

Supplemental Information

Table S1. Results of three-way ANOVAs of the effects of light intensity (L), dissolved inorganic phosphorus (PO_4^{3-}) concentration (P), $p\text{CO}_2$ level (C), and their interaction on growth rate, cellular contents of POC, PON, POP, PIC, carbohydrate and protein, and the ratios of POC : PON, POC : POP, PON : POP and PIC : POC, and the percentages of POC allocated to carbohydrate (carbohydrate-C : POC) and protein (protein-C : POC), and the percentage of PON allocated to protein (protein-N : PON). Please see figure 1 for more detailed information.

Parameter		L	P	C	L×P	L×C	P×C	L×P×C
Growth rate	F	4588.5	198.3	225.7	6.7	14.7	100.9	8.6
	<i>p</i>	<0.01	<0.01	<0.01	=0.02	<0.01	<0.01	<0.01
POC	F	864.7	0.6	0.6	36.4	8.1	0.2	2.6
	<i>p</i>	<0.01	=0.46	=0.46	<0.01	<0.01	=0.65	=0.12
PON	F	172.2	70.6	17.7	1.2	6.3	10.0	0.2
	<i>p</i>	<0.01	<0.01	<0.01	=0.33	=0.02	<0.01	=0.65
POP	F	188.3	724.8	8.2	6.6	0.1	0.2	0.2
	<i>p</i>	<0.01	<0.01	<0.01	=0.02	=0.89	=0.65	=0.65
PIC	F	329.4	109.1	47.2	17.7	8.9	1.9	0.1
	<i>p</i>	<0.01	<0.01	<0.01	<0.01	<0.01	=0.17	=0.98
POC : PON	F	207.6	396.4	0.1	14.9	0.2	9.3	2.1
	<i>p</i>	<0.01	<0.01	=0.96	<0.01	=0.65	<0.01	=0.16
POC : POP	F	7.7	351.3	18.7	0.1	0.3	2.6	1.0
	<i>p</i>	=0.01	<0.01	<0.01	=0.85	=0.62	=0.12	=0.32
PON : POP	F	29.4	183.1	29.9	1.9	0.1	0.3	0.1
	<i>p</i>	<0.01	<0.01	<0.01	=0.18	=0.97	=0.61	=0.94
PIC : POC	F	90.2	71.9	77.6	0.6	6.6	2.4	0.3
	<i>p</i>	<0.01	<0.01	<0.01	=0.46	=0.02	=0.14	=0.61
Carbohydrate	F	925.2	37.7	23.6	40.9	7.9	0.9	0.9
	<i>p</i>	<0.01	<0.01	<0.01	<0.01	<0.01	=0.34	=0.34
Protein	F	782.4	77.0	1.0	21.1	0.8	2.0	0.8
	<i>p</i>	<0.01	<0.01	=0.34	<0.01	=0.38	=0.17	=0.37
Carbohydrate-C : POC	F	793.3	76.2	17.1	4.9	0.7	0.6	0.1
	<i>p</i>	<0.01	<0.01	<0.01	=0.04	=0.41	=0.43	=0.95
Protein-C : POC	F	6.3	120.0	0.7	2.4	0.6	2.2	2.7
	<i>p</i>	=0.02	<0.01	=0.42	=0.13	=0.45	=0.15	=0.11
Protein-N : PON	F	36.3	4.3	2.8	9.2	0.7	0.7	0.2
	<i>p</i>	<0.01	=0.05	=0.10	<0.01	=0.41	=0.41	=0.63

