Text S1. Phytoplankton pigments

Water column chl *a* levels in R tanks continuously increased from ~ 3 µg l^{-1} at the beginning of the experiment to ~ 27 µg l^{-1} by day 11 of the experiment, holding steady at ~ 25 µg l^{-1} until day 25 before increasing to 56 µg l^{-1} on the last day (Fig. S1a). Chl *a* levels in NR tanks increased from ~ 3 µg l^{-1} at the beginning of the experiment to ~ 15 µg l^{-1} throughout the experiment and increased to 75 µg l^{-1} from day 22 to 29 (Fig. S1a) with temporal trends driven by two of the three NR tanks. Chlorophyll *a* concentrations were similar between R and NR tanks when examined over the entire experiment ($p = 0.9084$, Fig. S1a) but were higher in NR tanks than in R tanks during mixing-off ($p = 0.0346$, Fig. S1a, e, Table S2a).

Phaeophytin concentrations were significantly higher in R tanks than in NR tanks during mixing-on, and phaeophytin concentrations were significantly higher during mixing-on than mixing-off in R tanks as degraded material was resuspended and deposited in R tanks (Fig. S1b, f, Table S2a). Similar phaeophytin concentrations were observed in R tanks and NR tanks during mixing-off. The ratio chl *a* to phaeophytin, a measure of quality, was significantly higher in NR tanks during mixing-on and mixing-off and was lowest in R tanks during resuspension (Fig. S1g).

Following Jeffrey & Vesk (1997), Marshall (1994) and Marshall et al. (2005), pigments characteristic of Chesapeake Bay phytoplankton, our source water, were defined as: alloxanthin (Cryptophyceae), fucoxanthin (Chrysophyceae and Bacillariophyceae), lutein (Chlorophyceae and Prasinophyceae), perdidinin (Dinophyceae), and zeaxanthin (cyanobacteria, prochlorophytes, rhodophyta and some Chlorophyceae), and prasinoxanthin (Prasinophyceae). The ratio of chlorophyll *b* to chlorophyll *a* was taken to indicate chlorophytes (Van Meersche & Pinckney 2019).

The ratio of Perididinin to chl *a* indicating Dinophyceae, measured by HPLC, was significantly higher in R tanks than NR tanks ($p = 0.0016$, Fig. S2a, Table S2c), however, dinoflagellate concentrations measured by direct cell counts were similar between R tanks and NR tanks ($p = 0.1964$) and high variability was noted in the NR tanks (Fig. 3d, Table 2c). The ratio of Perididinin to chl *a* had significant time X treatment interaction, and regression analysis showed the ratio decreased significantly over time in both R tanks ($p = 0.0111$) and NR tanks ($p = 0.0244$).

The ratio of Fucoxanthin to chl *a* indicating Chrysophyceae and Bacillariophyceae, as measured by HPLC, was significantly higher in R tanks than in NR Tanks ($p = 0.0031$, Fig. S2c, Table S2c). Diatom concentrations measured by direct count, were not significantly different between R tanks and NR tanks ($p = 0.0802$, Fig. 4b, Table 2d), however, there was a significant time X treatment interaction where both R tanks ($p = 0.0365$) and NR tanks ($p = 0.0445$) increased significantly with time. Also, diatom concentrations were significantly higher in R tanks than in NR tanks from day 7 to 18. Interestingly, fucoxanthin and diatom concentration increased near the very end of the experiment (Fig. S2c, Fig. 3c.). The ratio of Alloxanthin to chl *a* indicating Cryptophyceae, was significantly higher in R tanks than in NR tanks ($p = 0.0036$, Fig. S2e, Table S2c).

The ratio of chl b to chl *a* indicating chlorophytes was similar between R tanks and NR tanks (p = 0.4567, Fig. S2d, Table S2c). The ratio of Prasinoxanthin to Chl *a* indicating Prasinophyceae was similar between R tanks and NR tanks ($p = 0.1612$, Fig. S2g, Table S2c), however, a significant time X treatment interaction showed that chlorophytes increased significantly over time in R tanks ($p = 0.0233$) whereas they did not in NR tanks ($p = 0.4883$).

