

## Supplemental Information

**Table S1.** Average surface seawater  $p\text{CO}_2$  level ( $\mu\text{atm}$ ), sea surface temperature ( $^\circ\text{C}$ ), daytime mean irradiance ( $\mu\text{mol photons m}^{-2} \text{s}^{-1}$ ), and nutrient concentration ( $\mu\text{mol L}^{-1}$ ) during 2000 to 2007 in Norwegian coastal waters where the *E. huxleyi* strain used here was isolated from (Larsen et al., 2004; Locarnini et al., 2006; Omar et al., 2010), and in projected levels for 2100 in high-latitude province in North Atlantic Ocean (Future) (Boyd et al., 2015).

	$p\text{CO}_2$ ( $\mu\text{atm}$ )	Temperature ( $^\circ\text{C}$ )	Daily irradiance ( $\mu\text{mol photons m}^{-2} \text{s}^{-1}$ )	Nitrate ( $\mu\text{mol L}^{-1}$ )	Phosphate ( $\mu\text{mol L}^{-1}$ )
2000– 2007	240 – 400	6.0 – 16.0	120 – 350	0 – 7.0	0.1 – 0.5
Future	580 – 970	7.9 – 19.0	156 – 455	0 – 4.9	0.1 – 0.3

**Table S2.** Comparison of experiment treatments between the studies of Zhang et al. (2019) and this work. Main differences between two studies were marked in bold.

Driver	The study of Zhang et al. (2019)			The present study		
$p\text{CO}_2$ ( $\mu\text{atm}$ )	410, 920			370, 960		
Temperature ( $^{\circ}\text{C}$ )	20			<b>16</b> , 20		
Light ( $\mu\text{mol photons m}^{-2} \text{s}^{-1}$ )	<b>80, 120, 200, 320, 480</b>			60, 240		
DIN ( $\mu\text{mol L}^{-1}$ )	<b>100</b> , 8			<b>24</b> , 8		
DIP ( $\mu\text{mol L}^{-1}$ )	<b>10</b> , 0.4			<b>1.5</b> , 0.5		
Experimental setup	HNHP	LC	<b>5 light levels</b>	LC	LT	<b>LL-HNHP</b>
		HC			HT	<b>HL-HNHP</b>
	LNHP	LC				<b>HL-LNHP</b>
		HC		HC	LT	<b>HL-HNLP</b>
	HNLP	LC			HT	<b>HL-LNLP</b>
		HC				

