

Supplementary Information

Table S1. The chemical and physical conditions at the start and at the end of each experiment for *Acropora hyacinthus* (Lyudao), *Favites abdita*, *Acropora hyacinthus* (Kochi) and *Platygyra contorta*. Values are mean $\pm$ standard deviation. “tank” means “measured in 5L beaker”, “log5 vials” means “measured in 50 mL Falcon tube containing 10^5 sperm mL^{-1} ”, “control vials” means “measured in 50 mL Falcon tube without sperm and eggs (control)”.

<i>Acropora hyacinthus</i> (Lyudao)						<i>Acropora hyacinthus</i> (Kochi)					
	Salinity	T	TA	pH	CO ₂		Salinity	T	TA	pH	CO ₂
	ppt	°C	$\mu\text{mol}\cdot\text{kg}^{-1}$	(NBS)	μatm		ppt	°C	$\mu\text{mol}\cdot\text{kg}^{-1}$	(NBS)	μatm
Start of Experiment						Start of Experiment					
tank			(n = 1)			Control Vials			(n = 5)		
Ambient CO ₂ $\times$ 27°C	33.0	27.0	2250.35	8.18	403.95	Ambient CO ₂ $\times$ 27 °C	33.6	26.84 $\pm$ 0.20	2219.39	8.11 $\pm$ 0.01	478 $\pm$ 14
High CO ₂ $\times$ 27°C	33.0	27.0	2250.35	7.87	933.75	High CO ₂ $\times$ 27 °C	33.6	26.78 $\pm$ 0.20	2219.39	7.82 $\pm$ 0.02	1034 $\pm$ 47
Ambient CO ₂ $\times$ 31°C	33.0	31.0	2250.35	8.15	446.64	Ambient CO ₂ $\times$ 31 °C	33.6	30.76 $\pm$ 0.20	2219.39	8.08 $\pm$ 0.01	526 $\pm$ 17
High CO ₂ $\times$ 31°C	33.0	31.0	2250.35	7.91	863.44	High CO ₂ $\times$ 31 °C	33.6	30.76 $\pm$ 0.20	2219.39	7.87 $\pm$ 0.01	939 $\pm$ 31
End of Experiment						End of Experiment					
log5 Vials			(n = 1)			log5 Vials			(n = 5)		
Ambient CO ₂ $\times$ 27 °C	32.8	27.1	2270.45	-	-	Ambient CO ₂ $\times$ 27 °C	33.4	26.86 $\pm$ 0.20	2222.32	8.04 $\pm$ 0.01	590 $\pm$ 9
High CO ₂ $\times$ 27 °C	32.8	26.9	2280.11	7.73	1354.77	High CO ₂ $\times$ 27 °C	33.5	26.86 $\pm$ 0.20	2297.64	7.76 $\pm$ 0.02	1245 $\pm$ 48
Ambient CO ₂ $\times$ 31 °C	33.1	30.5	2264.63	7.96	757.47	Ambient CO ₂ $\times$ 31 °C	33.5	30.85 $\pm$ 0.20	2225.28	8.00 $\pm$ 0.00	662 $\pm$ 8
High CO ₂ $\times$ 31 °C	32.8	30.5	2262.80	7.84	1042.26	High CO ₂ $\times$ 31 °C	33.6	30.84 $\pm$ 0.20	2225.69	7.81 $\pm$ 0.01	1114 $\pm$ 26
						Control Vials			(n = 5)		
						Ambient CO ₂ $\times$ 27 °C	33.5	26.88 $\pm$ 0.20	2221.73	8.05 $\pm$ 0.01	562 $\pm$ 8
						High CO ₂ $\times$ 27 °C	33.4	26.86 $\pm$ 0.20	2218.14	7.79 $\pm$ 0.01	1125 $\pm$ 40
						Ambient CO ₂ $\times$ 31 °C	33.5	30.80 $\pm$ 0.20	2225.33	8.04 $\pm$ 0.01	590 $\pm$ 9
						High CO ₂ $\times$ 31 °C	33.5	30.78 $\pm$ 0.20	2223.13	7.85 $\pm$ 0.02	992 $\pm$ 41

Table S1. Cont.