While the ratio of Zeaxanthin to chl *a* indicating cyanobacteria, prochlorophytes, rhodophyta and some Chlorophyceae was similar between the R tanks and NR tanks ($p = 0.0510$, Fig. S2f, Table S2c) there was a significant time X treatment interaction and the ratio decreased significantly over time in both R tanks ($p = 0.0401$) and NR tanks ($p = 0.0102$). The ratio of Lutein to chl *a* indicating Chlorophyceae and Prasinophyceae was similar between R and NR tanks ($p = 0.1724$, Fig. S2b, Table S2c) and there was not a significant time X treatment interaction.

Text S2. Mesozooplankton

Mesozooplankton were abundant in all tanks. Dominant mesozooplankton taxa were adult *Acartia tonsa* copepods (Fig. S4b), copepodites (Fig. S4c), copepod nauplii (Fig. S4d), and polychaete larvae (Fig. S4f). Their abundances, respectively, were not significantly different between R tanks and NR tanks (Table S2b). In addition, there was no time X treatment interaction (Table S2b). It took nearly a week for adult copepods and polychaete larvae to be detected (Fig. S4b, f). Pumps likely destroyed the adult mesozooplankton stages (Adey & Loveland 1998) during the initial raw water fill of the tanks at the start of the experiment. In R tanks and NR tanks *Acartia tonsa* were in highest abundance during the second week of the experiment (Fig. S4b). Occasionally harpactacoids were found in the samples (Fig. S4e). Mesozooplankton community, (i.e., counts converted to carbon) was not correlated with phytoplankton biomass (i.e., cell counts converted to carbon) in R tanks (Fig. S4g) nor in the NR tanks (Fig. S4h). Zooplankton nitrogen concentrations were similar between R tanks and NR tanks ($p = 0.7608$, Table S2b).

