

Sea Water Property	Low CO ₂	High CO ₂	Significance
Temperature (°C)	15.308 (15.305, 15.312)	15.319 (15.316, 15.323)	P<0.0001
Salinity	33.72 (33.619, 33.821)	33.71 (33.635, 33.791)	P=0.3669
TA (μmol kg _{sw} ⁻¹)	2249 (2245, 2253)	2250 (2246, 2254)	P=0.7388
DIC _{calc} (μmol kg _{sw} ⁻¹)	2221 (2216, 2226)	2315 (2309, 2322)	P<0.0001
pH _T	8.04 (8.03, 8.06)	7.60 (7.58, 7.63)	P<0.0001
pCO _{2CALC}	400 (389, 412)	1254 (1213, 1296)	P<0.0001
Ω _{aragonite}	2.34 (2.29, 2.40)	.98 (.90, 1.07)	P<0.0001
Ω _{calcite}	3.65 (3.57, 3.74)	1.53 (1.40, 1.66)	P<0.0001

Table S1. Experimental chemistry conditions.

Mean carbonate system parameter values, 95% confidence intervals and significance of difference between low and high CO₂ treatments during the course of the study. Partial pressure of CO₂ (pCO_{2calc}), aragonite and calcite saturation state (Ω_{aragonite/calcite}) and total dissolved inorganic carbon (DIC_{calc}) were calculated from the measured values of total alkalinity (TA), pH total (pHT), temperature and salinity. The significance of differences between CO₂ treatments were assessed using Student's t-test.

Response Variable	Response Group	LS Mean Estimate	SE	Lower 95% CI	Upper 95% CI	Group Comparison	Difference	SE	DF	t-Ratio	p	Lower 95% CI	Upper 95% CI
Total Zooids Added													
	BMR Low CO ₂	101.48	13.89	72.34	130.63	BMR Low - VD High CO ₂	-53.85	18.46	46.90	-2.92	0.005*	-90.99	16.72
	BMR High CO ₂	108.46	14.42	78.19	138.74	BMR High - VD High CO ₂	-46.88	18.86	46.90	-2.49	0.016*	-84.82	-8.94
	VD Low CO ₂	131.11	12.32	103.83	158.39	VD Low - VD High CO ₂	-24.23	11.90	46.90	-2.04	0.047*	-48.17	-0.29
	VD High CO ₂	155.34	12.16	128.41	182.28	BMR Low - VD Low CO ₂	-29.62	18.56	46.90	-1.60	0.117	-66.97	7.73
						BMR High - VD Low CO ₂	-22.65	18.96	46.90	-1.19	0.238	-60.79	15.50
						BMR Low - BMR High CO ₂	-6.98	13.49	46.90	-0.52	0.607	-34.11	20.16
Female Investment: log₁₀ (O+1)/([A_F+A_M+A_B]+1):													
	BMR Low CO ₂	-0.66	0.05	-0.77	-0.55	BMR Low - BMR High CO ₂	0.12	0.05	21.00	2.30	0.031*	0.01	0.23
	BMR High CO ₂	-0.78	0.05	-0.89	-0.67	VD Low - VD High CO ₂	0.11	0.04	13.90	2.35	0.034*	0.01	0.21
	VD Low CO ₂	-0.67	0.04	-0.77	-0.58	BMR Low - VD High CO ₂	0.12	0.07	25.10	1.78	0.087	-0.01	0.27
	VD High CO ₂	-0.79	0.04	-0.88	-0.69	BMR High - VD Low CO ₂	-0.10	0.07	25.50	-1.52	0.141	-0.25	0.03
						BMR Low - VD Low CO ₂	0.01	0.07	25.10	0.20	0.845	-0.13	0.15

						BMR High-VD High CO ₂	0.004	0.07	25.50	0.06	0.954	-0.14	0.14
Male Investment: A_m/(A_m+A_f):													
	BMR Low CO ₂	0.41	0.03	0.35	0.47	BMR Low - VD High CO ₂	0.08	0.04	18.77	2.08	0.051	0.01	0.16
	Co	0.36	0.03	0.30	0.42	BMR Low - BMR High CO ₂	0.05	0.03	18.77	1.80	0.087	-0.01	0.12
	VD Low CO ₂	0.36	0.03	0.31	0.42	VD Low - VD High CO ₂	0.03	0.03	18.77	1.23	0.235	-0.02	0.09
	VD High CO ₂	0.33	0.03	0.28	0.38	BMR Low-VD Low CO ₂	0.05	0.04	18.77	1.20	0.245	-0.03	0.13
						BMR High - VD High CO ₂	0.03	0.04	18.77	0.68	0.506	-0.05	0.11
						BMR High - VD Low CO ₂	-0.01	0.04	18.77	-	0.837	-0.09	0.07
Degenerated Zooid %													
	BMR Low CO ₂	0.19	0.02	0.15	0.24	BMR Low - BMR High CO ₂	-0.05	0.02	17.50	-	0.044*	-0.09	0.01
	BMR High CO ₂	0.24	0.02	0.19	0.29	BMR Low - VD High CO ₂	-0.05	0.03	17.50	-	0.091	-0.12	0.01
	VD Low CO ₂	0.23	0.02	0.19	0.27	BMR Low - VD Low CO ₂	-0.04	0.03	17.50	-	0.249	-0.10	0.03
	VD High CO ₂	0.25	0.02	0.20	0.29	VD Low - VD High CO ₂	-0.02	0.02	17.50	-	0.332	-0.06	0.02
						BMR High - VD Low CO ₂	0.01	0.03	17.50	0.31	0.757	-0.06	0.07
						BMR High - VD High CO ₂	-0.01	0.03	17.50	-	0.780	-0.07	0.06
Colony CaCO₃ Weight (10⁻⁵g)													
	BMR Low CO ₂	64.49	2.11	60.18	68.81	VD Low-VD High CO ₂	11.01	2.00	29.17	5.49	<0.001*	6.91	15.11
	BMR High CO ₂	51.69	2.18	47.23	56.15	BMR Low - BMR High CO ₂	12.80	2.03	29.17	6.31	<0.001*	8.66	16.95
	VD Low CO ₂	57.96	1.99	53.81	62.10	BMR Low - VD High CO ₂	17.54	2.88	29.17	6.09	<0.001*	11.66	23.43
	VD High CO ₂	46.95	2.08	42.68	51.22	BMR Low - VD Low CO ₂	6.54	2.83	29.17	2.31	0.028*	0.75	12.32
						BMR High	-6.27	2.8	29.	-	0.03	-	-0.38