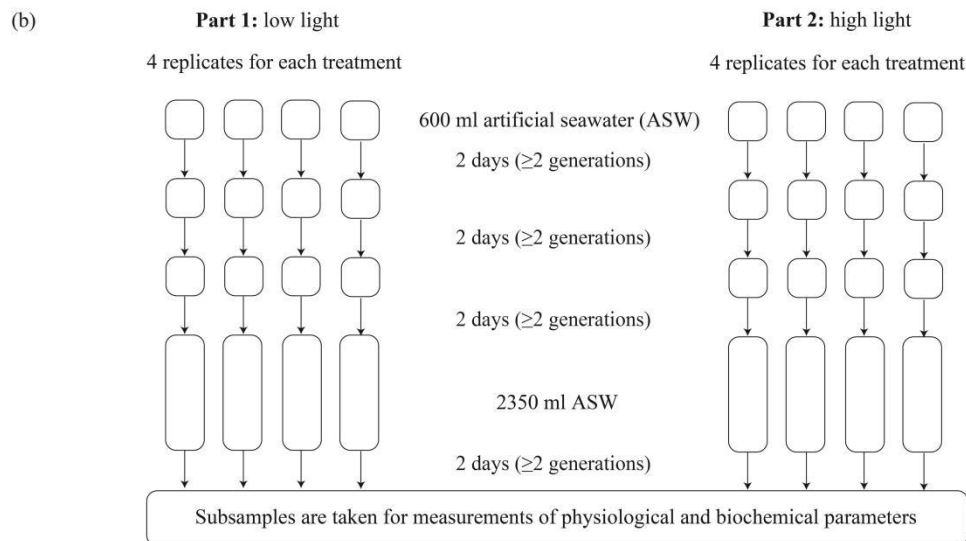
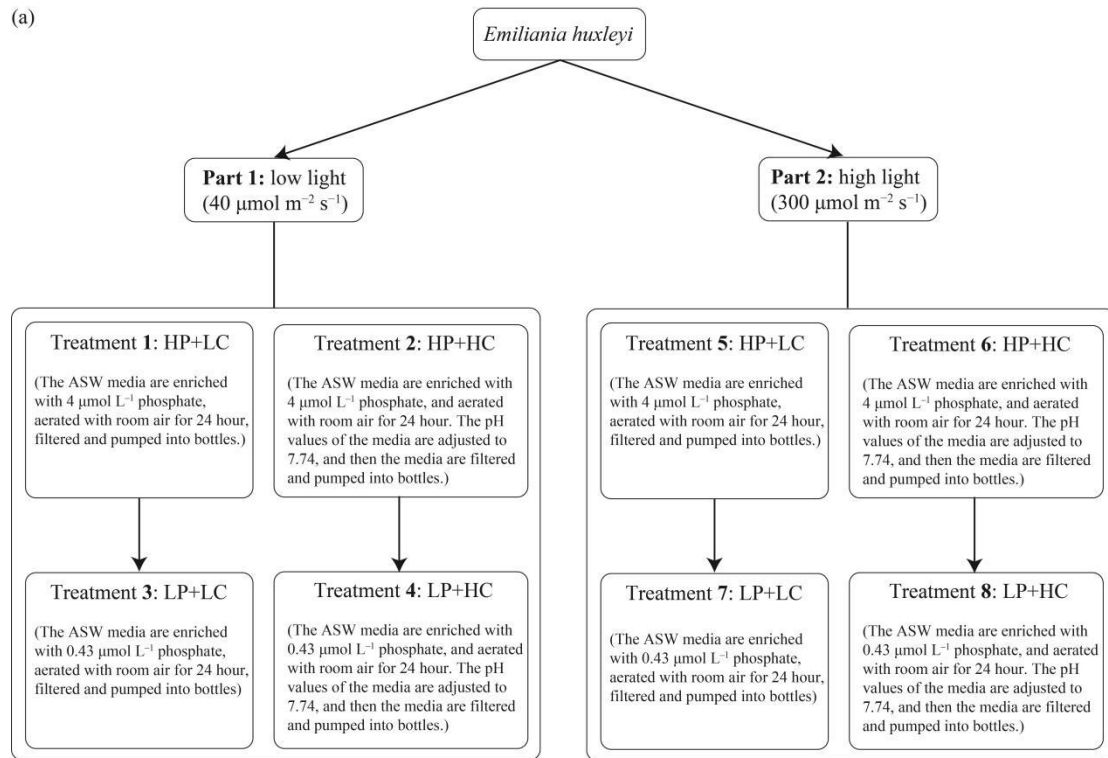


Figure S1. Flow chart of the experimental processes (a) and flow chart of the pre-culture and experimental cultures in each treatment (b). At the beginning of the incubations, HP and LP represent 4 and $0.43 \mu\text{mol L}^{-1} \text{PO}_4^{3-}$, and LC and HC represent low (about $426 \mu\text{atm}$) and high CO_2 (about $946 \mu\text{atm}$) concentrations, respectively.