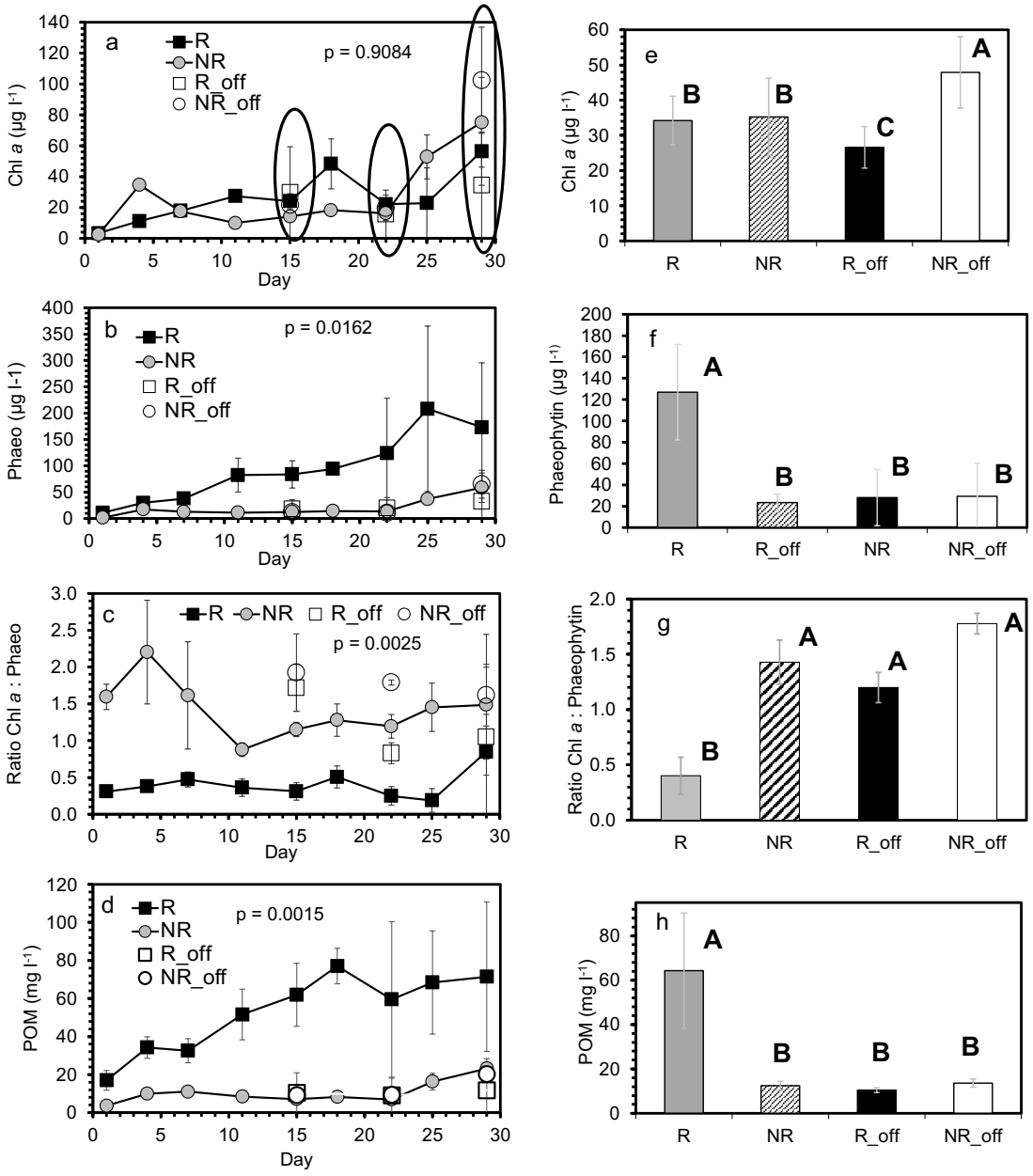

Fig. S1. Left panels: time series of 4 variables; right panels: data from R and NR tanks for mixing-on and mixing-off phases averaged over the three days as indicated by ellipses in panel (a). (a) Chlorophyll *a* (chl *a*), (b) phaeophytin (phaeo), (c) ratio of chl *a* and phaeophytin concentration, (d) particulate organic matter (POM) (means ± SD, *n* = 3 tanks for each system and mixing phase) over time in resuspension (R) tanks and non-resuspension (NR) tanks during mixing-on and mixing-off phases. (e-h) Data from R and NR tanks for mixing-on and mixing-off phases averaged over the 3 d indicated by ellipses in panel (a): (e) chl a, (f) phaeophytin, and (g) ratio of chl *a* to phaeophytin, (h) POM, during mixing-on and mixing-off phases. Different letters indicate statistical differences ($p \leq 0.05$). All tanks received daily oyster biodeposit additions.