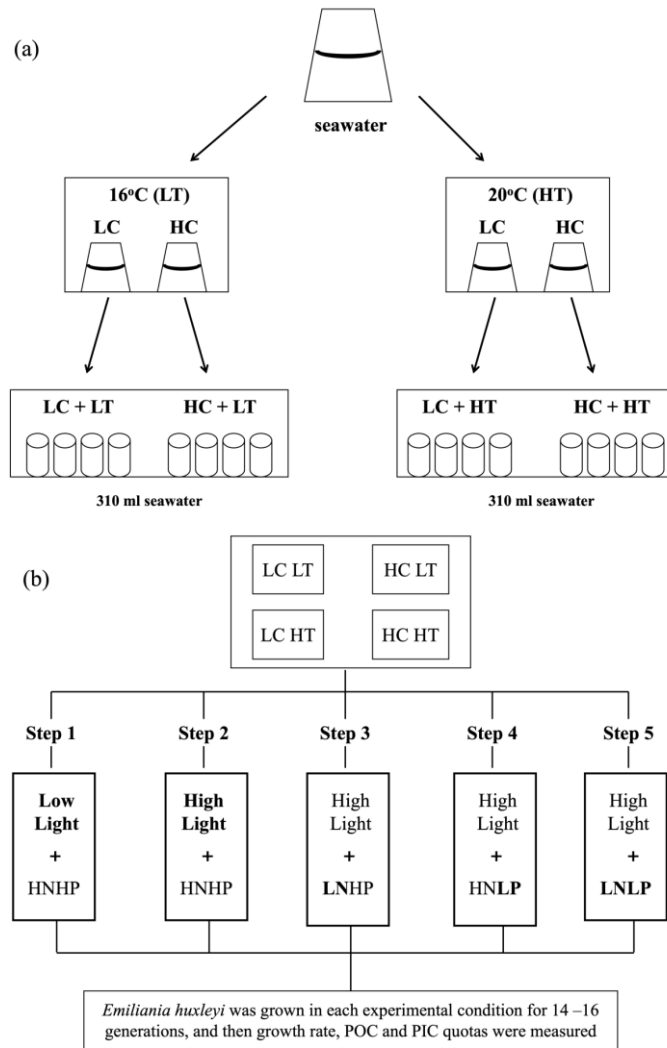


Figure S1

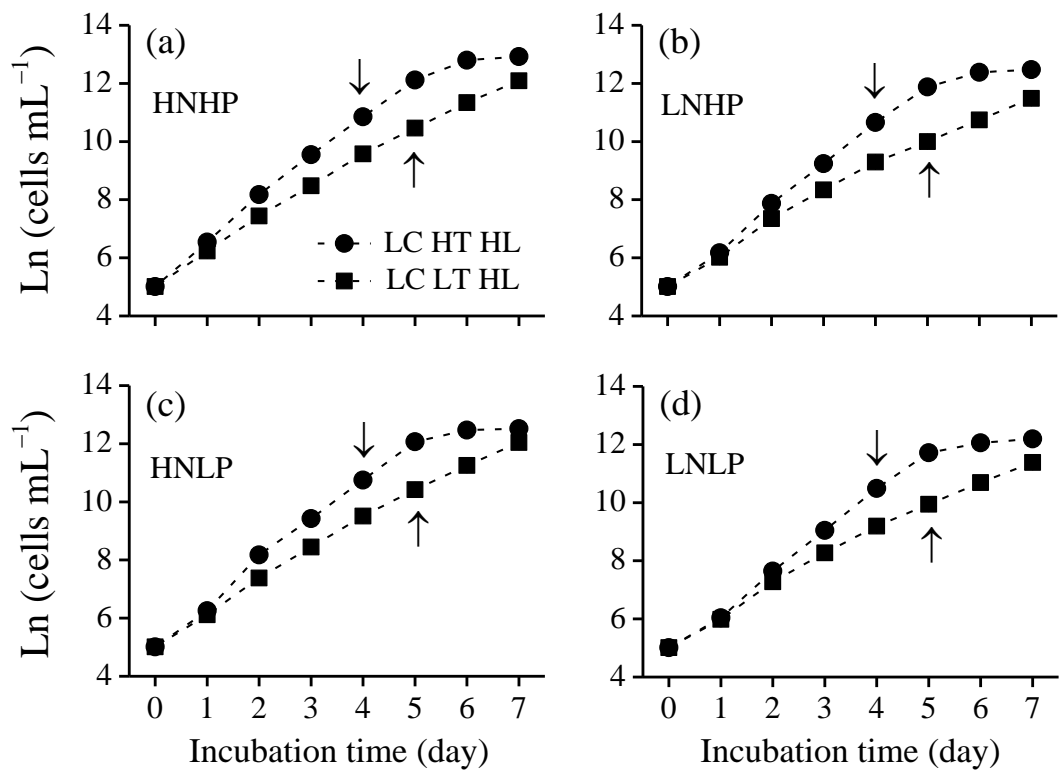


