

Supplementary Table S1. Two-way analyses of variance for herbivory rates of *Lacuna* grazing on *Ulva* with initial starvation under ambient pH and dissolved oxygen (DO), low DO, low pH, and low pH/DO (Experiment 1). Asterisks (*) next to p-values denote significant results ($p < 0.05$).

Source of Variation	DF	SS	MS	F	P
pH	1	0.5700	0.5700	32.500	<0.001*
Dissolved oxygen	1	0.6570	0.6570	37.454	<0.001*
pH x Dissolved oxygen	1	0.0004	0.0004	0.026	0.877
Residual	8	0.1400	0.0176		
Total	11	1.3690	0.1240		

Supplementary Table S2. Tukey Honest Significant Difference tests for herbivory rates of *Lacuna* grazing on *Ulva* with initial starvation under ambient pH and DO, low DO, low pH, and low pH/DO (Experiment 1). Asterisks (*) next to p-values denote significant results ($p < 0.05$).

Comparison	Diff.	Lower	Upper	P-value
Low DO vs. Control	-0.480	-0.827	-0.134	0.009*
Low DO/pH vs. Control	-0.904	-1.251	-0.558	<0.001*
Low pH vs. Control	-0.448	-0.795	-0.102	0.014*
Low DO/pH vs. Low DO	-0.424	-0.770	-0.077	0.019*
Low pH vs. Low DO	0.032	-0.314	0.378	0.990
Low pH vs. Low DO/pH	0.456	0.109	0.802	0.013*

Supplementary Table S3. Two-way analyses of variance for herbivory rates and survival of *Lacuna* grazing on *Ulva* without initial starvation (Experiment 2) under ambient and low pH and/or DO. Asterisks (*) next to p-values denote significant results ($p < 0.05$).

Parameter	Source of Variation	DF	SS	MS	F	P
Herbivory	pH	1	0.009	0.009	0.808	0.386
	Dissolved oxygen	1	1.294	1.294	119.122	<0.001*
	pH x Dissolved oxygen	1	0.002	0.002	0.179	0.680
	Residual	12	0.130	0.011		
	Total	15	1.435	0.096		
Survival	pH	1	1914.063	1914.063	26.727	<0.001*
	Dissolved oxygen	1	3906.25	3906.25	54.545	<0.001*
	pH x Dissolved oxygen	1	39.063	39.063	0.545	0.474
	Residual	12	859.375	71.615		
	Total	15	6718.75	447.917		

Supplementary Table S4. Tukey Honest Significant Difference tests for herbivory rates and survival of *Lacuna* grazing on *Ulva* without initial starvation (Experiment 2) under ambient and low pH and/or DO. Asterisks (*) next to p-values denote significant results ($p < 0.05$).

Parameter	Comparison	Diff.	Lower	Upper	P-value
Herbivory	Low DO vs. Control	-0.547	-0.766	-0.328	<0.001*
	Low DO/pH vs. Control	-0.616	-0.835	-0.397	<0.001*
	Low pH vs. Control	-0.025	-0.244	0.194	0.986
	Low DO/pH vs. Low DO	-0.069	-0.288	0.150	0.787
	Low pH vs. Low DO	0.522	0.303	0.741	<0.001*
	Low pH vs. Low DO/pH	0.591	0.372	0.810	<0.001*
Survival	Low DO vs. Control	-34.375	-52.141	-16.609	<0.001*
	Low DO/pH vs. Control	-53.125	-70.891	-35.359	<0.001*
	Low pH vs. Control	-25.000	-42.766	-7.234	0.006*
	Low DO/pH vs. Low DO	-18.750	-36.516	-0.984	0.038*
	Low pH vs. Low DO	9.375	-8.391	27.141	0.432
	Low pH vs. Low DO/pH	28.125	10.359	45.891	0.002*

Supplementary Table S5. Two-way analyses of variance for herbivory rates and survival of *Lacuna* grazing on *Ulva* starved under ambient or low DO and allowed to graze on *Ulva* under ambient, low DO, or low pH conditions with initial starvation (Experiment 3). Asterisks (*) next to p-values denote significant results ($p < 0.05$).