<i>Acropora hyacinthus</i> (Lyudao)						<i>Acropora hyacinthus</i> (Kochi)					
<i>Favites abdita</i>						<i>Platygyra contorta</i>					
Salinity	T	TA	pH	CO ₂		Salinity	T	TA	pH	CO ₂	
ppt	°C	μmol·kg ⁻¹	(NBS)	μatm		ppt	°C	μmol·kg ⁻¹	(NBS)	μatm	
Start of Experiment						Start of Experiment					
Tank			(n = 1)	Control Vials			(n = 5)				
Ambient CO ₂ × 27 °C	32.9	27.0	2258.15	8.15	441.71	Ambient CO ₂ × 27 °C	32.7	26.9 ± 0.20	2181.58	8.06 ± 0.00	550 ± 7
High CO ₂ × 27 °C	32.9	27.0	2258.15	7.76	1243.44	High CO ₂ × 27 °C	32.7	26.9 ± 0.20	2181.58	7.82 ± 0.01	1021 ± 14
Ambient CO ₂ × 31 °C	32.9	31.0	2258.15	8.15	448.83	Ambient CO ₂ × 31 °C	32.7	30.8 ± 0.20	2181.58	8.06 ± 0.00	558 ± 0
High CO ₂ × 31 °C	32.9	31.0	2258.15	7.93	822.49	High CO ₂ × 31 °C	32.7	30.7 ± 0.20	2181.58	7.84 ± 0.00	1001 ± 12
End of Experiment						End of Experiment					
log5 vials			(n = 1)	log5 vials			(n = 5)				
Ambient CO ₂ × 27 °C	33.3	26.9	2268.16	8.03	614.07	Ambient CO ₂ × 27 °C	32.9	26.89 ± 0.20	2196.04	8.00 ± 0.00	647 ± 0
High CO ₂ × 27 °C	33.2	26.9	2260.45	7.77	1209.28	High CO ₂ × 27 °C	32.9	26.89 ± 0.20	2192.50	7.79 ± 0.01	1106 ± 32
Ambient CO ₂ × 31 °C	33.6	30.8	2276.27	8.10	516.48	Ambient CO ₂ × 31 °C	33.0	30.78 ± 0.20	2189.03	8.00 ± 0.00	662 ± 8
High CO ₂ × 31 °C	33.4	30.9	2242.58	7.80	1142.34	High CO ₂ × 31 °C	32.9	30.79 ± 0.20	2187.75	7.82 ± 0.01	1073 ± 16
Control Vials			(n = 1)	Control Vials			(n = 5)				
Ambient CO ₂ × 27 °C	33.2	27.0	2265.15	-	-	Ambient CO ₂ × 27 °C	32.9	26.89 ± 0.20	2271.64	8.03 ± 0.01	618 ± 12
High CO ₂ × 27 °C	33.2	26.9	2257.55	7.78	1177.37	High CO ₂ × 27 °C	32.8	26.89 ± 0.20	2196.27	7.82 ± 0.01	1037 ± 27
Ambient CO ₂ × 31 °C	33.4	30.9	2272.58	8.10	517.06	Ambient CO ₂ × 31 °C	32.9	30.80 ± 0.20	2182.03	8.03 ± 0.01	599 ± 9
High CO ₂ × 31 °C	33.3	30.9	2265.54	7.83	1068.88	High CO ₂ × 31 °C	32.8	30.76 ± 0.20	2179.77	7.81 ± 0.01	1086 ± 20

Table S2. Table showing the results of the logistic regression using GLM for the effect of temperature and CO₂ on fertilization rate, abnormal development and early developmental success of the different coral species. Df = degrees of freedom, Dev = deviance, Resid. Df = residual degrees of freedom, Resid. Dev = residual deviance, $F = F$ -statistic, $p = p$ -value. NS = not significant, * means $p < 0.05$, ** means <0.01 and *** means <0.001 . ($n = 5$ per species).