Figure S2

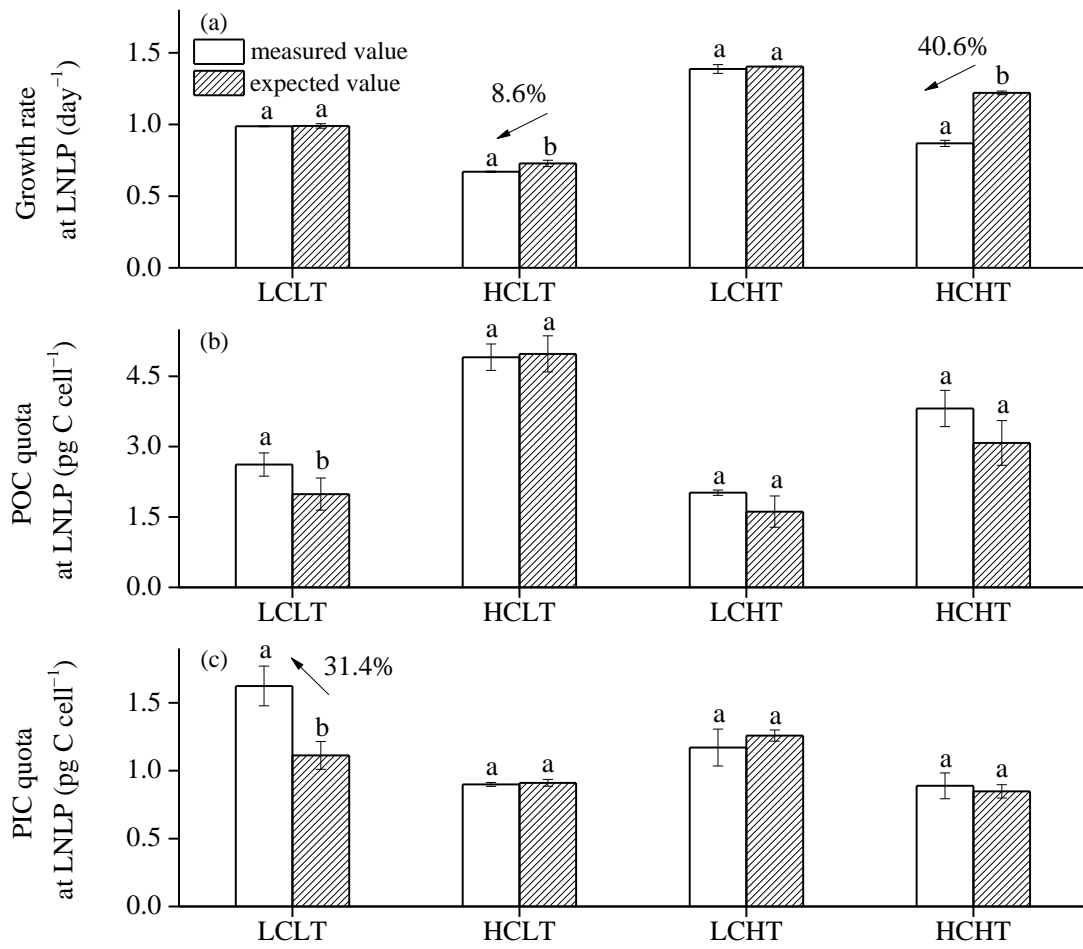


Figure S3

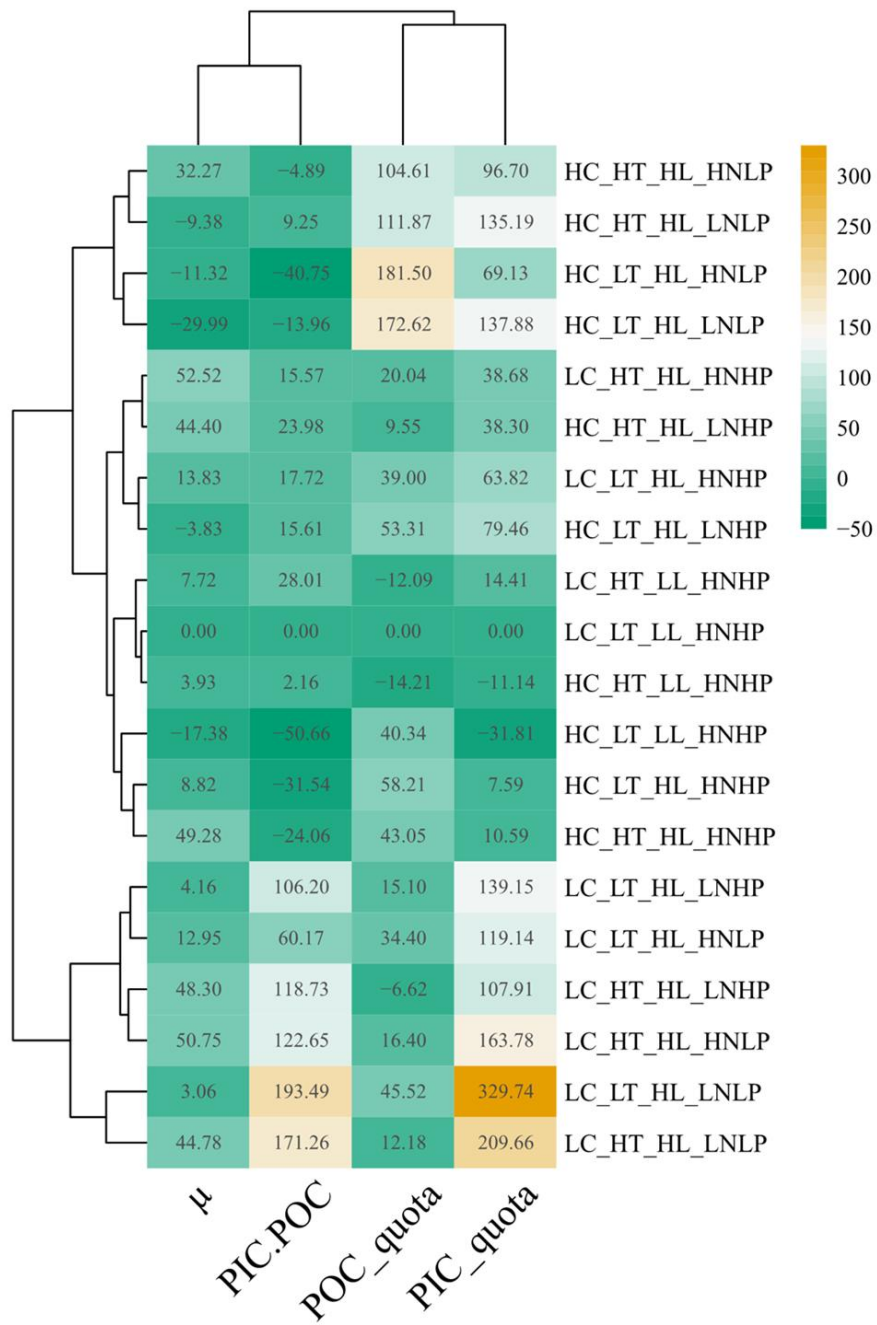