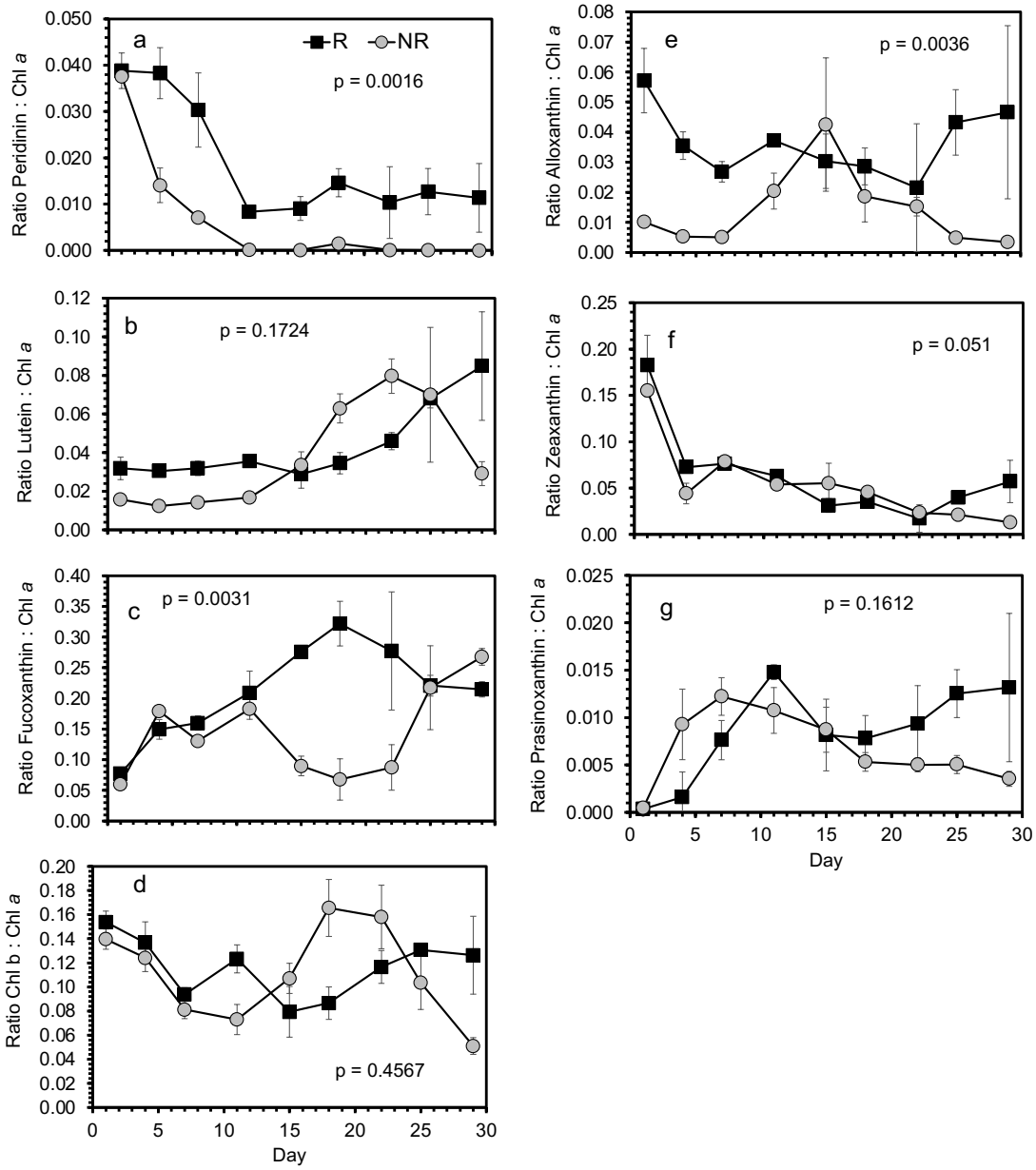

Fig. S2. (a-g) Ratios of phytoplankton accessory pigments to chlorophyll *a* (chl *a*) (all measured by HPLC) in resuspension tanks (R) and non-resuspension tanks (NR) over the experiment. *N* = 3 tanks for each system, means ± SD. *P*-values indicate statistical difference at $p \pm 0.05$. (a) Peridinin: chl *a*, (b) Lutein: chl *a*, (c) Fucoxanthin: chl *a*, (d) chl b: chl *a*, (e) Alloxanthin: chl *a*, (f) Zeaxanthin: chl *a*, and (g) Prasinoxanthin: chl *a.* All tanks received a daily addition of oyster biodeposits.