Parameter	Source of Variation	DF	SS	MS	F	P
Herbivory	pH	1	0.0374	0.0374	1.983	0.176
	Dissolved oxygen	2	1.289	0.645	34.205	<0.001*
	pH x Dissolved oxygen	2	0.107	0.0536	2.843	0.085
	Residual	18	0.339	0.0188		
	Total	23	1.773	0.0771		
Survival	pH	1	58.594	58.594	0.931	0.347
	Dissolved oxygen	2	3789.063	1894.531	30.103	<0.001*
	pH x Dissolved oxygen	2	273.438	136.719	2.172	0.143
	Residual	18	1132.813	62.934		
	Total	23	5253.906	228.431		

Supplementary Table S6. Tukey Honest Significant Difference tests for herbivory rates and survival of *Lacuna* grazing on *Ulva* starved under ambient or low DO and allowed to graze on *Ulva* under ambient, low DO, or low pH conditions with initial starvation (Experiment 3). Asterisks (*) next to p-values denote significant results ($p < 0.05$).

Parameter	Comparisons (Starvation>Grazing)	Diff.	Lower	Upper	P-value
Herbivory	Low DO>Ambient vs. Ambient>Ambient	-0.085	-0.394	0.223	0.947
	Ambient>Low DO vs. Ambient>Ambient	-0.690	-0.999	-0.382	<0.001*
	Low DO>Low DO vs. Ambient>Ambient	-0.448	-0.757	-0.140	0.002*
	Ambient>Low pH vs. Ambient>Ambient	-0.162	-0.471	0.146	0.565
	Low DO>Low pH vs. Ambient>Ambient	-0.082	-0.391	0.226	0.954
	Ambient>Low DO vs. Low DO>Ambient	-0.605	-0.914	-0.297	<0.001*
	Low DO>Low DO vs. Low DO>Ambient	-0.363	-0.672	-0.055	0.016*
	Ambient>Low pH vs. Low DO>Ambient	-0.077	-0.386	0.231	0.965
	Low DO>Low pH vs. Low DO>Ambient	0.003	-0.306	0.311	1.000
	Low DO>Low DO vs. Ambient>Low DO	0.242	-0.066	0.551	0.177
	Ambient>Low pH vs. Ambient>Low DO	0.528	0.220	0.837	<0.001*
	Low DO>Low pH vs. Ambient>Low DO	0.608	0.299	0.916	<0.001*
	Ambient>Low pH vs. Low DO>Low DO	0.286	-0.023	0.594	0.079
	Low DO>Low pH vs. Low DO>Low DO	0.366	0.057	0.674	0.015*
	Low DO>Low pH vs. Ambient>Low pH	0.080	-0.229	0.388	0.959
Survival	Low DO>Ambient vs. Ambient>Ambient	-9.375	-27.202	8.452	0.566
	Ambient>Low DO vs. Ambient>Ambient	-37.500	-55.327	-19.673	<0.001*
	Low DO>Low DO vs. Ambient>Ambient	-31.250	-49.077	-13.423	<0.001*
	Ambient>Low pH vs. Ambient>Ambient	-9.375	-27.202	8.452	0.566
	Low DO>Low pH vs. Ambient>Ambient	-15.625	-33.452	2.202	0.106
	Ambient>Low DO vs. Low DO>Ambient	-28.125	-45.952	-10.298	0.001*
	Low DO>Low DO vs. Low DO>Ambient	-21.875	-39.702	-4.048	0.011*
	Ambient>Low pH vs. Low DO>Ambient	0.000	-17.827	17.827	1.000
	Low DO>Low pH vs. Low DO>Ambient	-6.250	-24.077	11.577	0.869
	Low DO>Low DO vs. Ambient>Low DO	6.250	-11.577	24.077	0.869
	Ambient>Low pH vs. Ambient>Low DO	28.125	10.298	45.952	0.001*
	Low DO>Low pH vs. Ambient>Low DO	21.875	4.048	39.702	0.011*
	Ambient>Low pH vs. Low DO>Low DO	21.875	4.048	39.702	0.011*
	Low DO>Low pH vs. Low DO>Low DO	15.625	-2.202	33.452	0.106
	Low DO>Low pH vs. Ambient>Low pH	-6.250	-24.077	11.577	0.869

Supplementary Table S7. Two-way analyses of variance for herbivory rates and survival of *Lacuna* grazing on *Ulva* starved under ambient or low pH and allowed to graze on *Ulva* under ambient, low DO, or low pH conditions (Experiment 4). Asterisks (*) next to p-values denote significant results ($p < 0.05$).