Figure S4

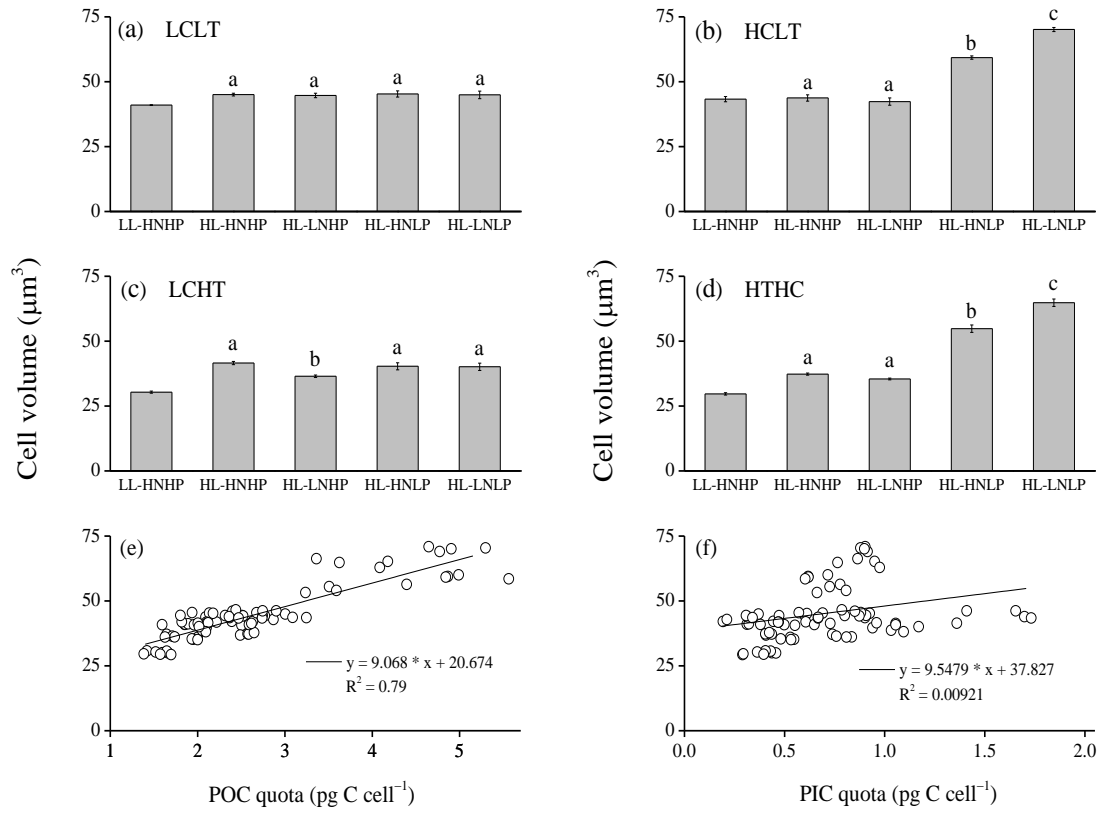


Figure S5

