

Table S1. Ambient site conditions at the oyster farm during sampling events. Temperature and dissolved oxygen (DO) values are from a HOBO data logger deployed adjacent to the oyster farm and set to log every 15 minutes. The mean daily low and high DO values incorporate every day the logger was deployed, and not just the days sediment flux incubations were conducted. Loggers were deployed from June 30 – August 15 in 2014 and from June 29 – September 17 in 2015. Salinity measurements are from a handheld probe (Hach HQ40d) and were made during sediment incubations. Values presented are means, followed by the standard deviation.

Sample Month	Daily Water Temp. (° C)	Salinity	Daily Low DO ($\mu\text{mol L}^{-1}$)	Daily High DO ($\mu\text{mol L}^{-1}$)
July 2014	24.6 ± 1.9	31.1 ^a	178 ± 63	425 ± 9
August 2014	23.9 ± 1.5		178 ± 44	453 ± 6
July 2015	24.8 ± 2.7	30.6 ± 0.8	125 ± 63	447 ± 19
August 2015	26.2 ± 2.4	30.7 ± 0.3	122 ± 84	469 ± 125
September 2015	22.4 ± 2.5	29.4 ± 0.5	69 ± 19	447 ± 31

^aOnly one salinity measurement was collected in July 2014

Table S2. Sediment porosity, density, and percent organic matter content at 0-1 and 3-4 cm depth at each age of oyster aquaculture. Values are means, followed by standard error. Percent organic matter was only determined for the top cm of sediment.

		0 yr (control)	3 yr	5 yr	7 yr
Porosity	0-1 cm	0.51 ± 0.01	0.46 ± 0.02	0.59 ± 0.02	0.53 ± 0.02
	3-4 cm	0.47 ± 0.03	0.42 ± 0.03	0.51 ± 0.02	0.58 ± 0.12
Density	0-1 cm	1.71 ± 0.05	1.65 ± 0.08	1.62 ± 0.09	1.34 ± 0.14
	3-4 cm	1.96 ± 0.10	1.82 ± 0.11	1.81 ± 0.08	1.80 ± 0.05
% Organic Matter	0-1 cm	1.71 ± 0.25	0.57 ± 0.13	1.70 ± 0.45	2.07 ± 0.10

Table S3. Data distribution and best models to describe sediment silicon pools and fluxes and dissolved oxygen fluxes. Random effect (individual sampling ring) did not improve models to describe any of the pools or fluxes (indicated by "--" in the table).

Pool/Flux	Distribution	Fixed Effects	Random Effect
DSi flux	Gamma	Aquaculture Presence + Temperature + Month	--
DO flux	Lognormal	Aquaculture Presence + Month	--
Porewater DSi	Normal	Aquaculture Presence + Temperature + Month	--
%ASi 0-1 cm	Gamma	Aquaculture Presence + Temperature	--
%ASi 3-4 cm	Lognormal	Aquaculture Presence + Temperature + Month	--
DSi flux	Gamma	Aquaculture Age + Month	--
DO flux	Lognormal	Aquaculture Age + Month	--
Porewater DSi	Normal	Aquaculture Age + Temperature + Month	--
%ASi 0-1 cm	Gamma	Aquaculture Age + Temperature	--
%ASi 3-4 cm	Lognormal	Aquaculture Age + Temperature + Month	--

Table S4. P-value estimates of pairwise comparisons estimated using least-square means for sediment dissolved silicon (DSi) and oxygen (O₂) fluxes, porewater DSi concentration, and sediment amorphous silicon content (%ASi) at 0-1 cm depth and 3-4 cm depth under various ages of aquaculture.

Aquaculture Ages	DSi Flux	O₂ Flux	Porewater [DSi]	%ASi 0-1 cm	%ASi 3-4 cm
0-2	1.000	1.000			
0-3	0.626	1.000	0.879	0.008	0.986
0-4	< 0.001	0.114			
0-5	< 0.001	0.900	0.070	0.002	0.024
0-6	0.015	0.232			
0-7	0.006	0.983	0.027	0.002	0.191
2-3	0.938	1.000			
2-4	0.010	0.077			
2-5	< 0.001	0.832			
2-6	0.094	0.173			
2-7	0.099	0.998			
3-4	0.065	0.126			
3-5	< 0.001	0.930	0.293	< 0.001	0.011
3-6	0.378	0.267			
3-7	0.363	0.957	0.219	< 0.001	0.103
4-5	0.963	0.702			
4-6	0.997	1.000			
4-7	0.947	0.018			
5-6	0.734	0.864			
5-7	0.305	0.456	1.000	0.988	0.472
6-7	1.000	0.054			

Table S5. Results of least square-mean pairwise comparisons for dissolved silicon flux from whole oysters, oyster shells, and the oyster digestive system.

