

Supplemental Information

Supplementary Tables

Table S1: Comparisons of water quality measurements among distal sites using one-way ANOVA with type III sum of squares. Water quality measurements were taken at each site biweekly from July 2018 to November 2018. Degrees of freedom (df), F-values, and p-values (*p*) are reported for these tests. If the one-way ANOVA was significant, a Tukey’s post-hoc test was run to compare the water quality measurements between pairs of sites, and t-values and p-values (*p*) are reported. MR refers to Merroir, PR refers to Piankatank River, UC refers to Urbanna Creek, and VP refers to VIMS Pier. Table 1 corresponds with this table.

Response Variable	df	F-value	<i>p</i>	Comparison of Sites	t-value	<i>p</i>
Temperature	3	0.120	0.948			
Salinity	3	19.221	<0.001	MR – PR	-2.646	0.056
				MR – UC	-2.218	0.138
				MR – VP	4.247	<0.001
				PR – UC	0.428	0.973
				PR – VP	6.823	<0.001
				UC – VP	6.406	<0.001
Dissolved oxygen	3	0.114	0.953			
pH _{Total}	3	2.542	0.072			
Total alkalinity	3	5.301	0.004	MR – PR	-0.924	0.792
				MR – UC	-1.743	0.317
				MR – VP	2.101	0.172
				PR – UC	-0.819	0.845
				PR – VP	3.000	0.024
				UC – VP	3.798	0.003
<i>p</i> CO ₂	3	2.730	0.059			
Ω _{Calcite}	3	3.062	0.041	MR – PR	-1.964	0.221
				MR – UC	-0.472	0.965
				MR – VP	1.056	0.718
				PR – UC	1.492	0.453
				PR – VP	2.967	0.027
				UC – VP	1.515	0.439

Table S2: Comparison of water quality measurements between the distal period at Merroir and the common garden conditions. A one-way ANOVA with type III sum of squares was performed. Measurements were taken at Merroir biweekly from July 2018 to November 2018 and at VIMS Pier weekly from November 2018 to December 2018 to describe common garden conditions. Degrees of freedom (df), F-values, and p-values (*p*) are reported. Table 1 corresponds with this table.

Response Variable	df	F-value	<i>p</i>
Temperature	1	24.084	<0.001
Salinity	1	6.159	0.028
Dissolved oxygen	1	18.356	<0.001
pH _{Total}	1	4.774	0.048
Total alkalinity	1	0.089	0.771
<i>p</i> CO ₂	1	7.051	0.020
Ω _{Calcite}	1	0.641	0.438

Table S3: Comparison of water quality measurements between the distal period at Piankatank River and the common garden conditions. A one-way ANOVA with type III sum of squares was performed. Measurements were taken at Piankatank River biweekly from July 2018 to November 2018 and at VIMS Pier weekly from November 2018 to December 2018 to describe common garden conditions. Degrees of freedom (df), F-values, and p-values (*p*) are reported. Table 1 corresponds with this table.

Response Variable	df	F-value	<i>p</i>
Temperature	1	28.561	<0.001
Salinity	1	10.686	0.006
Dissolved oxygen	1	9.412	0.009
pH _{Total}	1	7.445	0.017
Total alkalinity	1	0.218	0.648
<i>p</i> CO ₂	1	14.623	0.002
Ω _{Calcite}	1	0.687	0.422

Table S4: Comparison of water quality measurements between the distal period at Urbanna Creek and the common garden conditions. A one-way ANOVA with type III sum of squares was performed. Measurements were taken at Urbanna Creek biweekly from July 2018 to November 2018 and at VIMS Pier weekly from November 2018 to December 2018 to describe common garden conditions. Degrees of freedom (df), F-values, and p-values (*p*) are reported. Table 1 corresponds with this table.

Response Variable	df	F-value	<i>p</i>
Temperature	1	27.243	<0.001
Salinity	1	12.057	0.004
Dissolved oxygen	1	20.432	<0.001
pH _{Total}	1	3.663	0.078
Total alkalinity	1	1.909	0.190
<i>p</i> CO ₂	1	3.963	0.068
Ω _{Calcite}	1	0.006	0.938

Table S5: Comparison of water quality measurements between the distal period at VIMS Pier and the common garden conditions. A one-way ANOVA with type III sum of squares was performed. Measurements were taken at VIMS Pier biweekly from July 2018 to November 2018 and weekly from November 2018 to December 2018 to describe common garden conditions. Degrees of freedom (df), F-values, and p-values (*p*) are reported. Table 1 corresponds with this table.