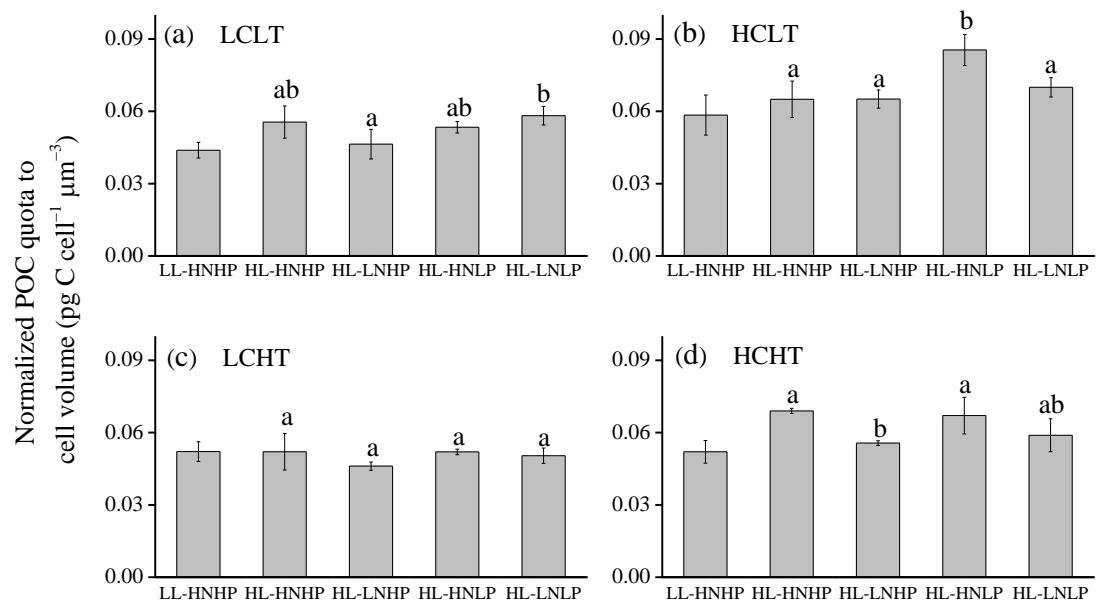


Figure S6



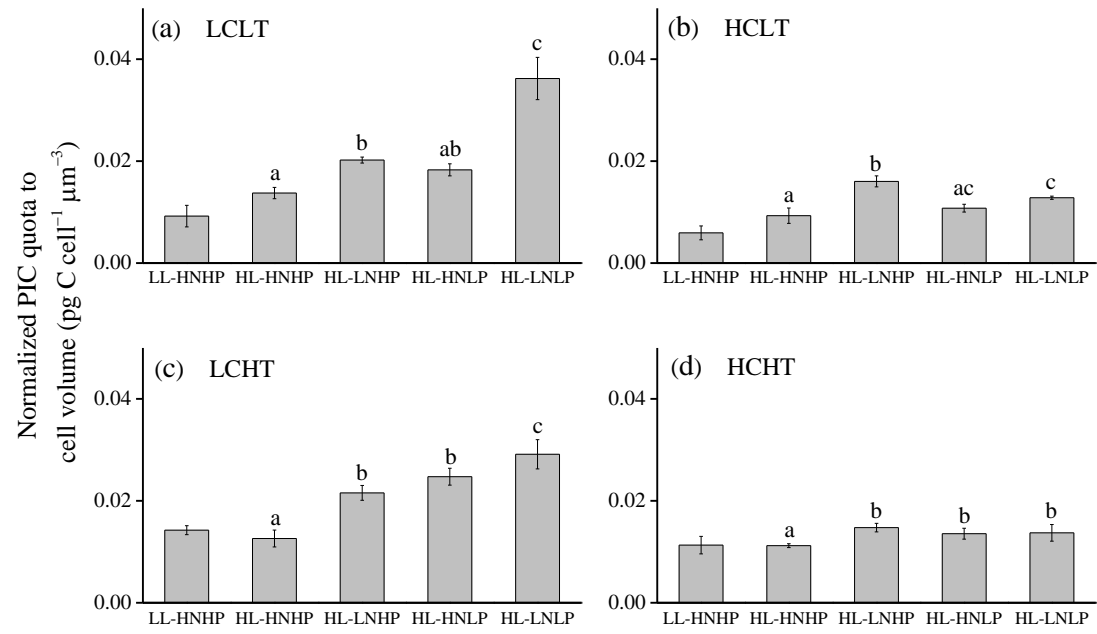


Figure S7

