

Supplementary Materials

Supplementary Figures

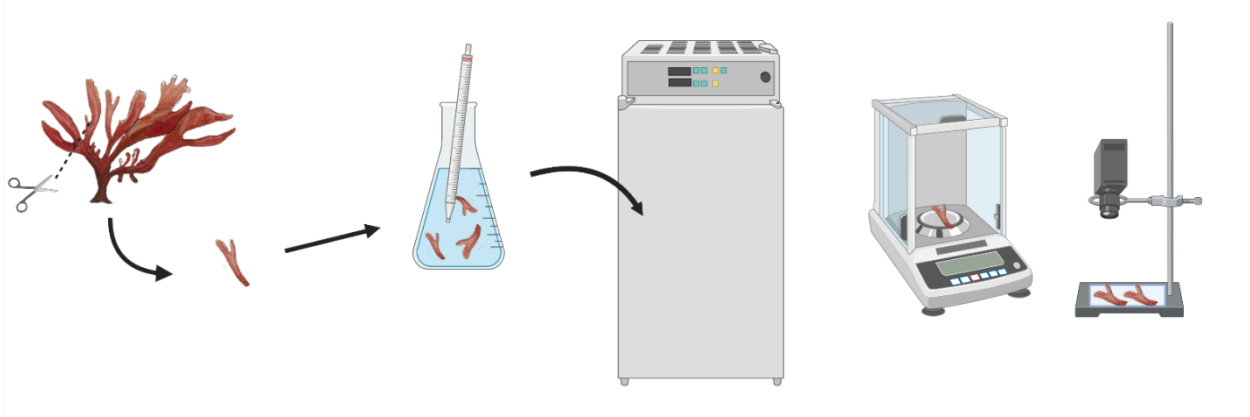


Fig. S1 Experimental workflow including selection of proliferations (samples), allocation into 250mL Erlenmeyer flasks (n=5), exposures to treatments inside growth chambers, weighing, and photographing. Created in BioRender.

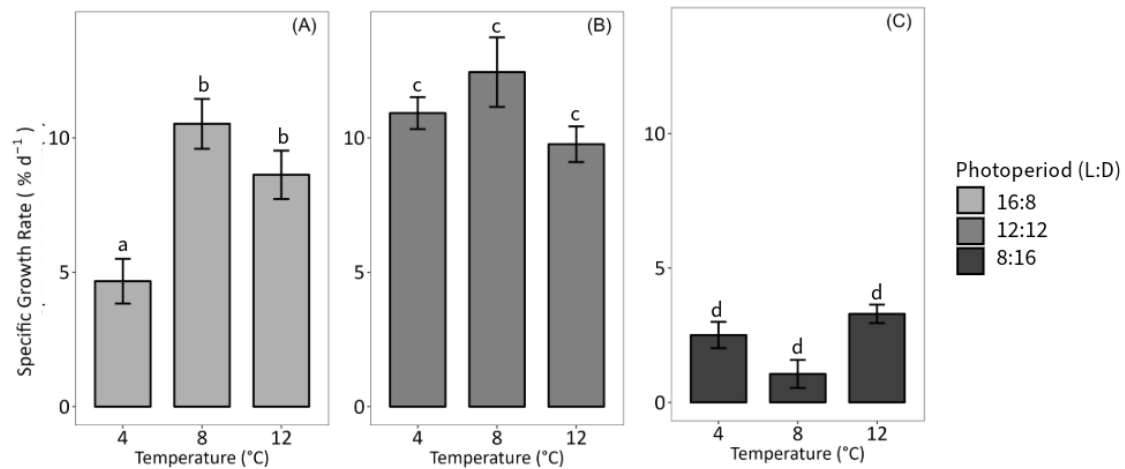


Fig. S2 Specific growth rate of *Devaleraea mollis* as a function of photoperiod (16L:8D, 12L:12D, and 8L:16D) and temperature (4, 8, and 12°C) grown with and 40 $\mu\text{mol photons m}^{-2} \text{s}^{-1}$ and F/2 as the nutrient source. Data shows mean values $\pm$ SE, n = 5. Significance is denoted by letters.

