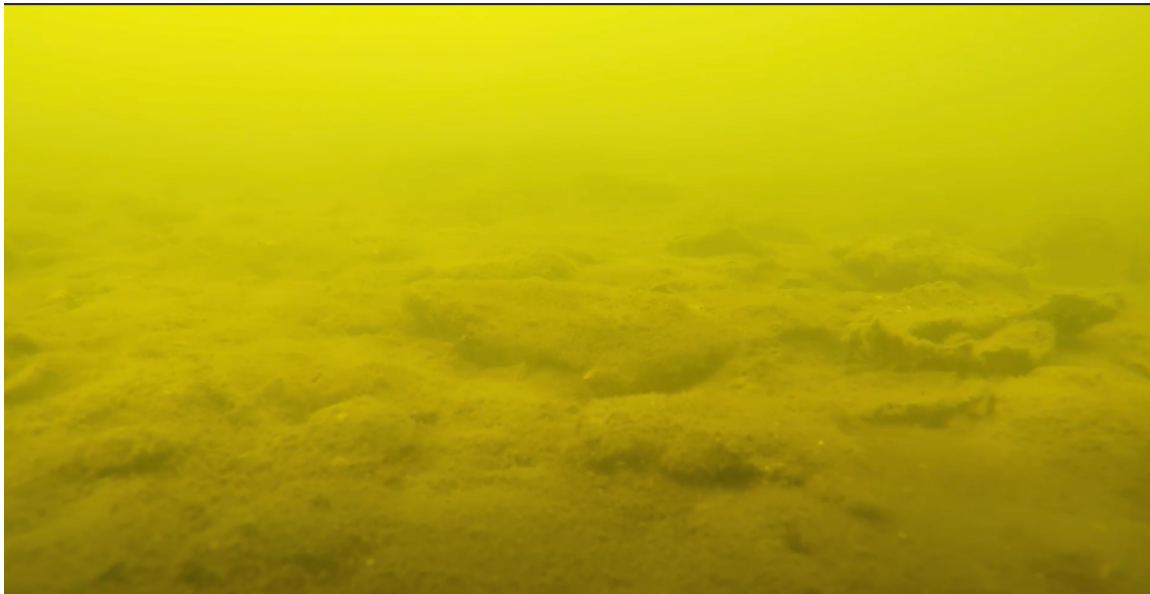


Figure S1. Example Stills from GoPro camera videos used in qualitative habitat scoring

Harvested Reefs

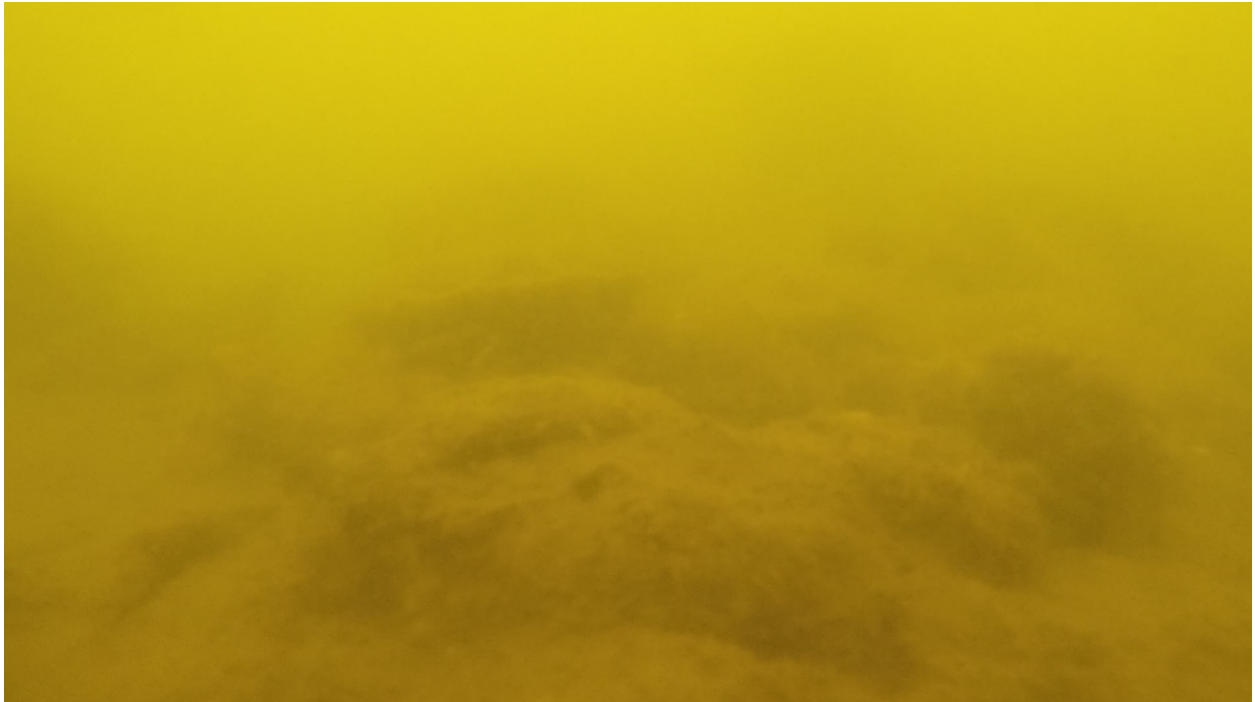
Broad Creek:



Great Wicomico:



James:



No-take Reserves (oyster sanctuaries)

Harris Creek:



Great Wicomico (Corps of Engineers):



Figure S2. Size (mm) distributions of oysters at each site by quadrat number.

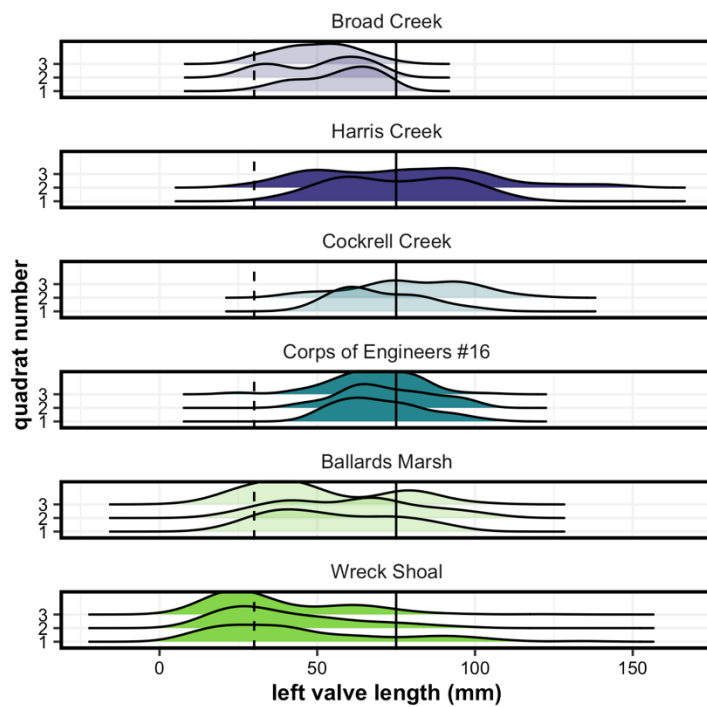


Table S1. Kruskal-Wallis (non-parametric ANOVA) results for salinity ~ site tests.

test	χ^2	df	p
5-year pre-survey salinity ~ site	34.4	3	< 0.001*
2-year pre-survey salinity ~ site	16.3	3	< 0.001*

* Denotes statistical significance at the $\alpha = 0.05$ level

Table S2. Dunn post-hoc test results for the Kruskal-Wallis test results shown in Table S1.

5-year pre-survey salinity ~ site			2-year pre-survey salinity ~ site		
comparison	z	p (adjusted)	comparison	z	p (adjusted)
BM - GW	2.14	0.039*	BM - GW	2.75	0.018*
BM - HC	5.33	<0.001*	BM - HC	3.87	< 0.001*
GW - HC	3.51	<0.001*	GW - HC	1.36	0.212
BM - WS	4.27	<0.001*	BM - WS	2.56	0.021*
GW - WS	2.35	0.028*	GW - WS	-0.148	0.882
HC - WS	-1.19	0.230	HC - WS	-1.47	0.211

* Denotes statistical significance at the $\alpha = 0.05$ level

Table S3. AIC values for habitat quality multinomial logistic regression model selection. The selected model is bolded.

test	k	AIC
habitat quality ~ site type	6	118.4
habitat quality ~ site type + salinity zone	9	118.7
habitat quality ~ site type + tributary + salinity zone	15	121.5
habitat quality ~ site	18	122.1
habitat quality ~ site type + site + tributary + salinity zone	18	122.1
habitat quality ~ 1 (null)	3	125.2
habitat quality ~ tributary	9	125.4

Table S4. Results from 2-tailed z-tests showing the differences between the habitat quality maxima between the two site types.

comparison	intercept	p
habitat max 1 - habitat max 2	0.049	0.473
habitat max 1 - habitat max 3	0.410	0.034*
habitat max 2 - habitat max 3	0.374	0.002*

