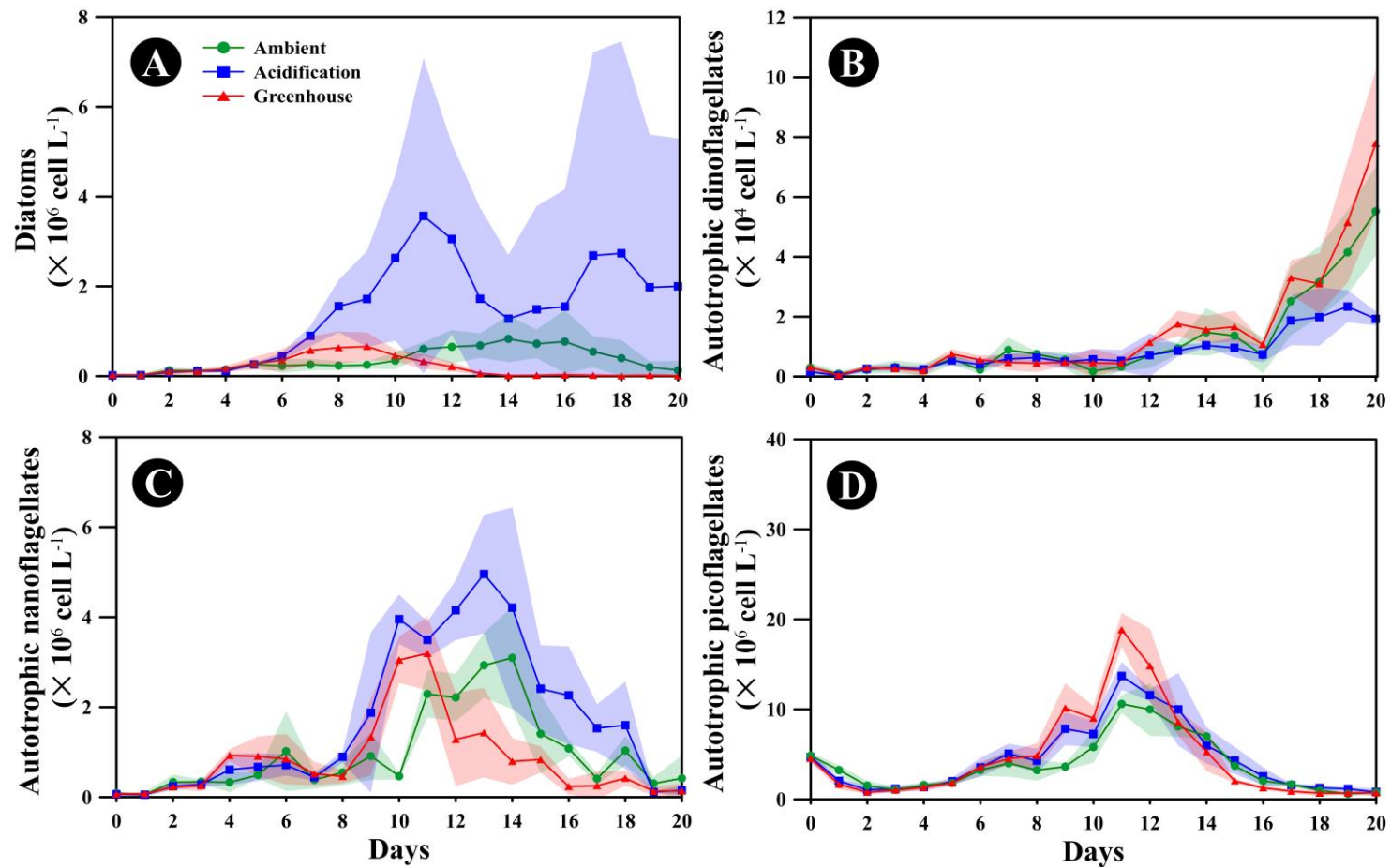


Fig. S-3. The autotrophic phytoplankton taxonomic composition during the experiment period under the ambient (green), acidification (blue), and greenhouse (red) conditions. Error bars represent the standard deviation from the mean of replicate enclosures (n=3) (source: Kim *et al.*, 2010).