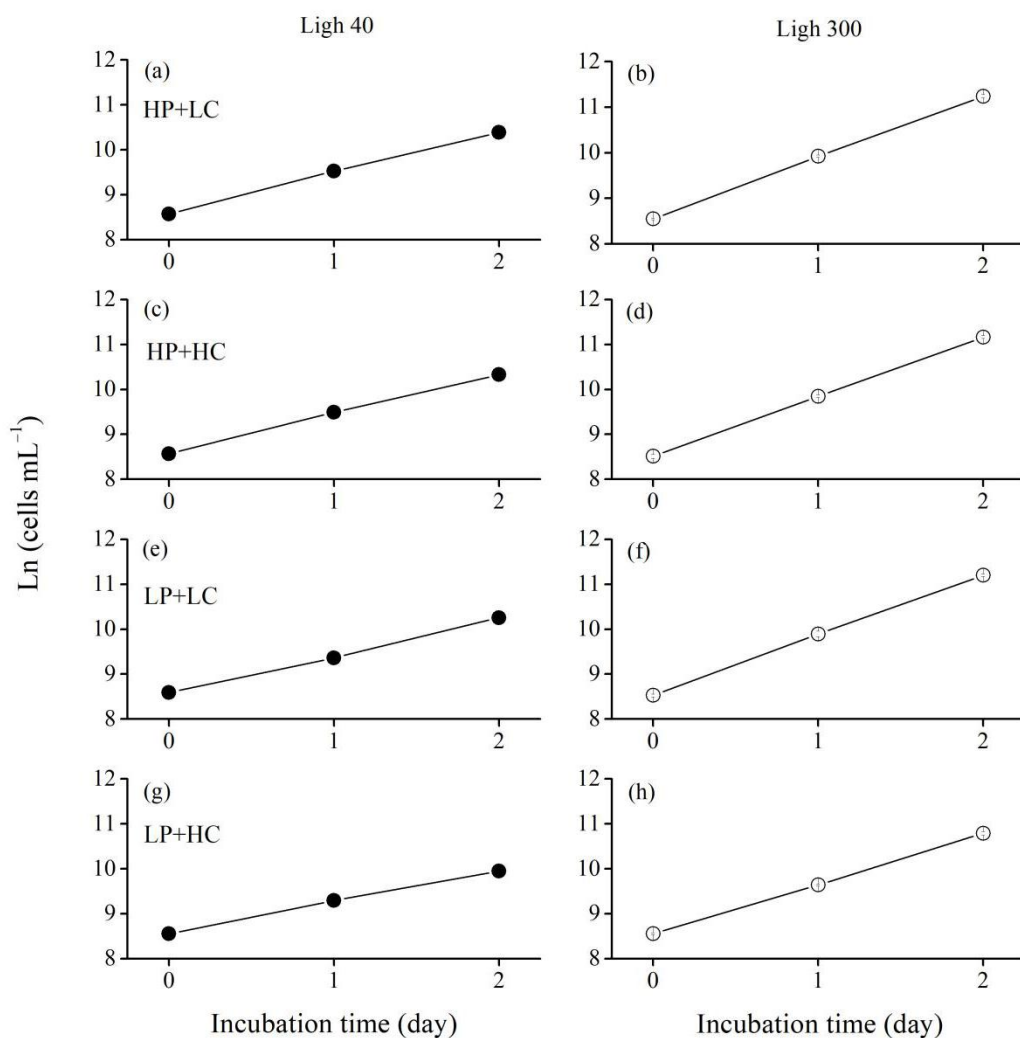


Figure S2. Cell density of *E. huxleyi* RCC1266 in the treatments of HP+LC, HP+HC, LP+LC and LP+HC under low light (left) and high light (right) intensities during the experimental cultures. The cells were inoculated to achieve an initial density of about 5000 cell mL⁻¹, and cultured in each experimental condition for 2 days and then diluted to the initial cell density again. This process was repeated four times. The data represents the means and standard deviation of four independent cultures in the fourth incubation. Please see figure 1 for more detailed information.