Response Variable	df	F-value	<i>p</i>
Temperature	1	32.826	<0.001
Salinity	1	13.400	0.003
Dissolved oxygen	1	16.074	0.002
pH _{Total}	1	1.466	0.249
Total alkalinity	1	32.157	<0.001
<i>p</i> CO ₂	1	2.869	0.116
Ω _{Calcite}	1	4.380	0.058

Table S6: Comparison of treatment conditions during acute salinity exposure for oysters collected after the initial deployment by treatment. There were four salinity treatments: low, ambient at Merroir (A1; 11 psu), ambient at Piankatank River and Urbanna Creek (A2; 9 psu), and ambient at VIMS Pier (A3; 16 psu). For normally distributed variables, one-way ANOVA with type III sum of squares was used, and degrees of freedom (df), F-values, and p-values (*p*) are reported. If the one-way ANOVA was significant, a Tukey’s post-hoc test was run. For variables that were not normally distributed, the Kruskal-Wallis test was used, and degrees of freedom (df), Kruskal-Wallis chi-squared values, and p-values (*p*) are reported. If the Kruskal-Wallis test was significant, a Dunn test was run. Table 2 corresponds with this table.

Response variable	df	F-value	K-W chi-squared	<i>p</i>	Treatment Comparison	t-value	Z-value	<i>p</i>
Temperature	3		9.845	0.020	L – A1	1.952	0.051	
					L – A2	2.492	0.013	
					L – A3	2.114	0.035	
					A1 – A2	-0.019	0.984	
					A1 – A3	0.128	0.898	
					A2 – A3	0.168	0.867	
Salinity	3		382.910	<0.001	L – A1	-13.037	<0.001	
					L – A2	-11.220	<0.001	
					L – A3	-15.934	<0.001	
					A1 – A2	3.967	<0.001	
					A1 – A3	-2.290	<0.001	
					A2 – A3	-6.611	<0.001	
Dissolved	3		17.831	<0.001	L – A1	-5.542	<0.001	
					L – A2	-2.232	0.112	
					L – A3	-5.780	<0.001	
					A1 – A2	3.481	0.003	
					A1 – A3	-0.189	0.998	
					A2 – A3	-3.699	0.002	
pH _{Total}	3		164.630	<0.001	L – A1	-8.427	<0.001	
					L – A2	-7.753	<0.001	
					L – A3	-10.344	<0.001	
					A1 – A2	2.210	<0.001	
					A1 – A3	-1.515	<0.001	
					A2 – A3	-3.960	<0.001	
Total alkalinity	3		184.550	<0.001	L – A1	-9.479	<0.001	
					L – A2	-8.154	<0.001	
					L – A3	-10.285	<0.001	
					A1 – A2	2.887	<0.001	
					A1 – A3	-1.499	<0.001	
					A2 – A3	4.315	<0.001	

$p\text{CO}_2$	3	86.424	<0.001	L – A1	6.031	<0.001
				L – A2	-6.813	<0.001
				L – A3	-6.695	<0.001
				A1 – A2	0.688	<0.001
				A1 – A3	-0.525	<0.001
				A2 – A3	-1.294	<0.001
				Ω_{Calcite}	3	122.450
				L – A2	-4.455	<0.001
				L – A3	-10.113	<0.001
				A1 – A2	2.613	<0.001
				A1 – A3	-3.078	<0.001
				A2 – A3	-6.140	<0.001

Table S7: Comparison of water treatments during acute salinity exposure for oysters from common garden conditions. This exposure had two salinity treatments: ambient (12 psu) and low (5 psu). For normally distributed variables, one-way ANOVA with type III sum of squares was used, and degrees of freedom (df), F-values, and p-values (p) are reported. For variables that were not normally distributed, the Kruskal-Wallis test was used, and degrees of freedom (df), Kruskal-Wallis chi-squared values, and p-values (p) are reported. Table 3 corresponds with this table.

Response Variable	df	F-value	K-W chi-squared	p
Temperature	1		20.634	<0.001
Salinity	1		336.780	<0.001
Dissolved oxygen	1	67.367		<0.001
pH_{Total}	1		188.290	<0.001
Total alkalinity	1		134.500	<0.001
$p\text{CO}_2$	1		118.170	<0.001
Ω_{Ca}	1		188.060	<0.001

Table S8: Comparison of oyster physiology immediately after distal period deployment and changes in oyster physiology during deployment under common garden conditions. Change in condition index and change in glycogen content are defined as the difference in condition index values and glycogen content values, respectively, before and after common garden conditions. A one-way ANOVA with type III sum of squares was performed, with site as an independent variable. Degrees of freedom (df), F-values, and p-values (*p*) are reported. If the one-way ANOVA was significant, a Tukey’s post-hoc test was run, and t-values and p-values (*p*) are reported. MR refers to Merroir, PR refers to Piankatank River, UC refers to Urbanna Creek, and VP refers to VIMS Pier. Figures 4 and 5 correspond with this table.