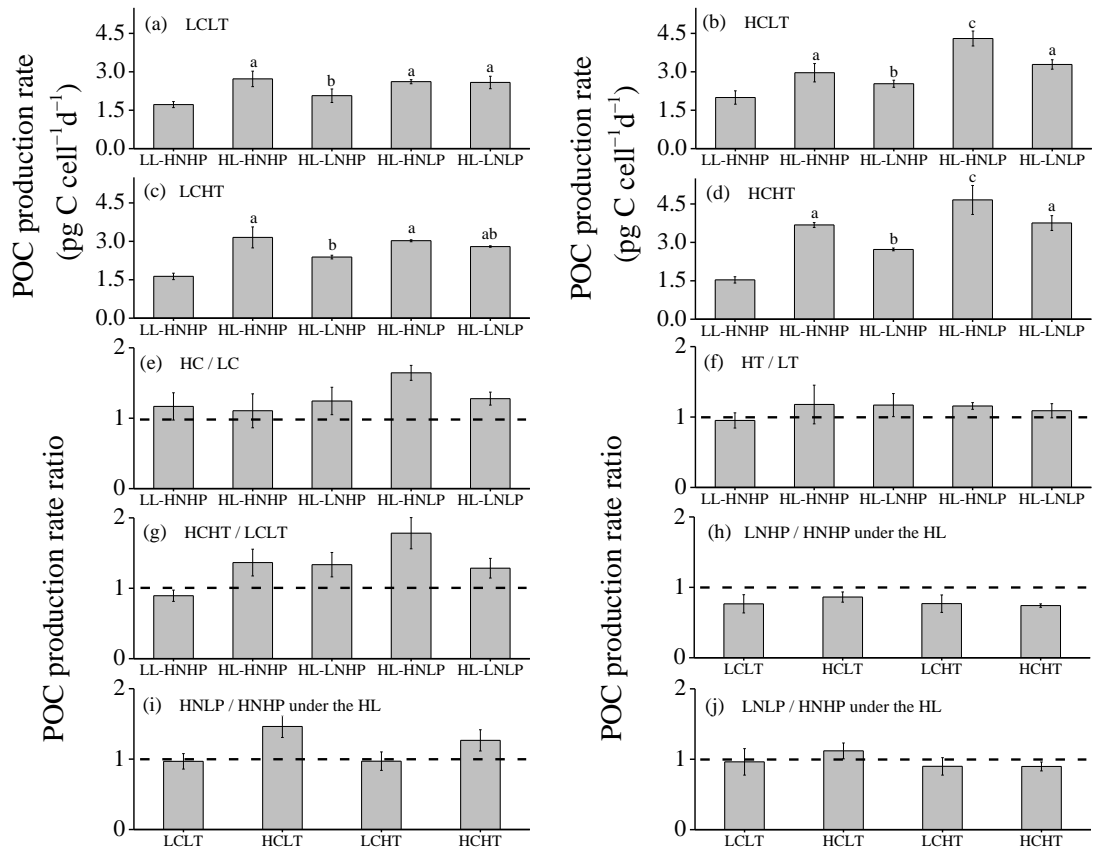


Figure S8

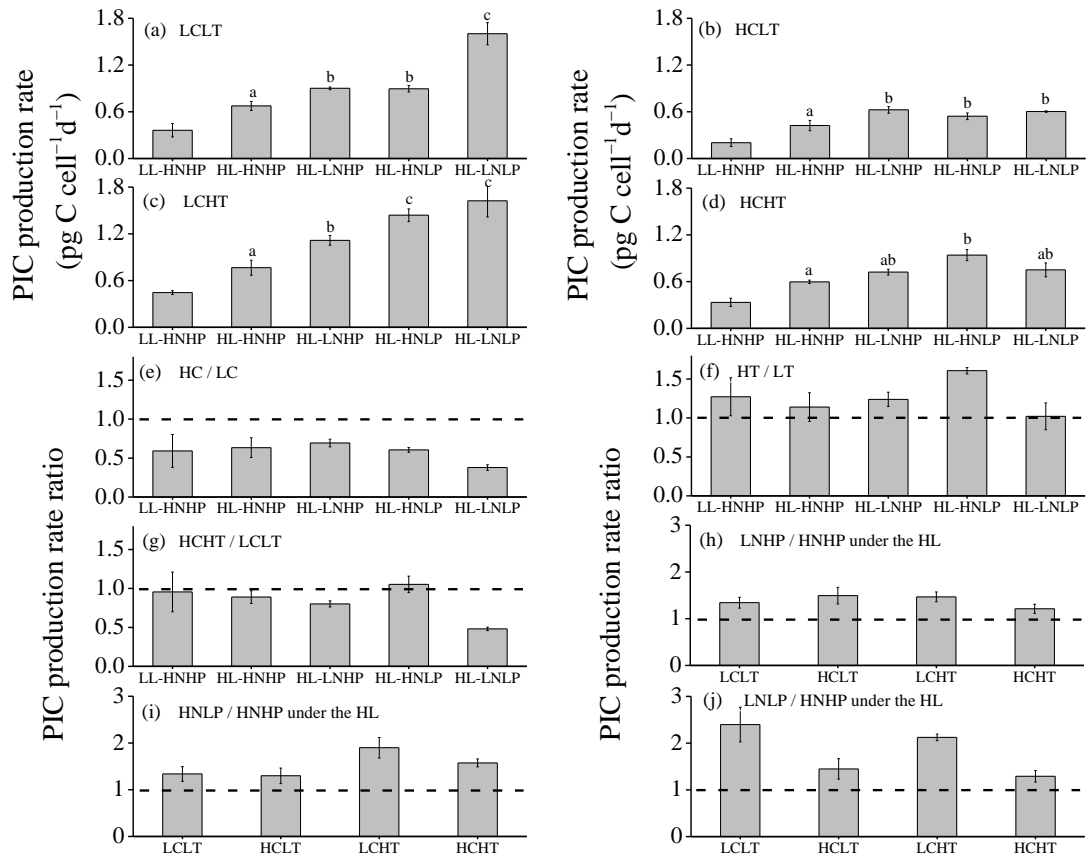