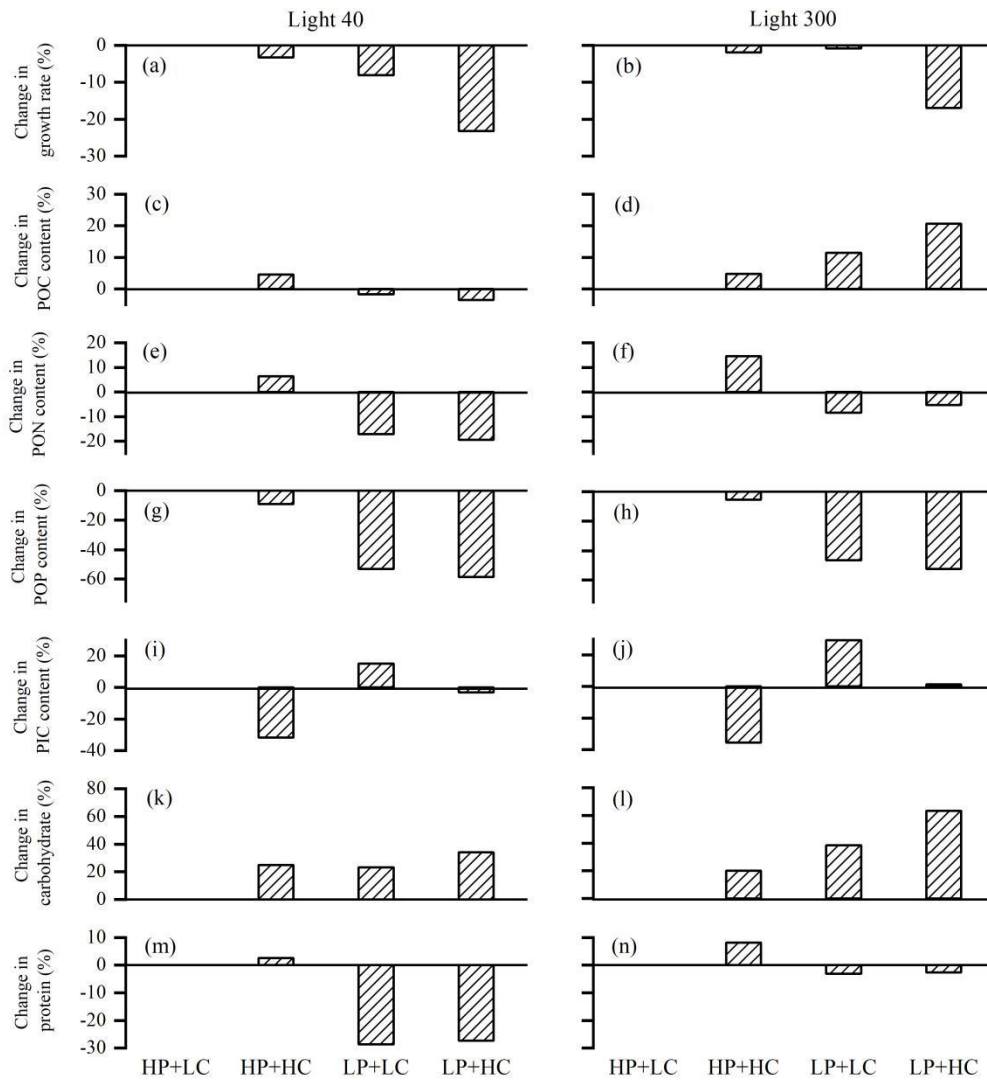


Figure S3. In comparison to the HP+LC treatment, changes in growth rate (**a, b**) and cellular contents of POC (**c, d**), PON (**e, f**), POP (**g, h**), PIC (**i, j**), carbohydrate (**k, l**) and protein (**m, n**) of *E. huxleyi* RCC1266 in the treatments of HP+HC, LP+LC and LP+HC under low light (left) and high light (right) intensities. The data represents the means of four independent cultures. Please see figure 1 for more detailed information.