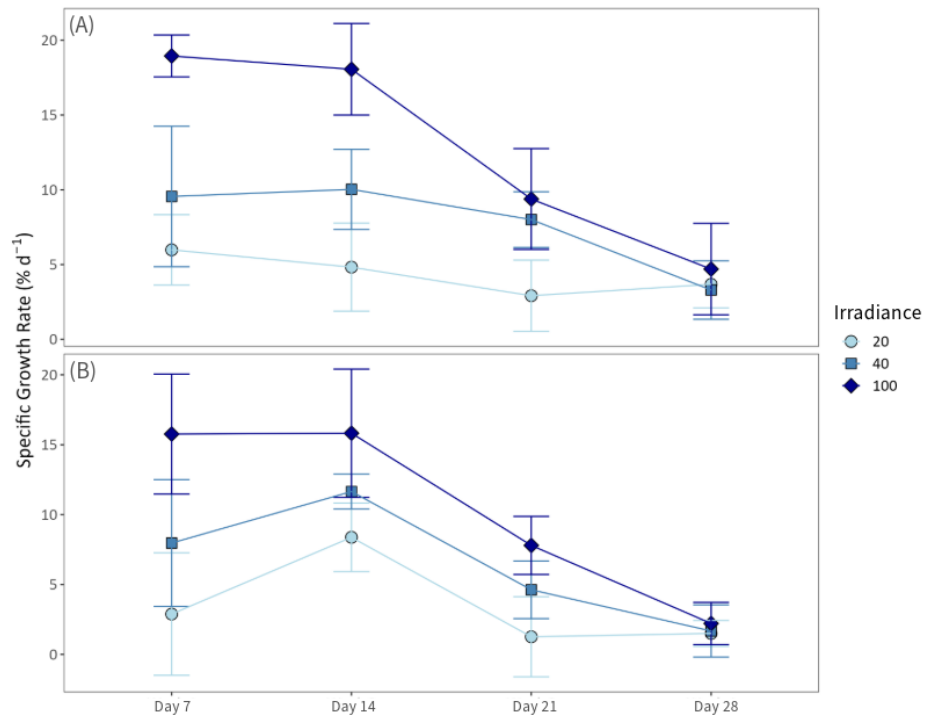


Fig. S3 Weekly SGRs as a function of irradiance in $\mu\text{mol photons m}^{-2} \text{ s}^{-1}$ for (A) *Devaleraea mollis* and (B) *Palmaria hecatensis*. Cultures were grown at 8°C with a 16L:08D, and F/2 for nutrients. Data shows mean values $\pm$ SD, $n = 5$.