Parameter	Source of Variation	DF	SS	MS	F	P
Herbivory	pH	1	1.381	1.381	169.533	<0.001*
	Dissolved oxygen	2	1.141	0.571	70.075	<0.001*
	pH x Dissolved oxygen	2	0.121	0.061	7.456	0.005*
	Residual	18	0.138	0.008		
	Total	23	2.833	0.129		
Survival	pH	1	26.042	26.042	3.000	0.100
	Dissolved oxygen	2	1302.083	651.042	75.000	<0.001*
	pH x Dissolved oxygen	2	52.083	26.042	3.000	0.075
	Residual	18	156.25	8.681		
	Total	23	1536.458	66.803		

Supplementary Table S8. Tukey Honest Significant Difference tests for herbivory rates and survival of *Lacuna* grazing on *Ulva* starved under ambient or low pH and allowed to graze on *Ulva* under ambient, low DO, or low pH conditions (Experiment 4). Asterisks (*) next to p-values denote significant results ($p < 0.05$).

Parameter	Comparisons (Starvation>Grazing)	Diff.	Lower	Upper	P-value
Herbivory	Low pH>Ambient vs. Ambient>Ambient	-0.617	-0.821	-0.413	<0.001*
	Ambient>Low DO vs. Ambient>Ambient	-0.674	-0.878	-0.470	<0.001*
	Low pH>Low DO vs. Ambient>Ambient	-0.966	-1.170	-0.762	<0.001*
	Ambient>Low pH vs. Ambient>Ambient	-0.139	-0.343	0.065	0.295
	Low pH>Low pH vs. Ambient>Ambient	-0.708	-0.929	-0.488	<0.001*
	Ambient>Low DO vs. Low pH>Ambient	-0.057	-0.261	0.147	0.944
	Low pH>Low DO vs. Low pH>Ambient	-0.349	-0.553	-0.145	0.001*
	Ambient>Low pH vs. Low pH>Ambient	0.478	0.274	0.682	<0.001*
	Low pH>Low pH vs. Low pH>Ambient	-0.091	-0.311	0.130	0.772
	Low pH>Low DO vs. Ambient>Low DO	-0.292	-0.496	-0.088	0.003*
	Ambient>Low pH vs. Ambient>Low DO	0.535	0.331	0.739	<0.001*
	Low pH>Low pH vs. Ambient>Low DO	-0.034	-0.255	0.186	0.996
	Ambient>Low pH vs. Low pH>Low DO	0.827	0.623	1.031	<0.001*
	Low pH>Low pH vs. Low pH>Low DO	0.258	0.038	0.478	0.017*
	Low pH>Low pH vs. Ambient>Low pH	-0.569	-0.789	-0.348	<0.001*
Survival	Low pH>Ambient vs. Ambient>Ambient	0.000	-6.621	6.621	1.000
	Ambient>Low DO vs. Ambient>Ambient	-18.750	-25.371	-12.129	<0.001*
	Low pH>Low DO vs. Ambient>Ambient	-12.500	-19.121	-5.879	<0.001*
	Ambient>Low pH vs. Ambient>Ambient	0.000	-6.621	6.621	1.000
	Low pH>Low pH vs. Ambient>Ambient	0.000	-6.621	6.621	1.000
	Ambient>Low DO vs. Low pH>Ambient	-18.750	-25.371	-12.129	<0.001*
	Low pH>Low DO vs. Low pH>Ambient	-12.500	-19.121	-5.879	<0.001*
	Ambient>Low pH vs. Low pH>Ambient	0.000	-6.621	6.621	1.000
	Low pH>Low pH vs. Low pH>Ambient	0.000	-6.621	6.621	1.000
	Low pH>Low DO vs. Ambient>Low DO	6.250	-0.371	12.871	0.071
	Ambient>Low pH vs. Ambient>Low DO	18.750	12.129	25.371	<0.001*
	Low pH>Low pH vs. Ambient>Low DO	18.750	12.129	25.371	<0.001*
	Ambient>Low pH vs. Low pH>Low DO	12.500	5.879	19.121	<0.001*
	Low pH>Low pH vs. Low pH>Low DO	12.500	5.879	19.121	<0.001*
	Low pH>Low pH vs. Ambient>Low pH	0.000	-6.621	6.621	1.000

Supplementary Table S9. One-way analyses of variance for herbivory rates and survival of *Lacuna* initially starved and allowed to graze on *Ulva* under ambient (7.85 mg L⁻¹), medium (5.94 mg L⁻¹), low (3.85 mg L⁻¹), and very low (1.75 mg L⁻¹) DO concentrations for 72 h (Experiment 5). Asterisks (*) next to p-values denote significant results ($p < 0.05$).

