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Impact of diurnal temperature fluctuations on larval settlement and growth of the reef coral *Pocillopora damicornis*

Lei Jiang et al.

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Supplementary figures

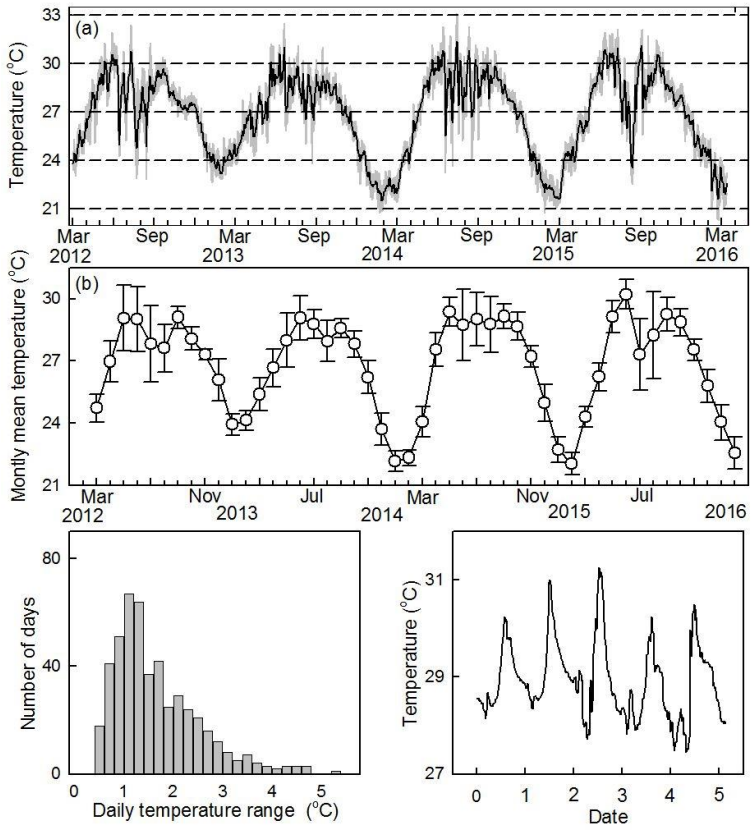

Fig S1. Temperature data at 3 m depth on Luihuitou fringing reef from 2012 to 2016. (a) The bold black line shows the daily average temperatures, and the shaded grey area illustrates the daily maximum and minimum temperatures; (b) monthly mean (±SD) temperatures from 2012 to 2016; (c) histogram of daily temperature range in summer (June–September) from 2012 to 2015; (d) showing a period of 5 days of diurnal temperature fluctuations (~3 ℃) in June 2014.

Fig S2. Metamorphosed and free drifting larvae of *Pocillopora damicronis* with extended tentacles.

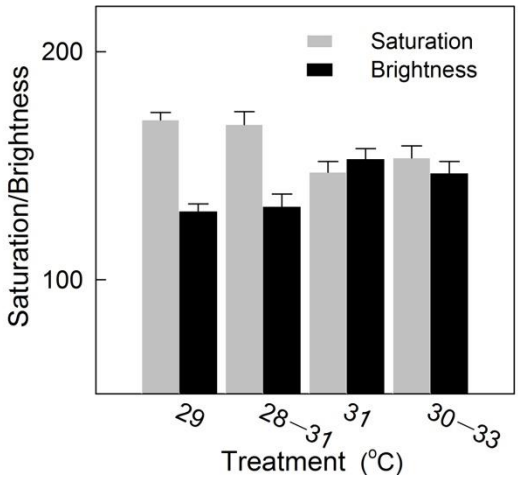

Fig S3. Photographic metrics for *Pocillopora damicornis* recruits at different temperature treatments.