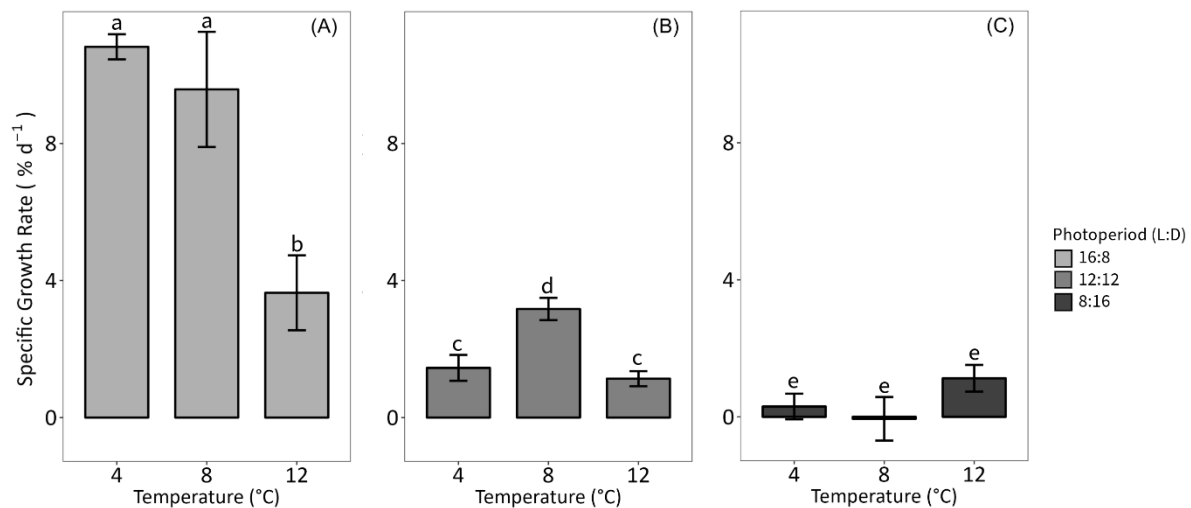


Fig. S4 Specific growth rate of *Palmaria hecatensis* as a function of photoperiod (16L:08D, 12L:12D, and 8L:16D) and temperature (4, 8, and 12°C) grown with and 40 $\mu\text{mol photons m}^{-2} \text{ s}^{-1}$ and F/2 as the nutrient source. Data shows mean values $\pm$ SE, $n = 5$. Significance is denoted by letters.

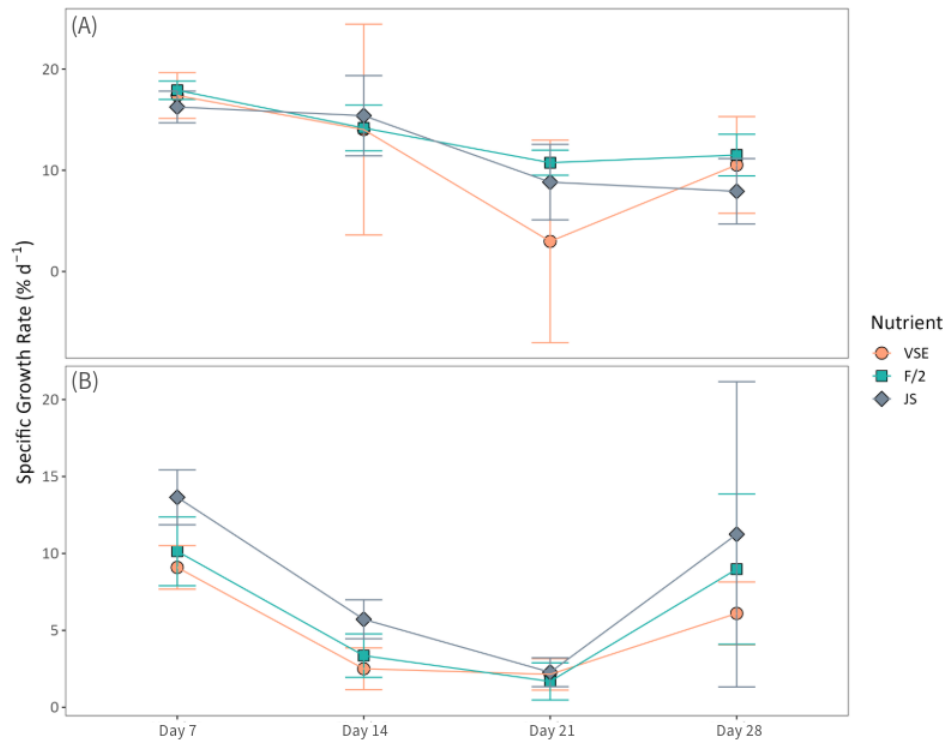


Fig. S5 Weekly SGRs as a function of nutrient source for (A) *Devaleraea mollis* and (B) *Palmaria hecatensis*. Cultures were grown at 8°C, 16L:08D, and 40 $\mu\text{mol photons m}^{-2} \text{s}^{-1}$ for *Devaleraea mollis* and 100 $\mu\text{mol photons m}^{-2} \text{s}^{-1}$ for *Palmaria hecatensis*. Data shows mean values $\pm$ SD, n = 5.