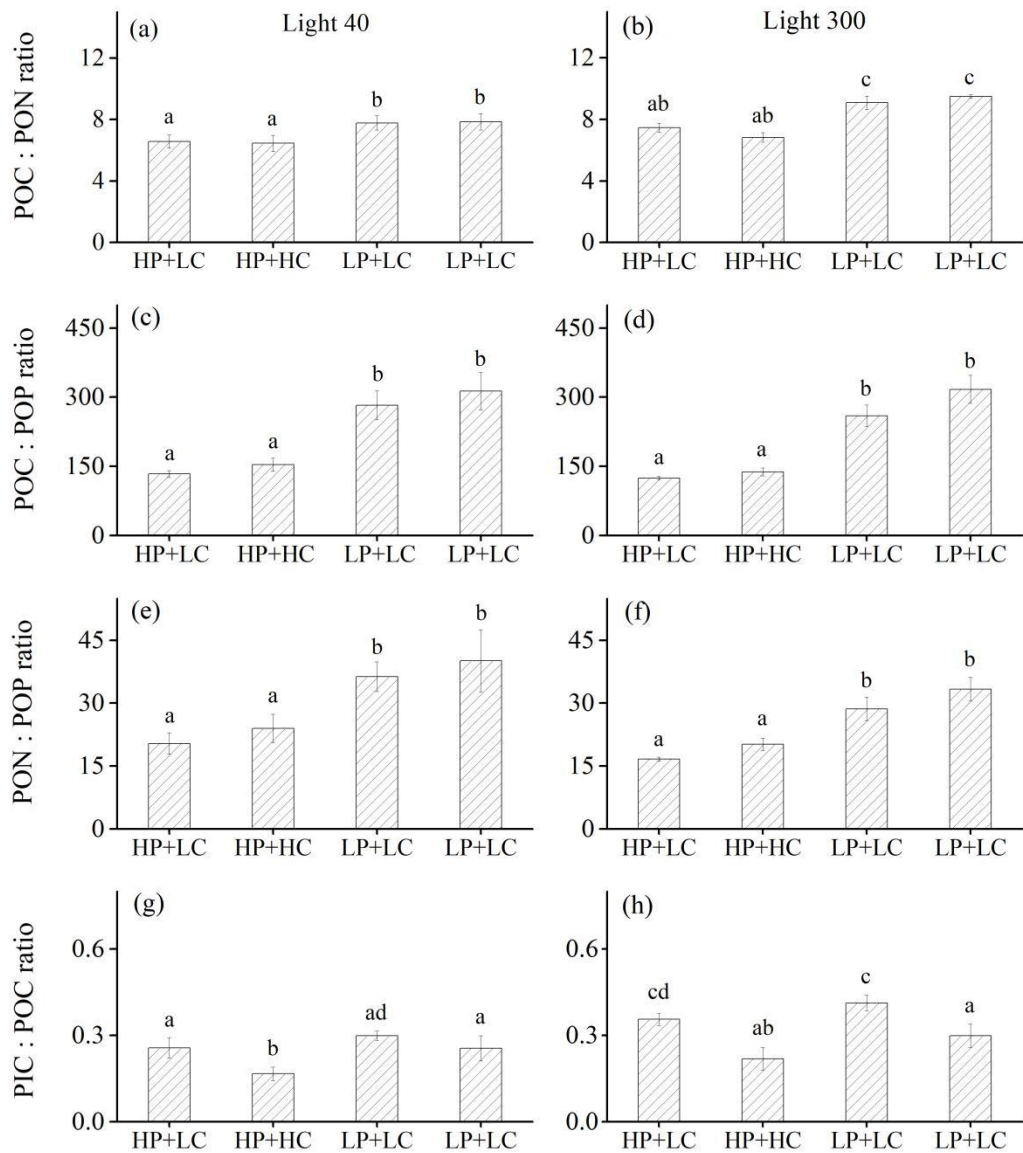


Figure S4. The ratios of POC : PON (a, b), POC : POP (c, d), PON : POP (e, f) and PIC : POC (g, h) of *E. huxleyi* RCC1266 in the treatments of HP+LC, HP+HC, LP+LC and LP+HC under low light (left) and high light (right) intensities. Different letters represent significant differences in each parameters between treatments ($p < 0.05$). The data represents the means and standard deviation of four independent cultures. Please see figure 1 for more detailed information.