* Denotes statistical significance at the $\alpha = 0.05$ level

Table S5. Kruskal-Wallis (non-parametric ANOVA) test results for condition index ~ site and internal volume ~ site.

test	χ^2	df	p
condition index ~ site	49.6	5	< 0.001*
volume ~ site	36.8	5	< 0.001*

* Denotes statistical significance at the $\alpha = 0.05$ level

Table S6. Dunn post-hoc test results for the condition index ~ site Kruskal-Wallis test results shown in Table S5.

comparison	condition index ~ site		internal volume ~ site	
	z	p (adjusted)	z	p (adjusted)
BC - BM	0.862	0.417	-3.74	< 0.001*
BC - CC	-0.270	0.787	-4.46	< 0.001*
BM - CC	-1.00	0.364	-1.44	0.171
BC - COE	3.72	< 0.001*	-3.63	0.002*
BM - COE	2.89	0.009*	0.81	0.448
CC - COE	3.29	0.003*	2.21	0.045*
BC - HC	1.74	0.123	-4.64	< 0.001*
BM - HC	1.06	0.395	-1.06	0.135
CC - HC	1.78	0.126	-0.126	0.899
COE - HC	-1.01	0.388	-2.41	0.034*
BC - WS	5.48	< 0.001*	-1.82	0.093
BM - WS	4.80	< 0.001*	2.34	0.036*
CC - WS	4.80	< 0.001*	3.35	0.020*
COE - WS	2.70	0.015*	1.99	0.01
HC - WS	2.67	0.014*	3.54	0.001*

* Denotes statistical significance at the $\alpha = 0.05$ level

Table S7. Zero-and-one-inflated beta (ZOIB) summary statistics comparing Clionid perforation intensities as a function of site type and tributary.

Family: zero_one_inflated_beta

Links: mu = logit; phi = log; zoi = logit; coi = logit

Formula: prop_sponge ~ site_type * tributary

phi ~ site_type * tributary

zoi ~ site_type * tributary

coi ~ site_type * tributary

Data: bioerodersNew (Number of observations: 797)

Samples: 4 chains, each with iter = 2000; warmup = 1000; thin = 1;

total post-warmup samples = 4000

Population-Level Effects:

	Estimate	Est. Error	Lower 95% CI	Upper 95% CI	R-hat	Bulk_ESS	Tail_ESS
Intercept	0.78	0.12	0.55	1.01	1.00	2865	2914
phi Intercept	1.64	0.18	1.28	1.97	1.00	2770	3624
zoi Intercept	-0.27	0.20	-0.67	0.12	1.00	2752	3134
coi Intercept	-1.84	0.46	-2.79	-1.01	1.00	4190	2882
site typesanctuary	0.53	0.24	0.06	0.98	1.00	1839	2194
tributaryGreatWicomico	-0.39	0.18	-0.74	-0.03	1.00	3092	2674
tributaryJames	-0.25	0.19	-0.63	0.13	1.00	2631	2929
site typesanctuary:tributaryGreatWicomico	-0.01	0.28	-0.58	0.54	1.00	1967	2260
site typesanctuary:tributaryJames	-0.49	0.29	-1.06	0.10	1.00	1807	2405
phi site typesanctuary	0.04	0.34	-0.64	0.72	1.00	1938	2485
phi tributaryGreatWicomico	0.22	0.31	-0.40	0.82	1.00	3055	2554
phi tributaryJames	0.14	0.31	-0.46	0.73	1.00	2817	2948
phi site typesanctuary:tributaryGreatWicomico	0.48	0.44	-0.36	1.35	1.00	1910	2164
phi site typesanctuary:tributaryJames	-0.15	0.45	-1.01	0.72	1.00	1937	2491
zoi site typesanctuary	-0.14	0.39	-0.91	0.61	1.00	2241	2698
zoi tributaryGreatWicomico	-0.47	0.40	-1.28	0.30	1.00	2866	2726
zoi tributaryJames	1.80	0.30	1.23	2.40	1.00	2898	2926
zoi site typesanctuary:tributaryGreatWicomico	0.02	0.54	-1.02	1.09	1.00	2162	2817
zoi site typesanctuary:tributaryJames	-1.84	0.46	-2.74	-0.94	1.00	2068	2285
coi site typesanctuary	-1.34	1.39	-4.66	0.87	1.00	4374	1625
coi tributaryGreatWicomico	-21.13	18.27	-69.03	-1.28	1.00	1153	1102
coi tributaryJames	-8.69	5.21	-21.16	-2.54	1.00	1702	1396
coi site typesanctuary:tributaryGreatWicomico	24.82	18.30	4.52	72.47	1.00	1169	1086
coi site typesanctuary:tributaryJames	10.03	5.38	3.16	23.37	1.00	1618	1435

Samples were drawn using sampling(NUTS). For each parameter, Bulk_ESS and Tail_ESS are effective sample size measures, and Rhat is the potential scale reduction factor on split chains (at convergence, Rhat = 1).

