

The following supplement accompanies the article

Effect of aquacultured oyster biodeposition on sediment N₂ production in Chesapeake Bay

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Supplement. Experimental and statistical approaches employed to collect samples and analyze the effect of aquacultured oyster biodeposition on sediment N₂ production rates; initial sediment physicochemical conditions at oyster aquaculture sites and sediment parameter responses to oyster treatments; seasonal measures of chl *a* in sediments associated with oyster treatments

Table S1. Experimental approach employed to measure the effect of aquacultured oyster biodeposition on sediment N₂ production rates at 2 locations in Chesapeake Bay, USA. At each site, treatment groups included sediment sample cores from directly underneath oyster aquaculture rafts (OY), no oyster aquaculture (REF), 5 to 10 m outside of oyster aquaculture array (NOY), freshly collected oyster biodeposits (BIO), forced accumulation of oyster biodeposits (FNC), and biodeposit additions to sediment cores in the lab (BA). Sample size for each treatment was n = 3. MIMS: membrane inlet mass spectrometry, na: not applicable

Trial	Date	Site	N ₂ production method	Samples analyzed for N ₂ production	Number of tests	Oyster biodeposit addition expt
1	June 2008	St. Jerome Spencer's	¹⁵ N tracer	OY, REF, NOY, FNC ^a , BIO	15	FNC ^a
1	June 2008	St. Jerome Spencer's	¹⁵ N tracer	OY, REF, NOY, FNC ^a , BIO	15	FNC ^a
1	October 2008	St. Jerome Spencer's	¹⁵ N tracer	OY, REF, BIO	9	na
1	October 2008	St. Jerome Spencer's	¹⁵ N tracer	OY, REF	6	na
1, 2	May 2009	St. Jerome	¹⁵ N tracer, MIMS	OY, REF, BA ^a	9	BA ^a
2	August 2009	St. Jerome Spencer's	MIMS	OY, REF, FNC ^a , BA ^a	12	FNC ^a , BA ^a
2	August 2009	St. Jerome Spencer's	MIMS	OY, REF, BA ^a	9	BA ^a

^aIndicates experimentally manipulated treatments as distinguished from environmental samples

Table S2. Sediment conditions at 2 oyster aquaculture locations in Chesapeake Bay. OM: organic matter. Values are mean \pm SE

Site	Salinity (‰)	pH	Sediment characteristics						
			OM (%)	C:N	H ₂ S (ppm)	Texture	Sand (%)	Silt (%)	Clay (%)
St. Jerome	12–15	7.32 \pm 0.06	1.17 \pm 0.11	7.34 \pm 0.76	33.60 \pm 24.50	Sand–loamy sand	87.33 \pm 1.33	4.67 \pm 1.33	8.00 \pm 0.00
Spencer's	5–15	7.38 \pm 0.14	9.14 \pm 1.75	15.43 \pm 0.70	51.60 \pm 31.07	Loam–sandy loam	47.41 \pm 6.33	34.10 \pm 5.23	18.40 \pm 2.65

Table S3. Summary of statistical results for paired oyster aquaculture rafts (OY) versus no oyster aquaculture (REF) sample treatments. All statistical tests were performed using 1-, 2-, or 3-way ANOVA and evaluated at $\alpha \leq 0.05$ unless otherwise noted. MIMS: membrane inlet mass spectrometry, s: significantly different, ns: non-significant test result, -: statistical test was not possible

	¹⁵ N tracer				MIMS		
	June 2008	October 2008	May 2009	Across seasons	May 2009	August 2009	Across seasons
St. Jerome	s	ns	ns	–	ns	s	–
Spencer's	ns	ns	–	–	–	s ^a	–
Treatment x Site	ns	ns	–	–	–	ns	–
Treatment x Site x Season	–	–	–	ns	–	–	ns
Treatment x Method	–	–	ns	–	ns	–	–

^aMann-Whitney *U* statistical testing

Table S4. Sediment and oyster biodeposit chl *a*, biochemical oxygen demand (BOD), chemical oxygen demand (COD), NH₄⁺, and total organic nitrogen (TON) concentration measures (mean ± SE) in Trials 1 and 2 at two Chesapeake Bay study sites with various oyster biodeposition treatments: directly underneath oyster aquaculture rafts (OY), no oyster aquaculture (REF), 5 to 10 m outside of the oyster aquaculture array (NOY), forced accumulation of oyster biodeposits in the field (FNC), and freshly collected oyster biodeposits (BIO). The overall treatment mean ± SE is shown (**bold**) across study sites. Significant differences detected between the 2 sites within a treatment are indicated by an asterisk (1-way ANOVA, p < 0.05)