Oyster Treatments	P-value
Digestive system – Shell biofilm	0.609
Digestive system – Untreated oyster	0.088
Shell biofilm – Untreated oyster	0.011

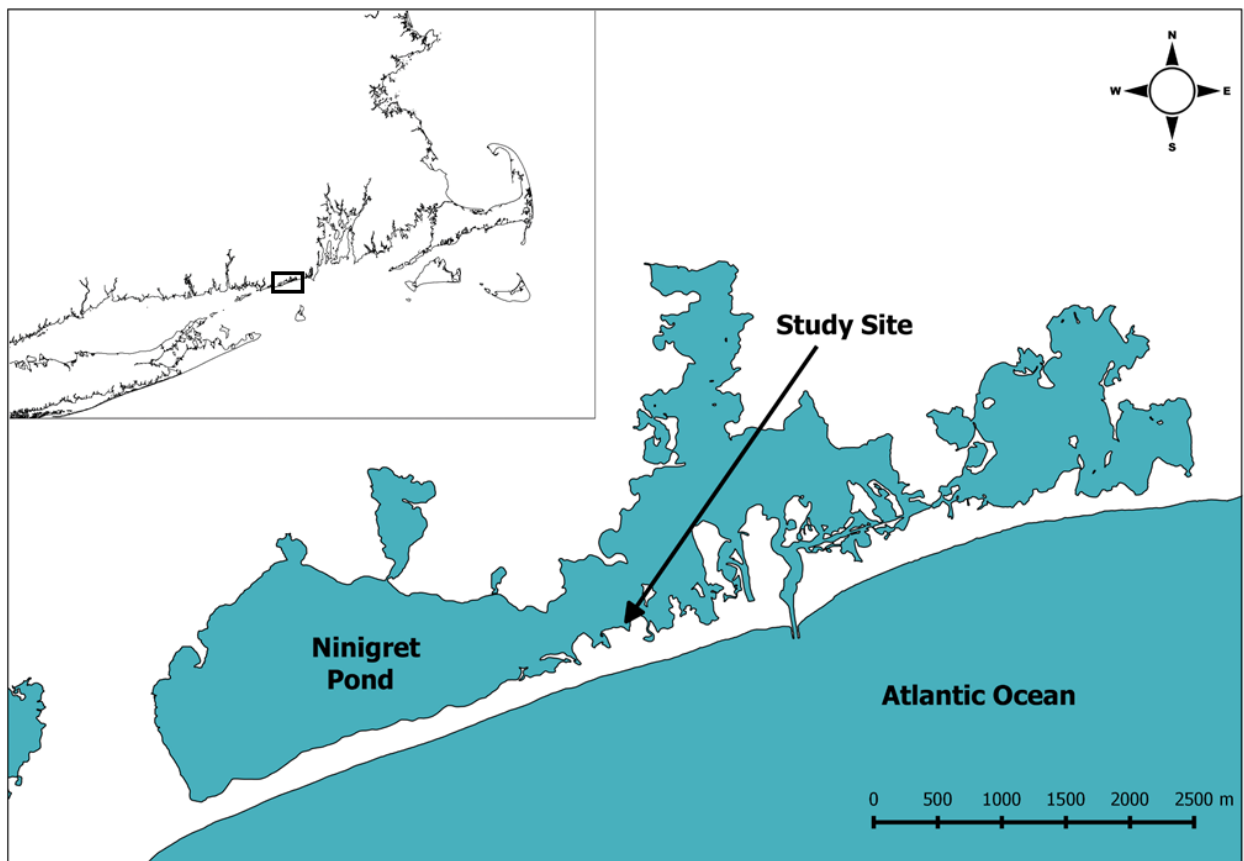


Figure S1. Location of the oyster farm sampled in this study