Figure S9

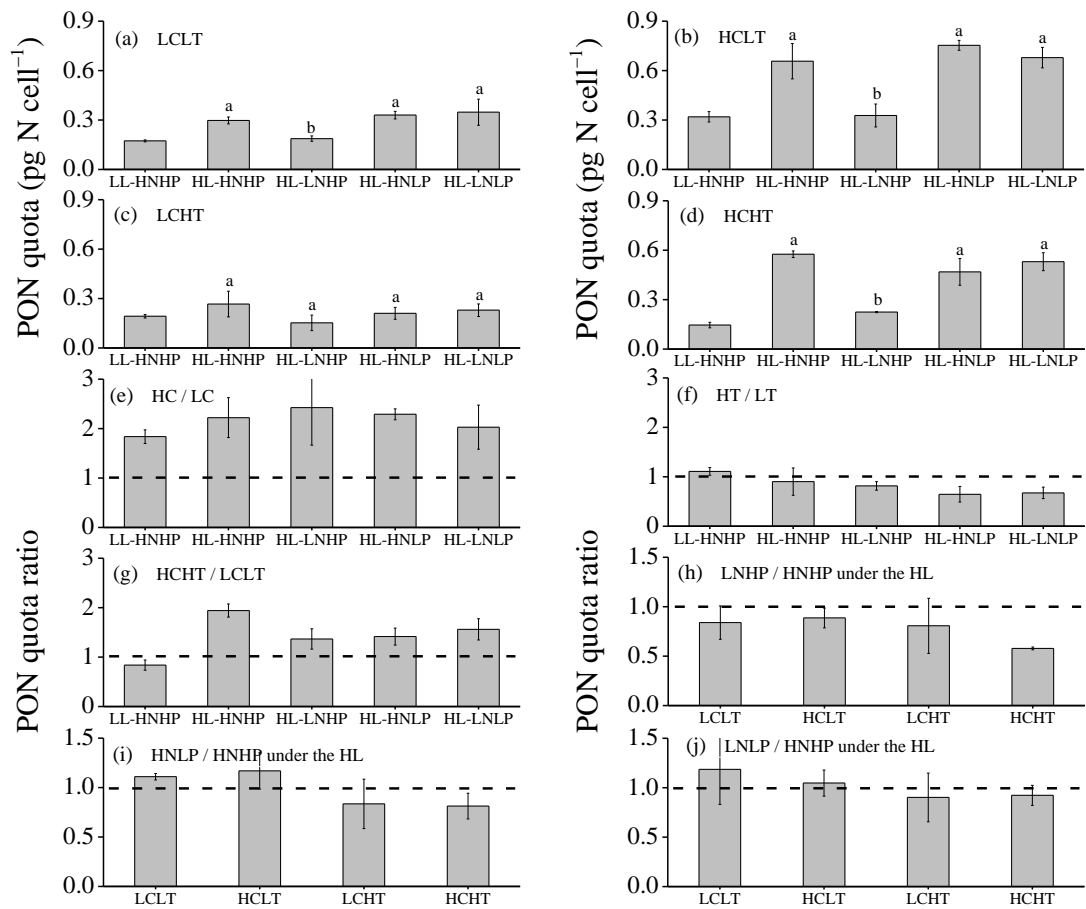


Figure S10

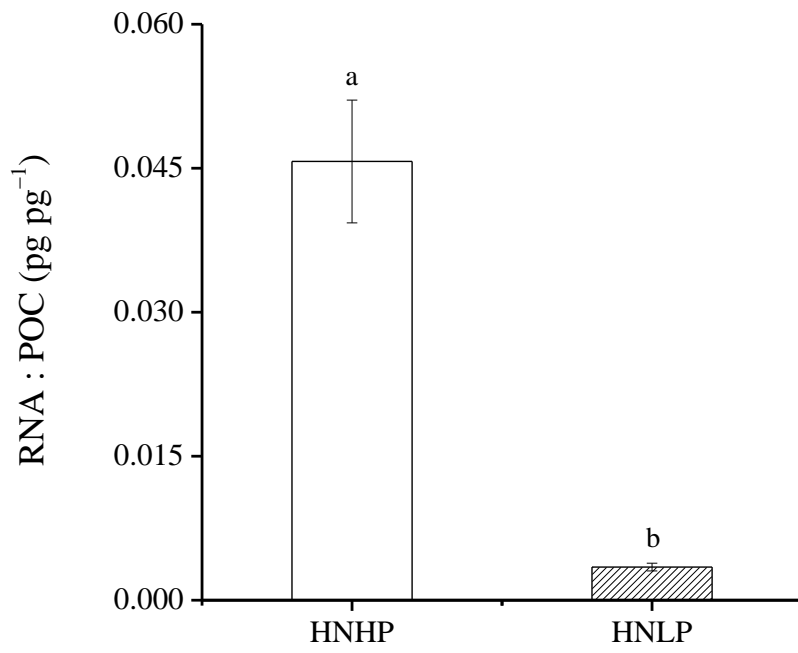


Figure S11

## References

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