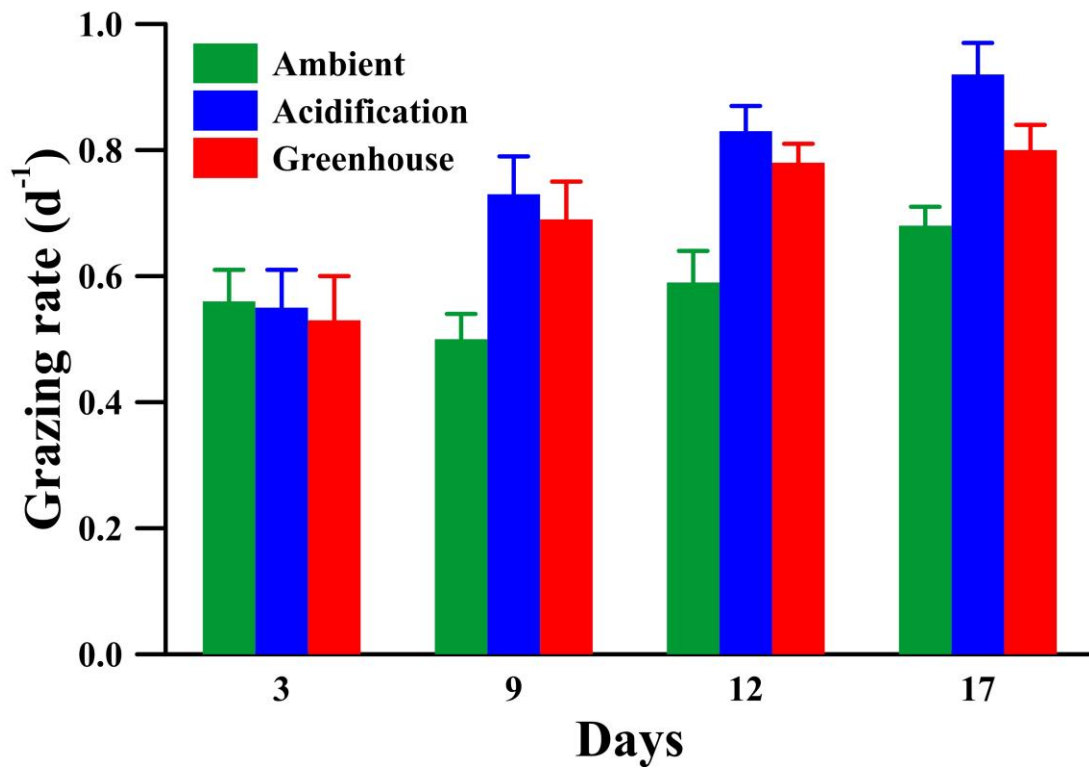


Fig. S-4. The grazing rate during the experiment period under the ambient (green), acidification (blue), and greenhouse (red) conditions. Error bars represent the standard deviation from the mean of replicate enclosures (n=3) (source: Kim et al. 2010).