Response variable	df	F-value	<i>p</i>	Comparison by Site	t-value	<i>p</i>
Condition Index	3	18.913	<0.001	MR – PR	2.312	0.118
				MR – UC	2.209	0.144
				MR – VP	-4.323	<0.001
				PR – UC	0.046	1.000
				PR – VP	-6.636	<0.001
				UC – VP	-6.254	<0.001
				Change in condition index	3	15.093
MR – UC	-0.920	0.793				
MR – VP	3.209	0.014				
PR – UC	1.821	0.278				
PR – VP	6.665	<0.001				
UC – VP	3.922	0.002				
Glycogen content	3	2.29	0.098			
Change in glycogen content	3	0.797	0.503			

Table S9: Comparison of oyster physiology immediately after common garden deployment. A one-way ANOVA with type III sum of squares was performed, with site as an independent variable. Degrees of freedom (df), F-values, and p-values (*p*) are reported. If the one-way ANOVA was significant, a Tukey's post-hoc test was run, and t-values and p-values (*p*) are reported. MR refers to Merroir, PR refers to Piankatank River, UC refers to Urbanna Creek, and VP refers to VIMS Pier.

Response variable	df	F-value	<i>p</i>	Comparison by Site	t-value	<i>p</i>
Condition Index	3	3.298	0.031	MR – PR	-0.158	0.999
				MR – UC	1.574	0.404
				MR – VP	-1.671	0.351
				PR – UC	1.879	0.253
				PR – VP	-1.710	0.332
				UC – VP	-3.137	0.017
Glycogen content	3	2.066	0.122			

Table S10: Comparison of total antioxidant potential following initial deployment and acute salinity exposure and change in total antioxidant potential of oysters during deployment under common garden conditions. Change in total antioxidant potential is defined as the difference in total antioxidant values before and after common garden conditions. A two-way ANOVA with type III sum of squares was performed, with site and treatment as independent variables. Degrees of freedom (df), chi-squared values, and p-values (*p*) are reported. When the interaction term in the full model was not significant, it was removed, and analysis proceeded using the reduced model. If the one-way ANOVA was significant, a Tukey's post-hoc test was run, and t-values and p-values (*p*) are reported. MR refers to Merroir, PR refers to Piankatank River, UC refers to Urbanna Creek, and VP refers to VIMS Pier. Figure 6 corresponds with this table.

Response variable	Reduced model terms	df	Chi-squared value	<i>p</i>	Site Comparison	t-value	<i>p</i>
Total antioxidant potential	Treatment	1	0.029	0.865			
	Site	3	2.045	0.563			
Change in total antioxidant potential	Treatment	1	0.819	0.366			
	Site	3	14.266	0.003			
					MR – PR	-2.782	0.028
					MR – UC	-0.308	0.990
					MR – VP	0.798	0.855
					PR – UC	2.474	0.063
					PR – VP	3.580	0.002
				UC – VP	1.106	0.686	

Table S11: Comparison of the change in condition index, glycogen content, and total antioxidant potential during deployment under common garden conditions to the null expectation of a mean of zero. Change in condition index, change in glycogen content, and change in total antioxidant potential is defined as the difference in condition index values, glycogen content values, and total antioxidant potential values, respectively, before and after common garden conditions. A one-sample Student's t-test was performed, with site as an independent variable. Degrees of freedom (df), t-values, and p-values are reported. MR refers to Merroir, PR refers to Piankatank River, UC refers to Urbanna Creek, and VP refers to VIMS Pier.

Physiological variable	Site	df	t-value	p
Change in condition index	MR	8	-3.729	0.006
	PR	14	-11.320	<0.001
	UC	6	-2.686	0.036
	VP	8	1.397	0.200
Change in glycogen content	MR	8	1.171	0.275
	PR	14	2.662	0.019
	UC	6	0.370	0.724
	VP	8	1.660	0.136
Change in total antioxidant potential	MR	13	-0.195	0.848
	PR	13	-5.233	<0.001
	UC	13	-1.080	0.300
	VP	13	0.644	0.531

Table S12: Multiple linear regression to assess the significance of pH, salinity, and temperature in predicting the change in condition index, change in glycogen content, and change in total antioxidant potential. Change in condition index, change in glycogen content, and change in total antioxidant potential are defined as the difference in condition index values, glycogen content values, and total antioxidant potential values, respectively, before and after common garden conditions. Full models were made with pH, salinity, and temperature as predictor variables. If a predictor variable was not significant, it was removed, and analysis proceeded with the reduced model. Estimates, t-values, p-values, and multiplied R^2 values are reported.