	Df	Dev	Resid. Df	Resid. Dev	F	p	
<i>Acropora hyacinthus</i> (Lyudao)							
Fertilization success							
NULL			19	446.1			
CO ₂	1	1	18	445.1	0.5	0.49	NS
T	1	356.4	17	88.7	172.3	5.60×10^{-10}	***
CO ₂ :T	1	55.2	16	33.5	26.7	9.40×10^{-5}	***
Abnormal Development							
NULL			19	397.4			
CO ₂	1	25.5	18	371.9	13.4	2.10×10^{-3}	**
T	1	333.2	17	38.8	175	5.00×10^{-10}	***
CO ₂ :T	1	2.7	16	36.1	1.4	0.25	NS
Early Developmental Success							
NULL			19	749.6			
CO ₂	1	3.3	18	746.3	1.8	0.19	NS
T	1	690.2	17	56.1	384.3	1.30×10^{-12}	***
CO ₂ :T	1	27.8	16	28.3	15.5	1.20×10^{-3}	**
<i>Favites abdita</i>							
Fertilization Success							
NULL			9	7.2			
CO ₂	1	0	8	7.1	0	0.86	NS
Abnormal Development							
NULL			9	14.4			
CO ₂	1	5	8	9.4	5.3	0.05	NS
Early Developmental Success							
NULL			9	23.4			
CO ₂	1	0.6	8	22.8	0.2	0.66	NS
<i>Acropora hyacinthus</i> (Kochi)							
Fertilization success							
NULL			19	102.8			
CO ₂	1	72.4	18	30.4	93.2	4.50×10^{-8}	***
T	1	12.7	17	17.7	16.4	9.30×10^{-4}	***
CO ₂ :T	1	3.2	16	14.5	4.1	0.06	NS
Abnormal Development							
NULL			19	2889.8			
CO ₂	1	0.5	18	2889.4	0.1	0.72	NS
T	1	2803.9	17	85.4	827.2	3.30×10^{-15}	***
CO ₂ :T	1	36.3	16	49.1	10.7	4.80×10^{-3}	**

Table S2. Cont.

	Df	Dev	Resid. Df.	Resid. Dev	F	p	
Early Developmental Success							
NULL			19	2677.8			
CO ₂	1	4.8	18	2673.1	1.5	0.24	NS
T	1	2610.5	17	62.6	832.9	3.20×10^{-15}	***
CO ₂ :T	1	17.4	16	45.1	5.6	0.03	*
<i>Platygyra contorta</i>							
Fertilization Success							
NULL			19	389.2			
CO ₂	1	28.3	18	351.9	20.2	3.70×10^{-4}	***
T	1	328.5	17	23.4	234.5	5.60×10^{-11}	***
CO ₂ :T	1	0.2	16	23.2	0.1	0.7	NS
Abnormal Development							
NULL			19	2463.2			
CO ₂	1	681.7	18	1781.5	1522.1	2.20×10^{-16}	***
T	1	1677.9	17	103.6	3746.7	2.20×10^{-16}	***
CO ₂ :T	1	96.4	16	7.2	215.3	1.10×10^{-10}	***
Early Developmental Success							
NULL			19	2722.6			
CO ₂	1	622.6	18	2100.1	968	9.70×10^{-16}	***
T	1	1932	17	168.1	3003.8	2.20×10^{-16}	***
CO ₂ :T	1	157.2	16	10.9	244.4	4.10×10^{-11}	***

Table S3. Table showing the results of the GLM for the effect of latitudinal location on fertilization rate, abnormal development and early developmental success of *A. hyacinthus* in Lyudao and Kochi. Df = degrees of freedom, Resid. Df = residual degrees of freedom, Resid. Dev = residual deviance, F = F -statistic, p = p-value. NS = not significant, * means $p < 0.05$, ** means <0.01 and *** means <0.001 . ($n = 5$ per location)