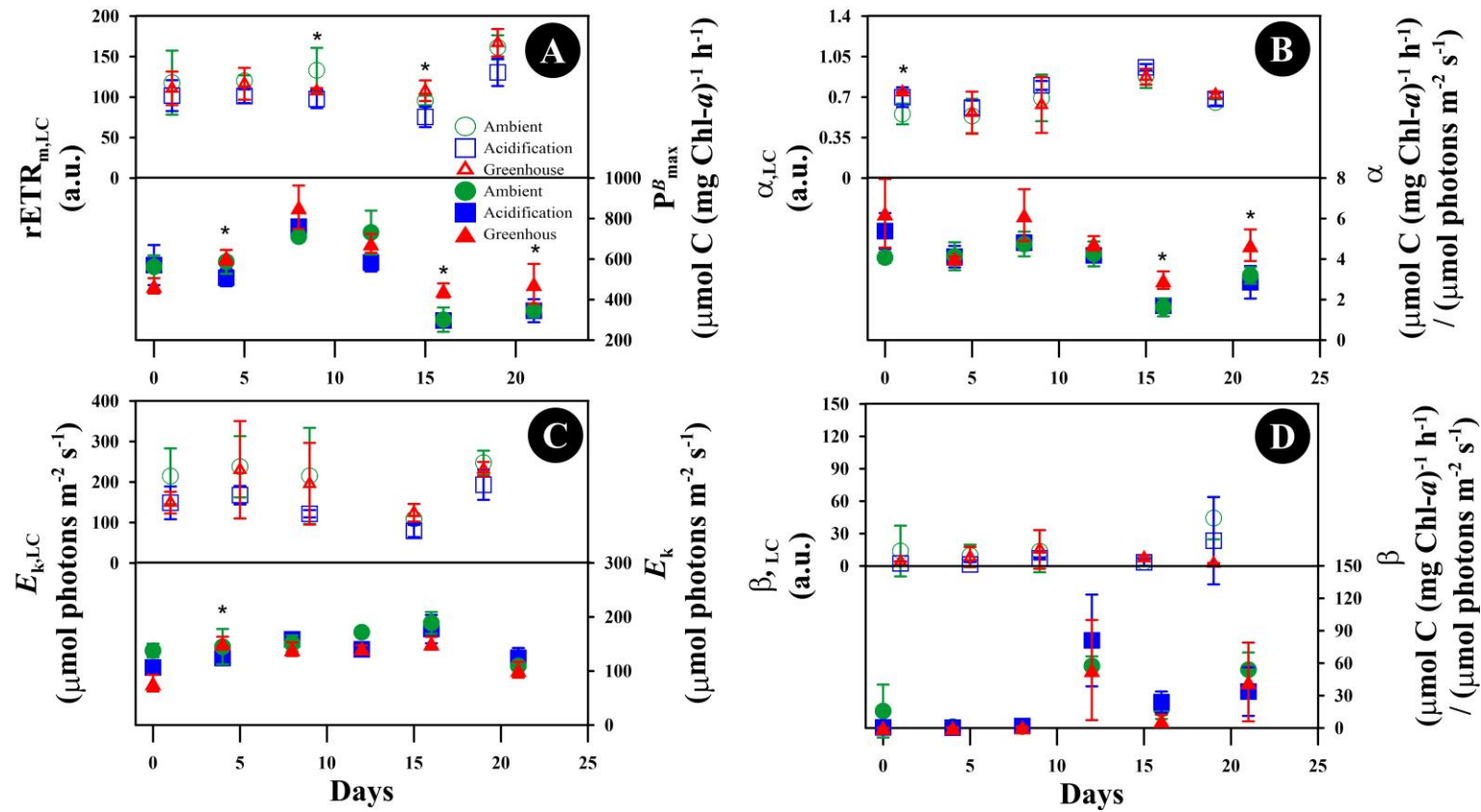


Fig. S-5. Photosynthetic parameters from LCs ( $rETR_{m,LC}$ ,  $\alpha_{LC}$ ,  $E_{k,LC}$  and  $\beta_{LC}$ ; top and opened) and P-I curves ( $P^B_{max}$ ,  $\alpha$ ,  $E_k$  and  $\beta$ ; bottom and closed) of phytoplankton community during the experimental period in the ambient (green), acidification (blue), and greenhouse conditions (data from Tables S1 and S2). Error bars represent the standard deviation from the mean of replicate enclosures. The asterisk (\*) represents significant differences at the  $p < 0.05$ .

## References

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- Kim, J.-M., Lee, K., Shin, K., Yang, E.J., Engel, A., Karl, D.M., and Kim, H.-C.: Shift in biogenic carbon from particulate to dissolved forms under high carbon dioxide and warm ocean conditions, *Geophys. Res. Lett.*, 38, L08612, doi:10.1029/2011GL047346, 2011.