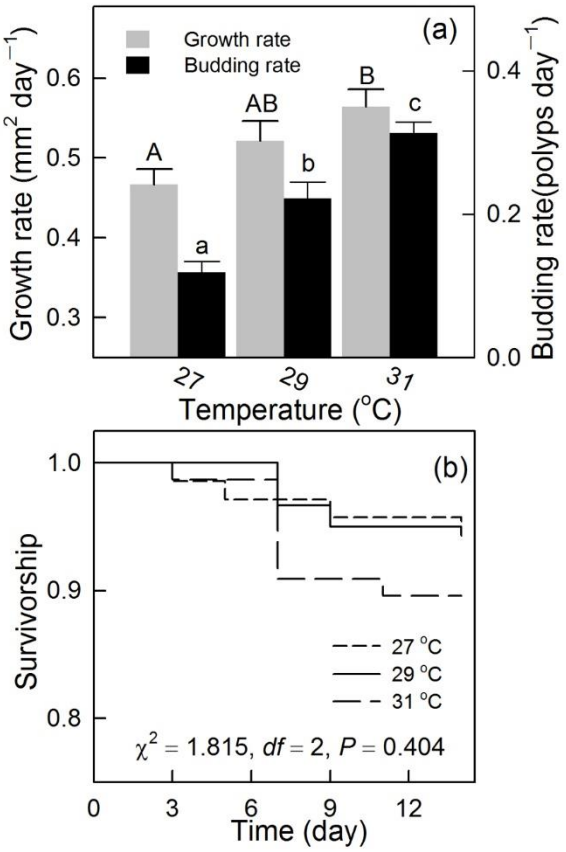

Fig S4. (a) Growth and (b) survival of *Pocillopora damicornis* recruits after 2 weeks at 27, 29 and 31 ℃. Lateral growth and budding rates were measured as described in Materials and methods. Growth was analyzed with one-way ANOVA followed by Fisher's LSD multiple comparisons (as indicated by letters). Survival curves were compared among treatments with Kaplan-Meier (KM) log-rank analysis.

Supplementary tables

Table S1. Statistical results of two-way ANOVAs on the effects of temperature treatments on larval survival and settlement of *Pocillopora damicornis*.

Variables	Source of variation	*df*	MS	*F*	*P*
Settlement assays					
Larval survival	Temp level	1	0.003	3	0.11
	Temp regime	1	0.003	3	0.11
	Level*Regime	1	0.003	3	0.11
	Error	12	0.001		
Floating & Metamorphosed	Temp level	1	0.041	1.64	0.22
	Temp regime	1	0.008	0.32	0.58
	Level*Regime	1	0.040	1.59	0.23
	Error	12	0.025		
Swimming larvae	Temp level	1	0.038	0.568	0.47
	Temp regime	1	0.006	0.094	0.76
	Level*Regime	1	0.038	0.568	0.47
	Error	12	0.067		
Settlement success	Temp level	1	0.133	9.43	**0.01**
	Temp regime	1	0.043	3.06	0.11
	Level*Regime	1	0.057	4.00	0.06
	Error	12	0.014		

Table S2. Pairwise post-hoc multiple comparisons (Fisher's LSD) for larval settlement. *P* values in bold indicate significance level at $\alpha = 0.05$.

Settlement	29 ℃	28-31 ℃	31 ℃	30-33 ℃
29 ℃				
28-31 ℃	0.861			
31 ℃	**0.004**	**0.006**		
30-33 ℃	0.374	0.471	**0.022**	

Table S3. Statistical results of two-way repeated measures ANOVAs on the effects of temperature treatments on Fv/Fm and $\Delta F/F_m'$ of juvenile *Pocillopora damicornis*.

Source of variation	SS	*df*	MS	*F*	*P*
Fv/Fm					
Within subjects					
Day	0.129	3	0.043	98.83	**<0.001**
Day*Temp level	0.003	3	0.001	2.468	0.063
Day*Temp regime	0.005	3	0.002	4.142	**0.007**
Day*level*regime	0.005	3	0.002	3.928	**0.009**
Between subjects					
Temp level	0.058	1	0.058	69.27	**<0.001**
Temp regime	0.004	1	0.004	4.384	**0.040**
Level*Regime	0.003	1	0.003	3.771	0.056
$\boldsymbol{\Delta F/F_m'}$					
Within subjects					
Time	0.193	3	0.064	58.88	**<0.001**
Time *Temp level	0.024	3	0.008	7.228	**<0.001**
Time *Temp regime	0.014	3	0.005	4.319	**0.006**
Time *level*regime	0.051	3	0.017	15.44	**<0.001**
Between subjects					
Temp level	0.015	1	0.015	3.146	0.082
Temp regime	0.055	1	0.055	11.44	**0.001**
Level*Regime	<0.001	1	<0.001	<0.001	0.994

Table S4. Statistical results of separated two-way ANOVAs on the effects of temperature treatments on maximum quantum yield (Fv/Fm) and effective quantum yield ($\Delta F/F_m'$) of juvenile *Pocillopora damicornis* at a specific measuring time point.