<i>Acropora hyacinthus</i> (Lyudao vs. Kochi)							
	Df	Dev	Resid. Df.	Resid. Dev	F	p	
Fertilization success							
NULL			39	3863.7			
location	1	3314.8	38	548.9	2329.5	2.20×10^{-16}	***
T	1	243.2	37	305.7	170.9	2.20×10^{-14}	***
CO ₂	1	24	36	281.8	16.9	2.60×10^{-4}	***
location:T	1	126.1	35	155.7	88.6	9.80×10^{-11}	***
location:CO ₂	1	49.3	34	106.4	34.7	1.50×10^{-6}	***
T:CO ₂	1	40.3	33	66.1	28.3	7.80×10^{-6}	***
location:T:CO ₂	1	18.1	32	48	12.7	1.20×10^{-3}	**

Table S3. Cont.

<i>Acropora hyacinthus</i> (Lyudao vs. Kochi)							
	Df	Dev	Resid. Df.	Resid. Dev	<i>F</i>	<i>p</i>	
Abnormal development							
NULL			39	3597.9			
location	1	310.7	38	3287.2	117.4	3.10×10^{-12}	***
T	1	3105.3	37	182	1173.2	2.20×10^{-16}	***
CO ₂	1	2.9	36	179	1.1	0.3	NS
location:T	1	54.5	35	124.5	20.6	7.50×10^{-5}	***
location:CO ₂	1	0.3	34	124.2	0.1	0.75	NS
T:CO ₂	1	33.6	33	90.6	12.7	1.20×10^{-3}	**
location:T:CO ₂	1	5.4	32	85.2	2	0.16	NS
Early Developmental Success							
NULL			39	3720.6			
location	1	293.2	38	3427.4	118.9	2.60×10^{-12}	***
T	1	3179.3	37	248.1	1289.7	2.20×10^{-16}	***
CO ₂	1	4.2	36	243.9	1.7	0.2	NS
location:T	1	106.5	35	137.4	43.2	2.10×10^{-7}	***
location:CO ₂	1	18.8	34	118.6	7.6	0.01	**
T:CO ₂	1	45.1	33	73.5	18.3	1.60×10^{-4}	***
location:T:CO ₂	1	0	32	73.5	0	0.89	NS

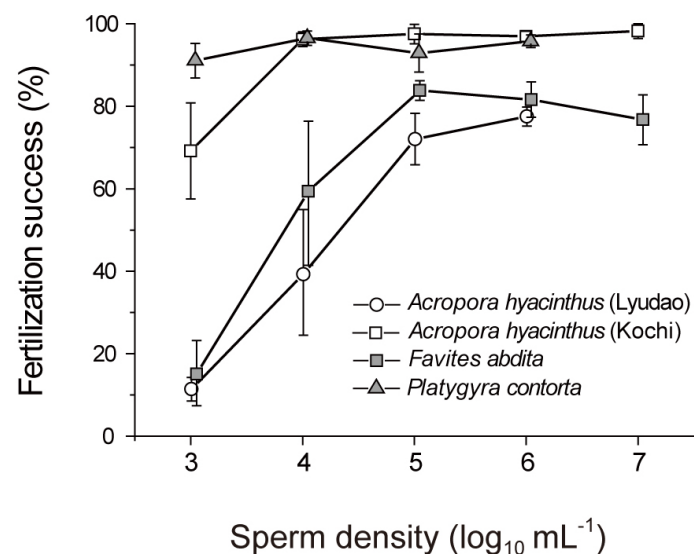


Figure S1. The effect of sperm density on the fertilization success of *A. hyacinthus* (Lyudao), *F. abdita*, *A. hyacinthus* (Kochi) and *p. contorta*. Average $\pm 95\%$ confidence intervals are shown ($n = 4-6$).