Parameter	Source of Variation	DF	SS	MS	F	P
Herbivory	Between Groups	3	1.657	0.552	35.504	<0.001*
	Residual	12	0.187	0.016		
	Total	15	1.843			
Survival	Between Groups	3	5263.672	1754.557	18.586	<0.001*
	Residual	12	1132.813	94.401		
	Total	15	6396.484			

Supplementary Table S10. Tukey Honest Significant Difference tests for herbivory rates and survival of *Lacuna* initially starved and allowed to graze on *Ulva* under ambient (7.85 ± 0.08 mg L⁻¹), medium (5.94 ± 0.22 mg L⁻¹), low (3.85 ± 0.44 mg L⁻¹), and very low (1.75 ± 0.13 mg L⁻¹) DO concentrations for 72 h (Experiment 5). Asterisks (*) next to p-values denote significant results ($p < 0.05$).

Parameter	Comparison	Diff.	Lower	Upper	P-value
Herbivory	Low DO vs. Ambient DO	-0.594	-0.856	-0.332	<0.001*
	Medium DO vs. Ambient DO	-0.182	-0.444	0.080	0.220
	Very Low DO vs. Ambient DO	-0.811	-1.073	-0.549	<0.001*
	Medium DO vs. Low DO	0.412	0.151	0.674	0.003*
	Very Low DO vs. Low DO	-0.217	-0.478	0.045	0.118
	Very Low DO vs. Medium DO	-0.629	-0.891	-0.367	<0.001*
Survival	Low DO vs. Ambient DO	-21.875	-42.272	-1.478	0.034*
	Medium DO vs. Ambient DO	0.000	-20.397	20.397	1.000
	Very Low DO vs. Ambient DO	-43.750	-64.147	-23.353	<0.001*
	Medium DO vs. Low DO	21.875	1.478	42.272	0.034*
	Very Low DO vs. Low DO	-21.875	-42.272	-1.478	0.034*
	Very Low DO vs. Medium DO	-43.750	-64.147	-23.353	<0.001*

Supplementary Table S11. One-way analysis of variance for herbivory rates of *Lacuna* initially starved for 24 h under ambient pH/DO and allowed to graze on *Ulva* for 12 h with varying durations of exposure (0 – 12 h) to low DO concentrations ($2.36 \pm 0.08 \text{ mg L}^{-1}$) (Experiment 6). Asterisks (*) next to p-values denote significant results ($p < 0.05$).

Source of Variation	DF	SS	MS	F	P
Between Groups	4	1.059	0.265	18.687	<0.001*
Residual	13	0.184	0.014		
Total	17	1.243			

Supplementary Table S12. Tukey Honest Significant Difference tests for herbivory rates of *Lacuna* initially starved for 24 h under ambient pH/DO and allowed to graze on *Ulva* for 12 h with varying durations of exposure (0 – 12 h) to low DO concentrations ($2.36 \pm 0.08 \text{ mg L}^{-1}$) (Experiment 6). Asterisks (*) next to p-values denote significant results ($p < 0.05$).

Comparison	Diff.	Lower	Upper	P-value
12-h vs. 0-h	-0.636	-0.923	-0.350	<0.001*
3-h vs. 0-h	-0.137	-0.402	0.128	0.509
6-h vs. 0-h	-0.218	-0.504	0.068	0.177
9-h vs. 0-h	-0.542	-0.807	-0.277	<0.001*
3-h vs. 12-h	0.500	0.213	0.786	0.001*
6-h vs. 12-h	0.418	0.112	0.724	0.006*
9-h vs. 12-h	0.095	-0.192	0.381	0.832
6-h vs. 3-h	-0.081	-0.368	0.205	0.894
9-h vs. 3-h	-0.405	-0.670	-0.140	0.003*
9-h vs. 6-h	-0.324	-0.610	-0.037	0.024*

Supplementary Table S13. One-way analyses of variance for herbivory rates and survival of *Lacuna* initially starved for 24 h under ambient pH/DO and allowed to graze on *Ulva* for 12 h with varying durations of exposure (0 – 12 h) to low DO concentrations (1.55 ± 0.07 mg L⁻¹) (Experiment 7). Asterisks (*) next to p-values denote significant results ($p < 0.05$).

