

Ocean acidification may alter predator–prey relationships and weaken nonlethal species interactions between gastropods and crabs

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Marine Ecology Progress Series 616: 83–94 (2019)

Table S1. Approximate environmental seawater parameters at each collection site during the months of collection of all species for this study. These data were not measured specifically for this study but were obtained from the Central and Northern California Ocean Observing System (CeNCOOS), Bodega Ocean Observing Node (BOON), Moss Landing Marine Laboratory, and National Data Buoy Center (NDBC). Averages were calculated for September and October 2015, at the time of collection and start of the experiment, and are only displayed for comparison purposes (were not used in any analyses).

Site	Salinity	Temperature (°C)	pH (total)
Bodega Bay, CA	32.94	13.29	7.96
Moss Landing, CA	32.79	16.10	8.16
San Mateo, CA	30.97	15.25	7.94
Nahant, MA	31.50	16.05	8.10

Table S2. Mean seawater conditions in each of the four seawater condition treatments. Temperature, salinity, total alkalinity and pH were directly measured, while others were calculated using CO2SYS³⁵. Standard deviations are in parentheses.

Treatments		Means (±SD)							
Temp	CO ₂	Salinity	Temperature (°C)	pH (total)	T Alk (μmol·kgSW ⁻¹)	TCO ₂ (μmol·kgSW ⁻¹)	pCO ₂ (μatm)	Ω _{calc}	Ω _{arag}
Control	Control	33.2 (1.35)	14.47 (0.85)	7.89 (0.047)	2194.4	2053.5	586.1	2.71	1.73
Heated	Control	33.2 (1.35)	16.79 (0.68)	7.89 (0.047)	2194.4	2039.0	589.2	2.95	1.90
Control	High	33.2 (1.35)	14.47 (0.85)	7.60 (0.046)	2194.4	2152.8	1226.4	1.47	0.94
Heated	High	33.2 (1.35)	16.79 (0.68)	7.60 (0.046)	2194.4	2142.6	1239.6	1.61	1.031.03

Table S3. Mean sizes of organisms used in these experiments (at start of experiment).

Species	Carapace width (mm)		Length (mm)		Immersed Weight (g)		Air Weight (g)		Estimated Shell Wt (g)		Estimated Tissue Wt (g)	
	AV	SE	AV	SE	AV	SE	AV	SE	AV	SE	AV	SE
<i>C. maenas</i>	45.88	0.54	-	-	-	-	-	-	-	-	-	-
<i>N. ostrina</i>	-	-	23.84	0.32	0.87	0.034	2.15	0.080	1.45	0.057	0.70	0.029
<i>N. lapillus</i>	-	-	25.62	0.31	1.48	0.45	3.06	0.089	2.46	0.075	0.80	0.004
<i>U. cinerea</i>	-	-	27.22	0.23	0.93	0.023	2.08	0.048	1.55	0.037	0.075	0.003

Table S4. ANOVA results for all of the measures of organism growth during 5-month experiments.