						- VD Low CO ₂		8	17	2.18	7*	12.16	
						BMR High - VD High CO ₂	4.74	2.93	29.17	1.62	0.116	-1.25	10.73
Colony Organic Weight (10⁻⁵g)													
	BMR Low CO ₂	16.86	2.35	12.19	21.53	BMR Low - VD High CO ₂	7.64	3.02	88.0	2.53	0.013*	1.60	13.65
	BMR High CO ₂	10.06	2.312	5.47	14.66	BMR Low - BMR High CO ₂	6.80	3.30	88.0	2.06	0.042*	0.24	13.35
	VD Low CO ₂	9.96	1.86	6.26	13.66	BMR Low - VD Low CO ₂	6.90	3.00	88.0	2.30	0.024*	0.94	12.86
	VD High CO ₂	9.22	1.9	5.45	12.99	BMR High - VD High CO ₂	0.84	2.99	88.0	0.28	0.778	-5.10	6.79
						VD Low - VD High CO ₂	0.74	2.66	88.0	0.28	0.782	-4.50	6.03
						BMR High - VD Low CO ₂	0.11	2.97	88.0	0.04	0.972	-5.80	6.01
% of Zooids with Organic Coverings													
	BMR Low CO ₂	0.01	0.01	-0.01	0.02	BMR Low - VD High CO ₂	-0.09	0.01	19.16	10.97	<0.001*	-0.10	-0.07
	BMR High CO ₂	0.09	0.01	0.08	0.10	BMR Low - BMR High CO ₂	-0.08	0.01	19.16	9.69	<0.001*	-0.10	-0.07
	VD Low CO ₂	0.01	0	0	0.02	VD Low - VD High CO ₂	-0.08	0.01	19.16	11.90	<0.001*	-0.10	-0.07
	VD High CO ₂	0.09	0.01	0.08	0.10	BMR High - VD Low CO ₂	0.08	0.01	19.16	9.91	<0.001*	0.06	0.10
						BMR Low - VD Low CO ₂	0	0.01	19.16	0.60	0.553	-0.02	0.01
						BMR High - VD High CO ₂	0	0.01	19.16	0.43	0.674	-0.02	0.01
% of Zooids with Organic Coverings in Treatment Phase Growth													
	BMR Low CO ₂	0.0006	0.01	-0.01	0.02	BMR Low - VD High	-0.13	0.01	25.51	13.0	<0.001*	-0.15	-0.10

						CO ₂				6			
	BMR High CO ₂	0.09	0.01	0.07	0.1	VD Low - VD High CO ₂	-0.13	0.01	25.51	14.69	<0.001*	-0.15	-0.10
	VD Low CO ₂	0	0.01	-0.01	0.01	BMR Low - BMR High CO ₂	-0.09	0.01	25.51	8.41	<0.001*	-0.12	-0.06
	VD High CO ₂	0.13	0.01	0.12	0.14	BMR High - VD Low CO ₂	0.09	0.01	25.51	9.12	<0.001*	0.06	0.12
						BMR High - VD High CO ₂	-0.04	0.01	25.51	3.93	0.003*	-0.07	-0.01
						BMR Low - VD Low CO ₂	0	0.01	25.51	0.07	0.999	-0.03	0.03
Mg/Ca_c													
	VD Low CO ₂	0.035	0.001	0.032	0.038	VD Low - VD High CO ₂	0.008	0.002	12.0	4.53	0.0007*	0.004	0.01
	VD High CO ₂	0.027	0.001	0.024	0.029								
Skeletal Wall Thickness (µm)													
	VD Low CO ₂	7.53	0.58	6.29	8.78	VD Low - VD High CO ₂	1.68	0.82	13.81	2.05	0.059	-0.08	3.43
	VD High CO ₂	5.85	0.58	4.61	7.09								

Table S2. Least squares group means estimates and significance assessments derived from mixed effects model output for colony response variables.