

Mechanistic understanding of ocean acidification impacts on larval feeding physiology and energy budgets of the mussel *Mytilus californianus*

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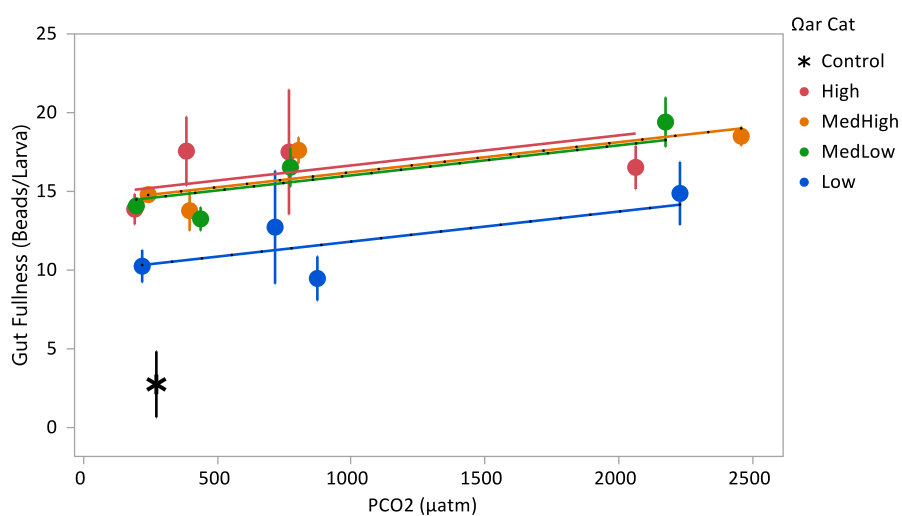


Figure S1. Gut fullness of *M. californianus* larvae over P_{CO_2} for each aragonite saturation state category (Ω_{ar} Cat). Larvae from the control treatment were not included in analysis. Bars represent standard deviations.

Table S1. Intercept estimates for the effects P_{CO_2} on gut fullness by Ω_{ar} category. Values for each Ω category can be found in Table 1.

Term	Estimate	Std Error	t Ratio	Prob> t	Connecting Letter Report	Mean Gut Fullness
Intercept (Ω_{ar} MedLow)	13.283692	0.637085	20.85	<.0001	A	
P_{CO_2} (slope)	0.0019091	0.000523	3.65	0.0038		15.84
Ω_{ar} category [High]	1.4746925	0.710443	2.08	0.0622	A	16.38
Ω_{ar} category [Low]	-3.361904	0.7103	-4.73	0.0006	B	11.85
Ω_{ar} category [MedHigh]	1.0441942	0.709509	1.47	0.1691	A	16.19

Table S2. Parameter estimates for larval energy content based on shell length (E_{SL}) and total larval energy content (E_T) and scope for growth of *M. californianus* larvae against aragonite saturation state (Ω_{ar}).

Model	Parameter	Estimate	Std Error	Lower 95%	Upper 95%	R ²
E_{SL} vs Ω_{ar}	Asymptote	691.52	16.37	659.43	723.61	0.94
	Scale	-617.9	63.71	-742.7	-493.0	
	Growth Rate	-1.269	0.207	-1.675	-0.863	
E_T vs Ω_{ar}	Asymptote	773.76	16.76	663.05	728.91	0.94
	Scale	-775.48	74.29	-921.10	-629.85	
	Growth Rate	-1.42	0.200	-1.822	-1.035	
SfG vs Ω_{ar}	Asymptote	82.98	1.00	81.0	84.96	0.98
	Scale	-227.15	17.96	-262.36	-191.95	
	Growth Rate	-3.02	0.199	-3.41	-2.63	

Table S3. *M. californianus* larval energy budget components affected by carbonate seawater treatments. Energy gains (ingestion) and losses (respiration and delay in initiation of feeding) as well as larval energy content from shell length (E_{SL}), total larval energy content (E_T), and available energy for growth (SfG) are estimated for larvae between the hours of 48-72 h post-fertilization. Asterisk denotes a preservation problem with this sample.

Treatment		P_{CO_2} (μatm)	Ω_{ar}	pH_{total}	Feeding Delay Impact (μJoule)	Ingestion (μJoules)	Respiration Cost (μJoules)	E_{SL} ($\mu\text{Joules/larva}$)	E_T ($\mu\text{Joules/larva}$)	SfG ($\mu\text{Joules/larva}$)
P_{CO_2} Cat	Ω_{ar} Cat									
Low	Low	219	0.5	7.84	0.02	8.0	12.06	336.23	372.14	35.91
Low	MedLow	197	1.09	8.03	0.04	15.0	12.06	571.19	647.37	76.18
Low	MedHigh	241	1.87	8.11	0.04	16.3	12.06	635.92	717.83	81.91
Low	High	191	4.58	8.35	0.04	16.4	12.06	685.27	767.58	82.31
MedLow*	Low	715	0.31	7.48	0.00	1.7	12.06	343.21	336.49	-6.72
MedLow	MedLow	437	1.03	7.84	0.02	14.7	12.06	574.72	649.57	74.85
MedLow	MedHigh	396	2.36	8.04	0.03	16.4	12.06	645.38	727.68	82.30
MedLow	High	365	4.82	8.21	0.03	16.4	12.06	693.70	776.07	82.37
MedHigh	Low	8.73	0.51	7.54	0.02	8.3	12.06	304.81	342.25	37.44
MedHigh	MedLow	773	1.17	7.75	0.01	15.3	12.06	587.37	665.20	77.83
MedHigh	MedHigh	803	2.33	7.88	0.01	16.4	12.06	651.88	734.30	82.42
MedHigh	High	767	4.69	8.05	0.01	16.4	12.06	680.85	763.35	82.50
High	Low	2228	0.65	7.39	-0.05	11.0	24.92	364.56	406.72	42.16
High	MedLow	2175	1.31	7.55	-0.07	15.7	12.06	560.40	640.43	80.04
High	MedHigh	2457	2.18	7.64	-0.08	16.4	12.06	648.90	731.78	82.88
High	High	2063	5.21	7.86	-0.06	16.4	12.06	708.05	790.95	82.90