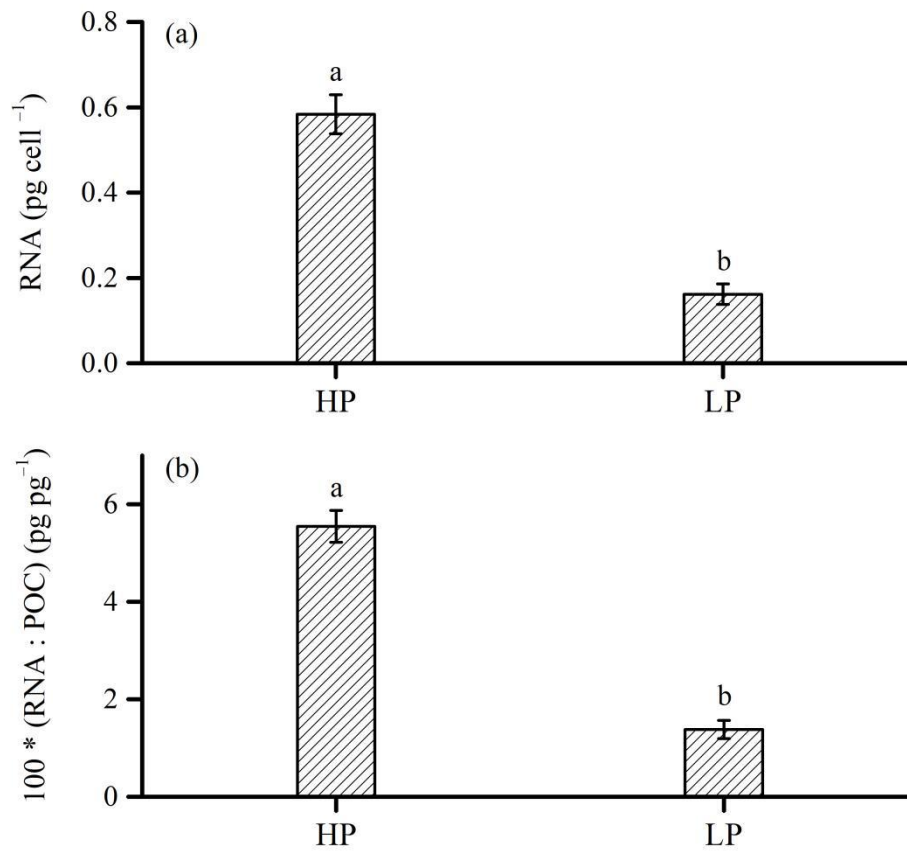


Figure S5. Cellular RNA content (a) and POC normalized RNA content (b) of *E. huxleyi* RCC1266 in the treatments of HP+LC and LP+LC under high light intensity. Different letters in each panel represent significant differences between treatments ($p < 0.05$). The data represents the means and standard deviation of four independent cultures. Please see figure 1 for more detailed information.