Supplementary Tables

Table S1. One-way ANOVA for the effect photoperiod (8L:16D, 12L:12D, and 16L:8D) on specific growth rates of *Devaleraea mollis* at three different temperatures (4, 8, and 12°C). Asterisks indicate a significant effect.

Temperature: 4°C					
Factor	df	Sum Sq	Mean Sq	F value	p-value
Photoperiod	2	190.97	95.48	44.56	2.79e-06*
Residuals	12	25.71	2.14		
Temperature: 8°C					
Factor	df	Sum Sq	Mean Sq	F value	p-value
Photoperiod	2	371.3	185.67	39.71	5.11e-06*
Residuals	12	56.1	4.68		
Temperature: 12°C					
Factor	df	Sum Sq	Mean Sq	F value	p-value
Photoperiod	2	119.19	59.59	26.12	4.25e-05*
Residuals	12	27.38	2.28		

Table S2. Tukey's HSD examining differences in the specific growth rates of *Devaleraea mollis* as a function of photoperiod (8L:16D, 12L:12D, and 16L:8D) at three different temperatures (4, 8, and 12°C). Asterisks indicate a significant effect.

Temperature: 4°C				
Comparison	Difference	Lower CI (lwr)	Upper CI (upr)	Adjusted p-value (p adj)
16:08 - 12:12	-6.25513	-8.724965	-3.785296	0.0000558*
8:16 - 12:12	-8.413918	-10.883752	-5.944084	0.0000028*
8:16 - 16:08	-2.158787	-4.628621	0.311047	0.0894072
Temperature: 8°C				
Comparison	Difference	Lower CI (lwr)	Upper CI (upr)	Adjusted p-value (p adj)
16:08 - 12:12	-1.922669	-5.571009	1.72567	0.3687246
8:16 - 12:12	-11.383925	-15.032265	-7.735586	0.0000069*
8:16 - 16:08	-9.461256	-13.109596	-5.812916	0.0000443*
Temperature: 12°C				
Comparison	Difference	Lower CI (lwr)	Upper CI (upr)	Adjusted p-value (p adj)
16:08 - 12:12	-1.138911	-3.687596	1.409774	0.4798067
8:16 - 12:12	-6.467232	-9.015917	-3.918547	0.0000547*
8:16 - 16:08	-5.328321	-7.877006	-2.779636	0.0003276*

Table S3. One-way ANOVA for the effect photoperiod (8L:16D, 12L:12D, and 16L:8D) on specific growth rates of *Devaleraea mollis* at three different temperatures (4, 8, and 12°C). Asterisks indicate a significant effect.

Photoperiod: 8L:16D					
Factor	df	Sum Sq	Mean Sq	F value	p-value
Temperature	2	12.86	6.428	6.149	0.0145*
Residuals	12	12.54	1.045		
Photoperiod: 12L:12D					
Factor	df	Sum Sq	Mean Sq	F value	p-value
Temperature	2	18.08	9.042	2.193	0.154
Residuals	12	49.47	4.123		
Photoperiod: 16L:8D					
Factor	df	Sum Sq	Mean Sq	F value	p-value
Temperature	2	89.22	44.61	11.35	0.00171*
Residuals	12	47.18	3.93		

Table S4. Tukey's HSD examining differences in the specific growth rates of *Devaleraea mollis* as a function of photoperiod (8L:16D, 12L:12D, and 16L:8D) at three different temperatures (4, 8, and 12°C). Asterisks indicate a significant effect.