Day/time	Source of variation	SS	*df*	MS	*F*	*P*
Fv/Fm						
August 26	Temp level	0.010	1	0.010	18.34	**<0.001**
	Temp regime	0.007	1	0.007	12.63	**0.001**
	Level*Regime	<0.001	1	<0.001	0.136	0.714
	Error	0.043	76	0.001		
August 27	Temp level	0.007	1	0.007	16.44	**<0.001**
	Temp regime	0.001	1	0.001	2.121	0.149
	Level*Regime	0.001	1	0.001	1.205	0.276
	Error	0.033	76	<0.001		
August 28	Temp level	0.023	1	0.023	48.23	**<0.001**
	Temp regime	<0.001	1	<0.001	0.739	0.393
	Level*Regime	<0.001	1	<0.001	0.280	0.598
	Error	0.037	76	<0.001		
August 29	Temp level	0.021	1	0.021	31.33	**<0.001**
	Temp regime	0.001	1	0.001	0.977	0.326
	Level*Regime	0.008	1	0.008	11.45	**0.001**
	Error	0.050	76	0.001		
ΔF/Fm'						
08:00	Temp level	0.004	1	0.004	1.661	0.203
	Temp regime	0.002	1	0.004	0.750	0.390
	Level*Regime	0.038	1	0.038	14.29	**<0.001**
	Error	0.149	56	0.003		
11:00	Temp level	0.017	1	0.017	9.270	**0.006**
	Temp regime	0.008	1	0.008	4.384	**0.040**
	Level*Regime	0.003	1	0.003	3.771	0.056
	Error					
14:00	Temp level	0.011	1	0.011	6.301	**0.015**
	Temp regime	0.023	1	0.023	13.06	**0.001**
	Level*Regime	0.004	1	0.004	2.538	0.117
	Error	0.098	56	0.002		
17:00	Temp level	0.018	1	0.018	11.20	**0.001**
	Temp regime	0.038	1	0.038	23.71	**<0.001**
	Level*Regime	0.004	1	0.004	2.730	0.104
	Error	0.090	56	0.002		

Table S5. Statistical results of two-way ANOVAs on the effects of temperature treatments on maximum excitation pressure (Qm) and bleaching index and growth of juvenile *Pocillopora damicornis*.

Variables	Source of variation	*df*	MS	*F*	*P*
Qm	Temp level	1	0.001	0.137	0.713
	Temp regime	1	0.067	10.45	**0.002**
	Level*Regime	1	<0.001	0.075	0.786
	Error	56	0.006		
Bleaching	Temp level	1	0.036	1.627	0.205
	Temp regime	1	0.007	0.328	0.568
	Level*Regime	1	0.014	0.636	0.427
	Error	107	0.022		
Budding rate	Temp level	1	2.258	22.80	**<0.001**
	Temp regime	1	0.132	1.251	0.262
	Level*Regime	1	0.002	0.018	0.894
	Error	107	0.090		
Lateral growth	Temp level	1	0.358	25.42	**<0.001**
	Temp regime	1	0.030	2.123	0.148
	Level*Regime	1	0.001	0.038	0.845
	Error	107	0.014		
Calcification	Temp level	1	8221	36.70	**<0.001**
	Temp regime	1	1036	4.625	**0.034**
	Level*Regime	1	463.3	2.068	0.154
	Error	96	223.9		

Table S6. Pairwise post-hoc multiple comparisons (Fisher's LSD) for calcification. *P* values in bold indicate significance level at $\alpha = 0.05$.

Calcification	29 ℃	28-31 ℃	31 ℃	30-33 ℃
29 ℃				
28-31 ℃	0.625			
31 ℃	**<0.001**	**<0.001**		
30-33 ℃	**0.008**	**0.002**	**0.010**	