Table S8. ZOI summary statistics comparing blistering intensities as a function of site type and tributary.

Family: zero_inflated_beta

Links: mu = logit; phi = log; zi = logit

Formula: prop_poly ~ site_type * tributary

phi ~ site_type * tributary

zi ~ site_type * tributary

Data: bioerodersNew (Number of observations: 1319)

Samples: 4 chains, each with iter = 2000; warmup = 1000; thin = 1;

total post-warmup samples = 4000

Population-Level Effects:

	Estimate	Est. Error	l-95% CI	u-95% CI	Rhat	Bulk_ESS	Tail_ESS
Intercept	-4.08	0.11	-4.29	-3.86	1.00	2146	2573
phi Intercept	4.77	0.23	4.3	5.19	1.00	2005	2477
zi Intercept	0.15	0.21	-0.25	0.56	1.00	2887	2796
site typesanctuary	1.08	0.27	0.59	1.63	1.00	1460	1894
tributaryGreatWicomico	1.91	0.15	1.61	2.21	1.00	2304	2657
tributaryJames	1.29	0.13	1.03	1.53	1.00	2334	2790
site typesanctuary:tributaryGreatWicomico	-1.11	0.29	-1.70	-0.55	1.00	1411	1916
site typesanctuary:tributaryJames	-0.54	0.28	-1.12	0.00	1.00	1472	1834
phi site typesanctuary	-2.21	0.40	-3.04	-1.46	1.00	1464	1784
phi tributaryGreatWicomico	-1.42	0.35	-2.10	-0.73	1.00	2185	2475
phi tributaryJames	-1.07	0.27	-1.60	-0.52	1.00	1481	2056
phi site typesanctuary:tributaryGreatWicomico	1.62	0.49	0.64	2.60	1.00	1527	1993
phi site typesanctuary:tributaryJames	1.57	0.44	0.71	2.48	1.00	1481	2056
zi site typesanctuary	-1.43	0.43	-2.32	-0.61	1.00	2062	2623
zi tributaryGreatWicomico	-1.59	0.46	-2.51	-0.71	1.00	2541	2649
zi tributaryJames	-0.53	0.26	-1.04	-0.02	1.00	3088	2942
zi site typesanctuary:tributaryGreatWicomico	2.42	0.61	1.27	3.65	1.00	1779	2507
zi site typesanctuary:tributaryJames	3.65	0.48	2.73	4.60	1.00	2043	2557

Samples were drawn using sampling(NUTS). For each parameter, Bulk_ESS and Tail_ESS are effective sample size measures, and Rhat is the potential scale reduction factor on split chains (at convergence, Rhat = 1).

Table S9. AIC values for sponge score ordinal logistic regression model selection. The selected fixed effects model is bolded.

test	k	AIC
sponge score ~ site type * tributary	9	1996
sponge score ~ site type * tributary + (1 oyster ID)	10	1998
sponge score ~ site type * tributary + (1 bag ID)	10	1998
sponge score ~ site type * tributary + (1 bag ID) + (1 oyster ID)	11	2000

Table S10. AIC values for macrofaunal richness linear regression model selection. The selected model is bolded.

test	k	AIC
richness ~ tributary * site type	6	203.6
richness ~ tributary + site type	4	265.1
richness ~ tributary	3	288.5
richness ~ site type	2	320.8

Table S11. AIC values for macrofaunal abundance linear regression model selection. The selected model is bolded.

test	k	AIC
richness ~ tributary * site type	6	580.9
richness ~ tributary + site type	4	790.9
richness ~ tributary	3	1182
richness ~ site type	2	1298

Table S12. Abundance and richness mean counts and standard error (SE) by site

	Choptank		Great Wicomico		James	
	Harvested Broad Creek	Sanctuary Harris Creek	Harvested Cockrell Creek	Sanctuary Corps of Engineers	Harvested Ballards Marsh	Sanctuary Wreck Shoals
Abundance CPUE mean	4.8	0	1.5	12	3.6	47
Abundance CPUE SE	1.6	0	0.72	4.8	1.4	8.4
Richness CPUE mean	2.2	0	0.9	2.4	1.4	8.2
Richness CPUE SE	0.73	0	0.38	0.70	0.43	0.63