Photoperiod: 8L:16D				
Comparison	Difference	Lower CI (lwr)	Upper CI (upr)	Adjusted p-value (p adj)
8 - 4	-1.4479802	-3.1731693	0.2772089	0.1045146
12 - 4	0.7873909	-0.9377982	2.51258	0.4657695
12 - 8	2.2353711	0.510182	3.9605602	0.0122077*
Photoperiod: 12L:12D				
Comparison	Difference	Lower CI (lwr)	Upper CI (upr)	Adjusted p-value (p adj)
8 - 4	1.522027	-1.903974	4.9480294	0.4836696
12 - 4	-1.159295	-4.585297	2.2667071	0.6488754
12 - 8	-2.681322	-6.107324	0.7446797	0.1341397
Photoperiod: 16L:8D				
Comparison	Difference	Lower CI (lwr)	Upper CI (upr)	Adjusted p-value (p adj)
8 - 4	5.854489	2.5089703	9.200007	0.0014541*
12 - 4	3.956924	0.6114061	7.302443	0.0209804*
12 - 8	-1.897564	-5.2430826	1.447954	0.3194977

Table S5 (a) & (b): One-way ANOVA for irradiance experiments for *Devaleraea mollis* (a), with a pairwise comparison post hoc analysis (b). Asterisks indicate a significant effect.

(a)					
Factor	df	Sum Sq	Mean Sq	F value	p-value
Irradiance	2	179.64	89.82	35.54	<0.001*
Residuals	12	30.33	2.53		

(b)					
Factor	Estimate	SE	df	t.ratio	p-value
20 - 40 Irradiance	-3.37	1.01	12	-3.53	0.0147*
20 - 100 Irradiance	-8.42	1.01	12	-8.37	<0.0001*
40 - 100 Irradiance	-5.05	1.01	12	-5.02	0.0008*

Table S6 (a) & (b): Welch's One-way ANOVA for the nutrient source experiments for *Devaleraea mollis* (a), with a pairwise t-test with Bonferroni correction (b). Asterisks indicate a significant effect.

(a)			
Factor	df	F value	p-value
Nutrient Source	2	5.72	0.039*

(b)			
Group1	Group2	Mean_Diff	p-value
VSE	F/2	2.35785	0.0204*
VSE	JS	0.87171	0.4961
F/2	JS	1.48614	0.2204

Table S7. One-way ANOVA for the effect of temperature (4, 8, and 12°C) on specific growth rates of *Palmaria hecatensis* at three different photoperiods (8L:16D, 12L:12D, and 16L:8D). Asterisks indicate a significant effect.

Photoperiod: 8L:16D					
Factor	df	Sum Sq	Mean Sq	F value	p-value
Temperature	2	3.677	1.838	1.585	0.245
Residuals	12	13.917	1.16		
Photoperiod: 12L:12D					
Factor	df	Sum Sq	Mean Sq	F value	p-value
Temperature	2	11.987	5.993	12.13	0.00132*
Residuals	12	5.931	0.494		
Photoperiod: 16L:8D					
Factor	df	Sum Sq	Mean Sq	F value	p-value
Temperature	2	147.25	73.63	10.62	0.00222*
Residuals	12	83.21	6.93		

Table S8. Tukey's HSD examining differences on the specific growth rates of *Palmaria hecatensis* as a function of temperature (4, 8, and 12°C) at three different photoperiods (8L:16D, 12L:12D, and 16L:8D). Asterisks indicate a significant effect.

Temperature: 4°C				
Comparison	Difference	Lower CI (lwr)	Upper CI (upr)	Adjusted p-value (p adj)
16:08 - 12:12	9.372095	7.964074	10.7801154	<0.0001*
8:16 - 12:12	-1.148417	-2.556438	0.2596038	0.1161019
8:16 - 16:08	-10.520512	-11.928532	-9.1124908	<0.0001*
Temperature: 8°C				
Comparison	Difference	Lower CI (lwr)	Upper CI (upr)	Adjusted p-value (p adj)
16:08 - 12:12	6.408864	2.427966	10.3897619	0.0027633*
8:16 - 12:12	-3.225623	-7.206521	0.7552747	0.1188724
8:16 - 16:08	-9.634487	-13.615385	-5.6535892	0.000086*
Temperature: 12°C				
Comparison	Difference	Lower CI (lwr)	Upper CI (upr)	Adjusted p-value (p adj)
16:08 - 12:12	2.506834247	-0.06621531	5.0798838	0.0563951
8:16 - 12:12	-0.008810131	-2.58185969	2.56423943	0.999954
8:16 - 16:08	-2.515644378	-5.08869394	0.05740518	0.0555014