Dependent variables	Predictors	Estimate	t-value	p-value	Mult. R^2
Change in condition index	Salinity (distal)	0.299	6.540	<0.001	0.530
Change in glycogen content	pH (distal)	-16.054	-0.591	0.529	0.062
	Salinity (distal)	0.155	0.893	0.378	
	Temperature (distal)	-2.490	-0.636	0.558	
Change in total antioxidant potential	pH (distal)	4.187	0.392	0.697	0.228
	Salinity (distal)	-0.012	-0.155	0.878	
	Temperature (distal)	0.510	0.287	0.775	
	Treatment	-0.061	-0.905	0.370	

Table S13: Initial shell heights prior to the distal period deployment in July 2018. A one-way ANOVA with type III sum of squares was performed, with site as an independent variable. Figure S1 corresponds with this table.

Variable	df	F-value	p
Initial shell height	3	0.531	0.662

Supplementary Figures

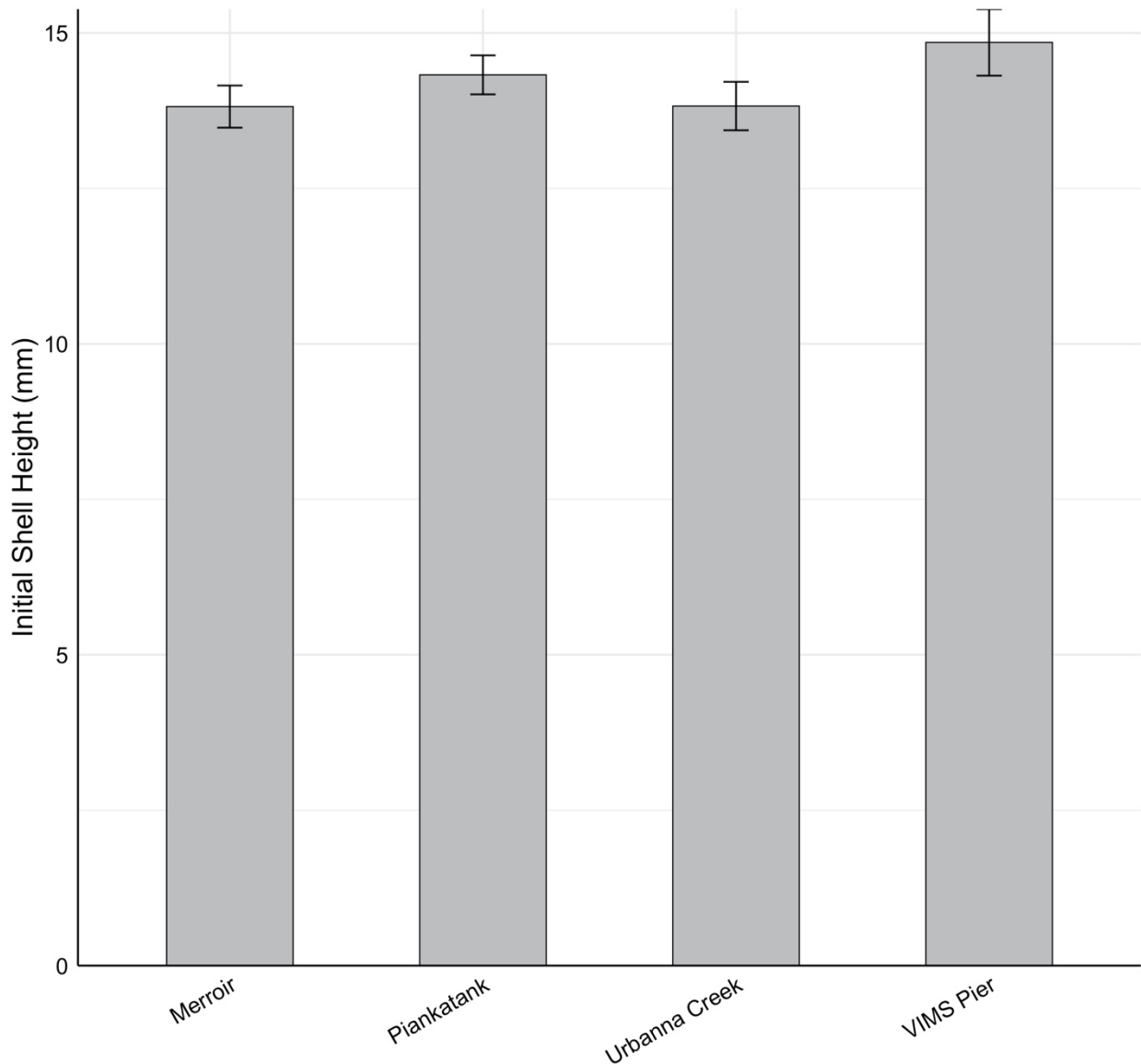


Figure S1: Initial shell height by distal site (mean \pm standard error). Data was collected on the day of distal site deployment (July 9, 2018). No significant differences were detected among distal sites. This information is expanded upon in Table S13