Spp	Test	Variable	Temperature			CO ₂			Crab			Interactions (p-value)			
			df	F	P	df	F	P	df	F	P	T x CO ₂	T x Crab	CO ₂ x Crab	T x CO ₂ x Crab
NO	3-way	Lateral Growth	1,50	0.001	0.99	1,50	0.45	0.51	1,50	9.70	0.003	0.83	0.43	0.057	0.91
NO	3-way	Shell Weight	1,50	0.37	0.55	1,50	1.97	0.17	1,50	9.77	0.003	0.97	0.68	0.057	0.61
NO	3-way	Tissue Weight	1,50	0.77	0.39	1,50	0.067	0.80	1,50	14.24	<0.001	0.54	0.56	0.018	0.90
NO	3-way	Tissue Eaten	1,50	0.36	0.55	1,50	0.93	0.34	1,50	17.23	<0.001	0.84	0.87	0.14	0.62
NO	3-way	Wt : Lat Growth	1,19	0.78	0.39	1,19	5.95	0.025	1,19	1.55	0.23	0.42	0.65	0.10	0.54
NL	3-way	Lateral Growth	1,51	0.47	0.50	1,51	0.21	0.65	1,51	1.55	0.22	0.70	0.76	0.51	0.61
NL	3-way	Shell Weight	1,51	0.21	0.65	1,51	1.89	0.18	1,51	2.11	0.175	0.71	0.72	0.76	0.42
NL	3-way	Tissue Weight	1,51	0.35	0.56	1,51	0.071	0.79	1,51	3.56	0.065	0.45	0.92	0.94	0.44
NL	3-way	Shell Length	1,51	0.45	0.51	1,51	1.97	0.17	1,51	0.028	0.87	0.67	0.35	0.34	0.51
NL	3-way	Tissue Eaten	1,51	0.70	0.41	1,51	0.62	0.43	1,51	5.09	0.028	0.97	0.34	0.52	0.53
NL		Aperture Teeth	In high CO ₂ tmts, 40% had aperture teeth in the absence of crabs, 87% in presence of crabs												
UC	3-way	Lateral Growth	1,55	0.60	0.44	1,55	1.47	0.23	1,55	1.07	0.31	0.15	0.59	0.13	0.097
UC	3-way	Shell Weight	1,55	0.17	0.68	1,55	14.3	<0.001	1,55	1.05	0.31	0.27	0.41	0.011	0.18
UC	3-way	Shell Length	1,55	0.071	0.79	1,55	4.23	0.044	1,55	0.36	0.55	0.66	0.95	0.77	0.67
UC	3-way	Tissue Weight	1,55	0.84	0.37	1,55	1.62	0.21	1,55	0.082	0.775	0.945	0.32	0.98	0.67
UC	3-way	Shell:Tissue	1,55	0.88	0.35	1,55	7.81	0.007	1,55	1.82	0.18	0.34	0.85	0.25	0.34
UC	3-way	Tissue Eaten	1,55	7.70	0.008	1,55	0.62	0.44	1,55	6.20	0.016	0.83	0.91	0.78	0.60
CM	2-way	Carapace Width	1,28	0.012	0.91	1,28	1.42	0.24	-	-	-	0.28	-	-	-
CM	2-way	Tiss Eaten / wk	1,28	0.001	0.98	1,28	0.37	0.55	-	-	-	0.033	-	-	-

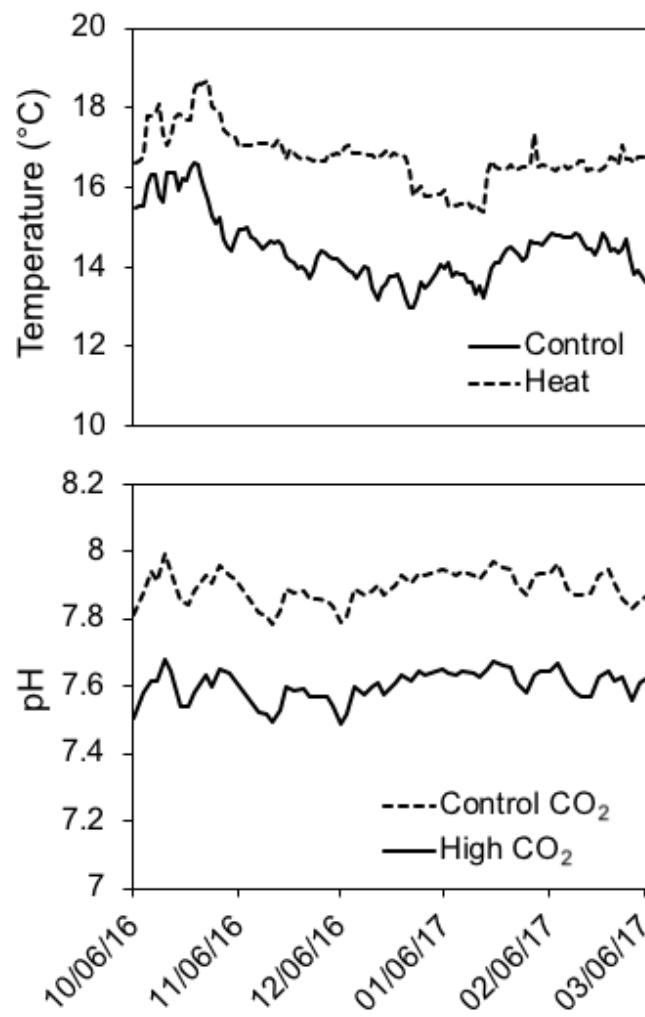


Fig. S1. pH and temperature levels over the course of the experiment