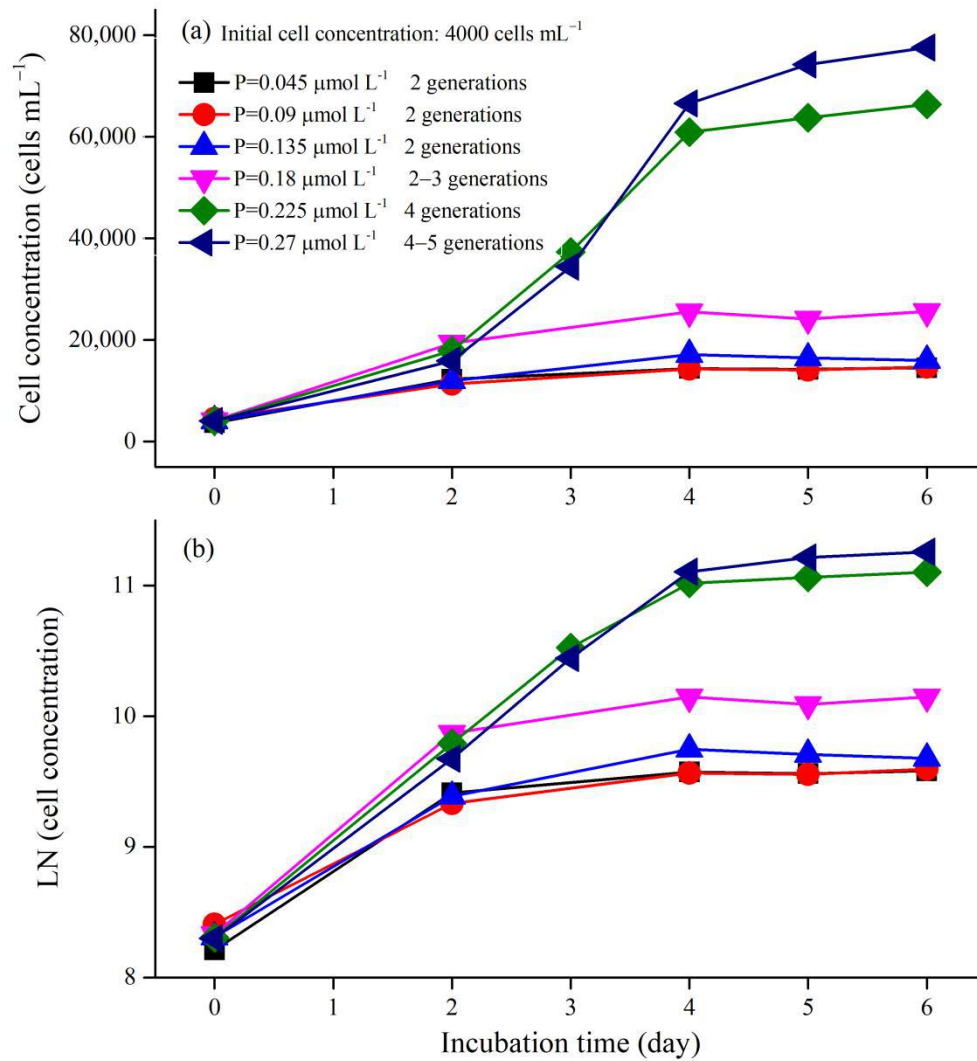


Figure S6. Cell density of *E. huxleyi* RCC1266 under different phosphorus concentrations (P) at 150 $\mu\text{mol photons m}^{-2} \text{s}^{-1}$ of photosynthetically active radiation under low CO₂ level.

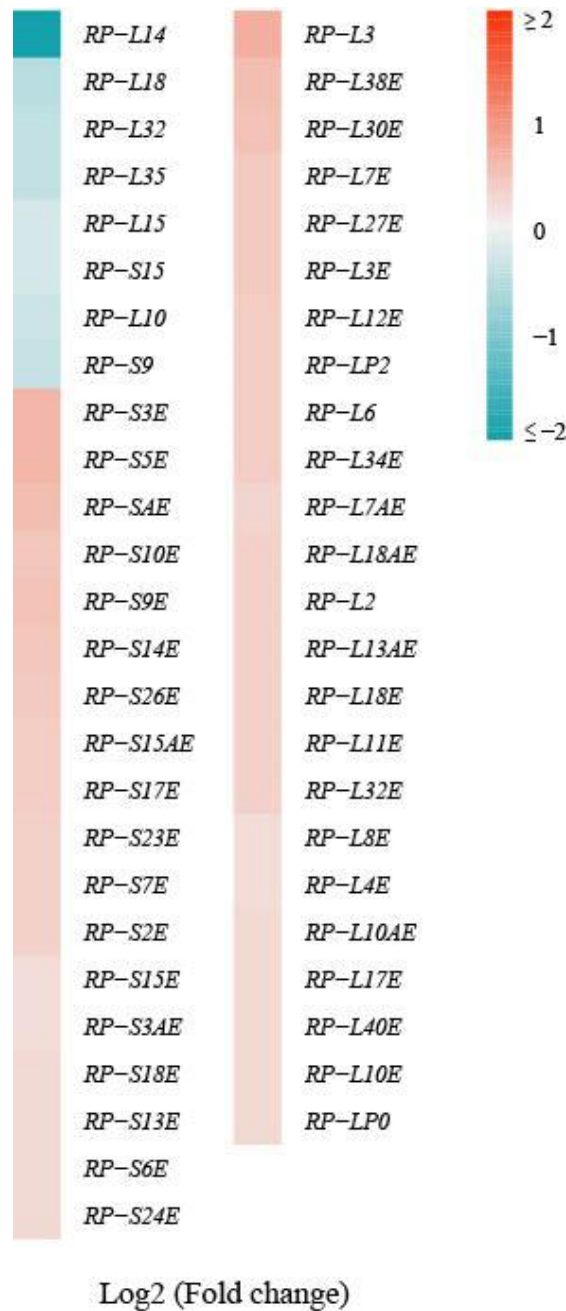


Figure S7. Heatmap of significant change in expression of genes linked to ribosome metabolism (Ribosome_ko03010) under the low pH treatment (ocean acidification) in comparison to the high pH treatment (present CO₂ level). Red indicates up-regulation of gene, and blue indicates down-regulation of gene. *RP-S* presents genes linked to small subunit ribosomal protein, and *RP-L* presents genes linked to large subunit ribosomal protein.