Treatment	Site	Chl <i>a</i> (µg cm ⁻³)	BOD (mg kg ⁻¹)	COD (g kg ⁻¹)	NH ₄ ⁺ (mg kg ⁻¹)	TON (g kg ⁻¹)
OY	St. Jerome	11.9 ± 1.2	398 ± 125	5.3 ± 0.5	22 ± 3	2.9 ± 2.3
	Spencer's	13.3 ± 1.7	669 ± 52	37.9 ± 2.1	198 ± 28	3.5 ± 0.2
	Mean	12.7 ± 3.9	557 ± 47 *	23.4 ± 2.9 *	116 ± 34 *	3.3 ± 0.5
REF	St. Jerome	19.4 ± 6.2	200 ± 22	7.6 ± 0.5	132 ± 52	1.4 ± 0.8
	Spencer's	6.1 ± 0.5	405 ± 43	34.4 ± 3.4	57 ± 50	2.1 ± 0.5
	Mean	12.2 ± 3.7 *	354 ± 69 *	21.4 ± 3.1 *	93 ± 37	1.9 ± 0.6
NOY	St. Jerome	10.2 ± 1.5	232 ± 42	7.2 ± 0.9	33 ± 4	0.6 ± 0.0
	Spencer's	5.6 ± 0.4	480 ± 37	41.1 ± 4.0	133 ± 16	2.3 ± 0.2
	Mean	7.5 ± 4.2	378 ± 59 *	22.4 ± 3.3 *	90 ± 51 *	1.5 ± 0.7 *
FNC	St. Jerome	24.3 ± 7.3	241 ± 81	7.6 ± 2.4	43 ± 10	0.4 ± 0.1
	Spencer's	11.8 ± 1.6	545 ± 18	27.6 ± 12.4	367 ± 61	4.6 ± 0.4
	Mean	18.6 ± 7.3	362 ± 124	15.6 ± 8.0	190 ± 102 *	2.5 ± 1.4 *
BIO	St. Jerome	106.4 ± 21.5	643 ± 54	14.7 ± 0.4	1470 ± 228	12.7 ± 1.1
	Spencer's	74.2 ± 23.3	959 ± NA	19.5 ± NA	1225 ± 289	14.9 ± 0.9
	Mean	90.3 ± 6.0	748 ± 160	16.3 ± 10.3	1338 ± 93	13.9 ± 1.3

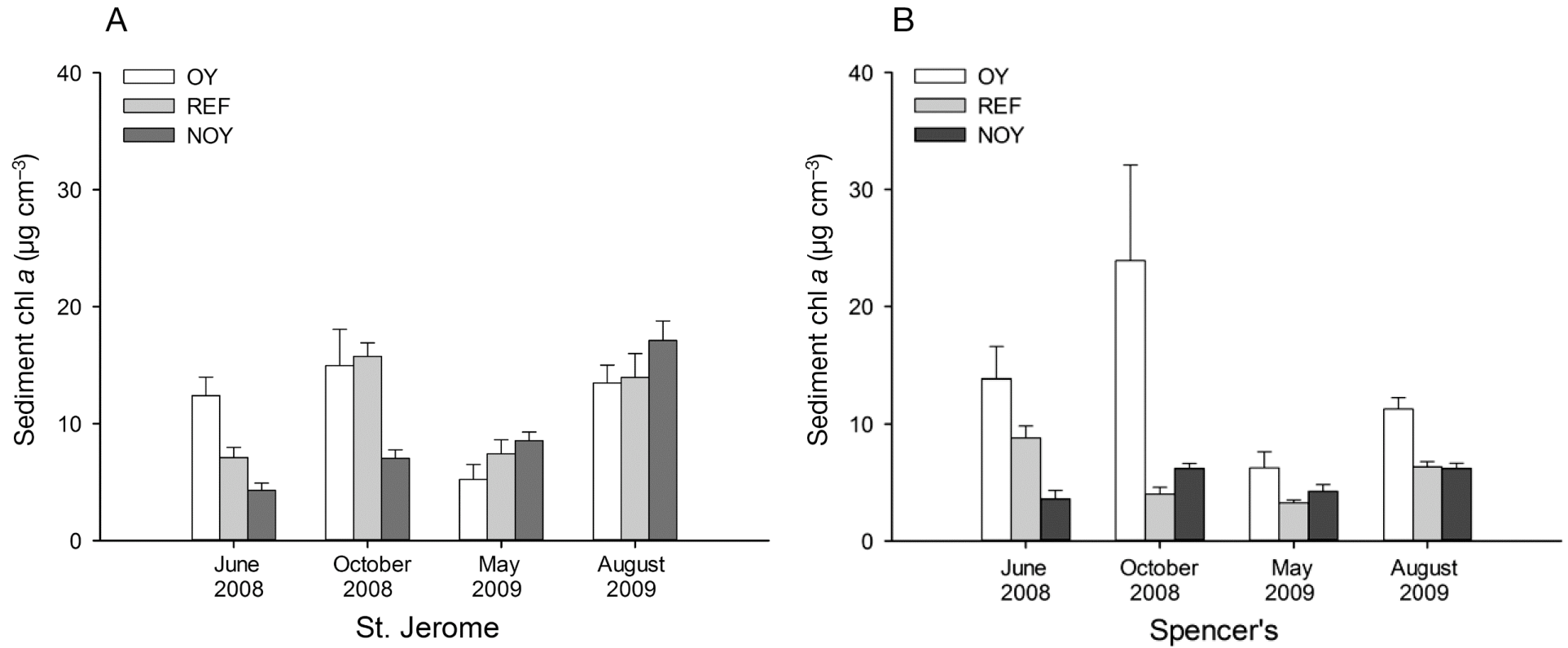


Fig. S1. Sediment levels of chl *a* (mean $\mu\text{g cm}^{-3}$) + SE) a proxy for benthic microalgae and an indicator of pseudofeces production, at 2 sites where oysters were aquacultured (OY), at comparable reference sites without oyster aquaculture (REF), and 5 to 10 m outside of oyster aquaculture array (NOY)