Parameter	Source of Variation	DF	SS	MS	F	P
Herbivory	Between Groups	4	9.200	2.300	76.641	<0.001*
	Residual	14	0.420	0.030		
	Total	18	9.620			
Survival	Between Groups	4	312.500	78.125	4.286	0.016*
	Residual	15	273.437	18.229		
	Total	19	585.938			

Supplementary Table S14. Tukey Honest Significant Difference tests for herbivory rates and survival of *Lacuna* initially starved for 24 h under ambient pH/DO and allowed to graze on *Ulva* for 12 h with varying durations of exposure (0 – 12 h) to low DO concentrations (1.55 ± 0.07 mg L⁻¹) (Experiment 7). Asterisks (*) next to p-values denote significant results ($p < 0.05$).

Parameter	Comparison	Diff.	Lower	Upper	P-value
Herbivory	12-h vs. 0-h	-1.551	-1.964	-1.139	<0.001*
	3-h vs. 0-h	0.009	-0.372	0.391	1.000
	6-h vs. 0-h	-1.056	-1.437	-0.674	<0.001*
	9-h vs. 0-h	-1.519	-1.901	-1.137	<0.001*
	3-h vs. 12-h	1.561	1.149	1.973	<0.001*
	6-h vs. 12-h	0.496	0.083	0.908	0.016*
	9-h vs. 12-h	0.032	-0.380	0.445	0.999
	6-h vs. 3-h	-1.065	-1.447	-0.683	<0.001*
	9-h vs. 3-h	-1.528	-1.910	-1.147	<0.001*
	9-h vs. 6-h	-0.463	-0.845	-0.082	0.015*
Survival	12-h vs. 0-h	-9.375	-18.698	-0.052	0.048*
	3-h vs. 0-h	0.000	-9.323	9.323	1.000
	6-h vs. 0-h	0.000	-9.323	9.323	1.000
	9-h vs. 0-h	-6.250	-15.573	3.073	0.282
	3-h vs. 12-h	9.375	0.052	18.698	0.048*
	6-h vs. 12-h	9.375	0.052	18.698	0.048*
	9-h vs. 12-h	3.125	-6.198	12.448	0.835
	6-h vs. 3-h	0.000	-9.323	9.323	1.000
	9-h vs. 3-h	-6.250	-15.573	3.073	0.282
	9-h vs. 6-h	-6.250	-15.573	3.073	0.282

Supplementary Table S15. One-way analyses of variance for herbivory rates of *Lacuna* initially starved for 24 h under ambient pH/DO and allowed to graze on *Ulva* for 6 h with varying durations of exposure (0 – 6 h) to low DO concentrations ($0.72 \pm 0.04 \text{ mg L}^{-1}$) (Experiment 8). Asterisks (*) next to p-values denote significant results ($p < 0.05$).

Source of Variation	DF	SS	MS	F	P
Between Groups	2	4.992	2.496	207.669	<0.001*
Residual	9	0.108	0.012		
Total	11	5.100			

Supplementary Table S16. Tukey Honest Significant Difference tests for herbivory rates of *Lacuna* initially starved for 24 h under ambient pH/DO and allowed to graze on *Ulva* for 6 h with varying durations of exposure (0 – 6 h) to low DO concentrations ($0.72 \pm 0.04 \text{ mg L}^{-1}$) (Experiment 8). Asterisks (*) next to p-values denote significant results ($p < 0.05$).

Comparison	Diff.	Lower	Upper	P-value
3-h vs.0-h	-0.659	-0.876	-0.443	<0.001*
6-h vs.0-h	-1.573	-1.789	-1.357	<0.001*
6-h vs.3-h	-0.914	-1.130	-0.697	<0.001*

Supplementary Table S17. One-way analysis of variance for herbivory rates of *Lacuna* either not starved or starved for 3 h in low DO concentrations ($0.75 \pm 0.06 \text{ mg L}^{-1}$) and then allowed to graze for 3 h in the same low DO conditions (Experiment 9).

Source of Variation	DF	SS	MS	F	P
Between Groups	1	0.062	0.062	0.818	0.401
Residual	6	0.454	0.076		
Total	7	0.516			

Supplementary Figure S1. Map of Shinnecock Bay, NY, USA. All maps were generated using ArcMap 10.4.1 (Esri). On the map, the numbers denote, (1) the collection sites for *Lacuna vincta* and *Ulva rigida* used in all experiments, and (2) the location of the Stony Brook Southampton Marine Science Center.