Table S9. One-way ANOVA for the effect photoperiod (8L:16D, 12L:12D, and 16L:8D) on specific growth rates of *Palmaria hecatensis* at three different temperatures (4, 8, and 12°C). Asterisks indicate a significant effect.

Photoperiod: 8L:16D				
Comparison	Difference	Lower CI (lwr)	Upper CI (upr)	Adjusted p-value (p adj)
8 - 4	-0.3584182	-2.1755284	1.458692	0.8601384
12 - 4	0.8241112	-0.99299	2.641221	0.4699841
12 - 8	1.1825294	-0.6345808	2.99964	0.2323067
Photoperiod: 12L:12D				
Comparison	Difference	Lower CI (lwr)	Upper CI (upr)	Adjusted p-value (p adj)
8 - 4	1.7187882	0.532608	2.9049685	0.0058777*
12 - 4	-0.3154957	-1.501676	0.8706845	0.7625709
12 - 8	-2.0342839	-3.220464	-0.8481037	0.0017044*
Photoperiod: 16L:8D				
Comparison	Difference	Lower CI (lwr)	Upper CI (upr)	Adjusted p-value (p adj)
8 - 4	-1.244443	-5.687611	3.198726	0.7409608
12 - 4	-7.180756	-11.62394	-2.737588	0.0026846*
12 - 8	-5.936314	-10.379482	-1.493145	0.0100648*

Table S10. Tukey's HSD examining differences in the specific growth rates of *Palmaria hecatensis* as a function of photoperiod (8L:16D, 12L:12D, and 16L:8D) at three different temperatures (4, 8, and 12°C). Asterisks indicate a significant effect.

Temperature: 4°C					
Factor	df	Sum Sq	Mean Sq	F value	p-value
Photoperiod	2	333.1	166.5	239.1	2.15e-10*
Residuals	12	8.4	0.7		
Temperature: 8°C					
Factor	df	Sum Sq	Mean Sq	F value	p-value
Photoperiod	2	240.5	120.25	21.6	0.000105*
Residuals	12	66.8	5.57		
Temperature: 12°C					
Factor	df	Sum Sq	Mean Sq	F value	p-value
Photoperiod	2	21.02	10.511	4.52	0.0344*
Residuals	12	27.91	2.325		

Table S11 (a) & (b): One-way ANOVA for irradiance experiments for *Palmaria hecatensis* (a), with a pairwise comparison post hoc analysis (b). Asterisks indicate a significant effect.

(a)					
Factor	df	Sum Sq	Mean Sq	F value	p-value
Irradiance	2	179.64	89.82	35.54	<0.001*
Residuals	12	30.33	2.53		

(b)					
Factor	Estimate	SE	df	t.ratio	p-value
20 - 40 Irradiance	-2.97	1.01	12	-2.87	0.0349*
20 – 100 Irradiance	-6.89	1.01	12	-6.65	<0.0001*
40 - 100 Irradiance	-3.92	1.01	12	-3.78	0.0068*

Table S12 (a) & (b): Welch's One-way ANOVA for the nutrient source experiments for *Palmaria hecatensis* (a), with a pairwise t-test with Bonferroni correction (b). Asterisks indicate a significant effect.

(a)			
Factor	df	F value	p-value
Nutrient Source	2	3.58	0.09

(b)		
Factor	VSE	F/2
F/2	1.00	
JS	0.054	0.276