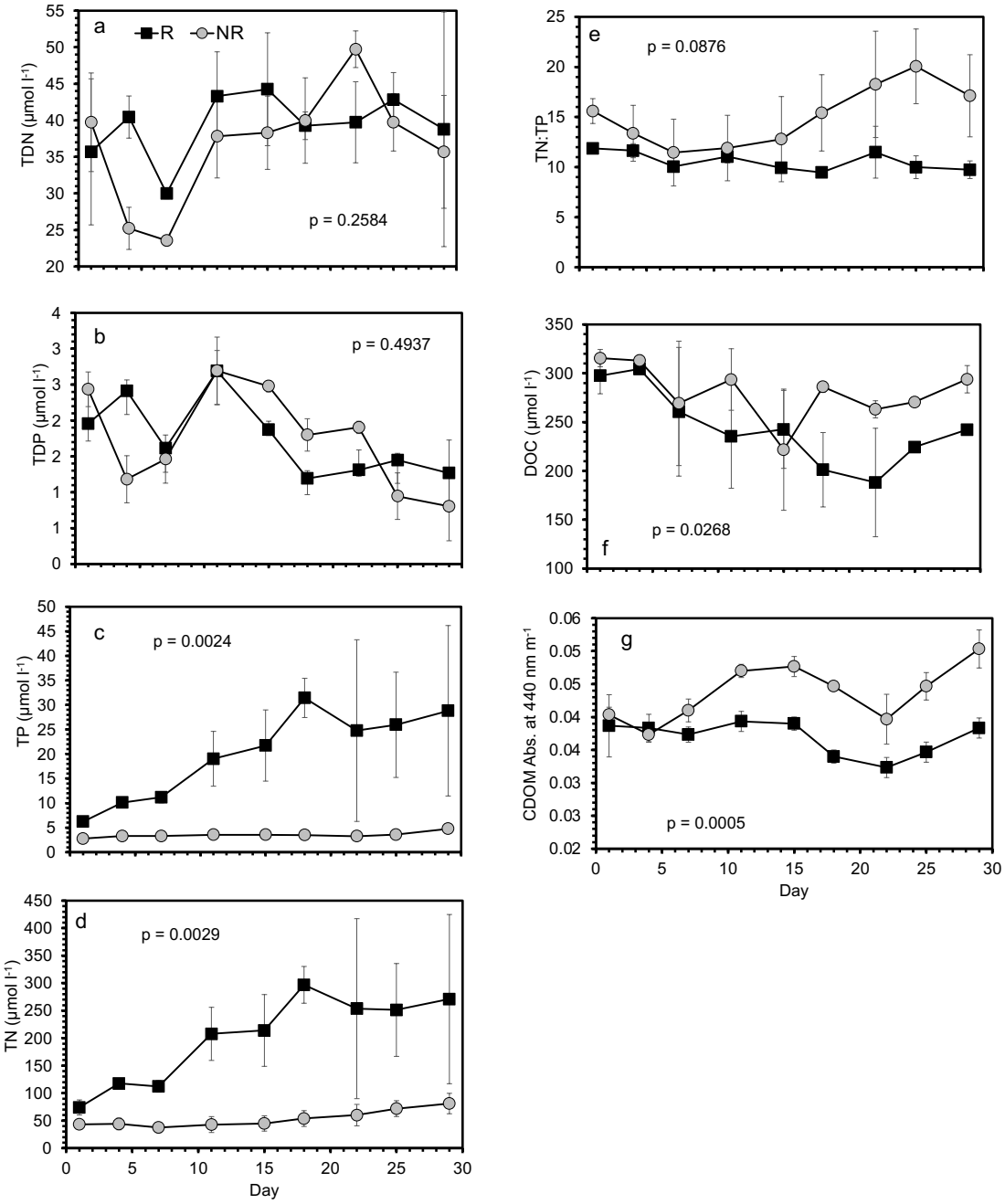

Fig. S3. (a) Total dissolved nitrogen (TDN), (b) total dissolved phosphorus (TDP), (c) total phosphorus (TP), (d) total nitrogen (TN), (e) TN : TP ratio (f) dissolved organic carbon (DOC), (g) chromophoric dissolved organic matter (CDOM) in resuspension tanks (R) and non-resuspension tanks (NR) over the experiment. N = 3, means ± SD, *p*-values indicate statistical difference at $p \leq 0.05$. All tanks received a daily addition of oyster biodeposits.

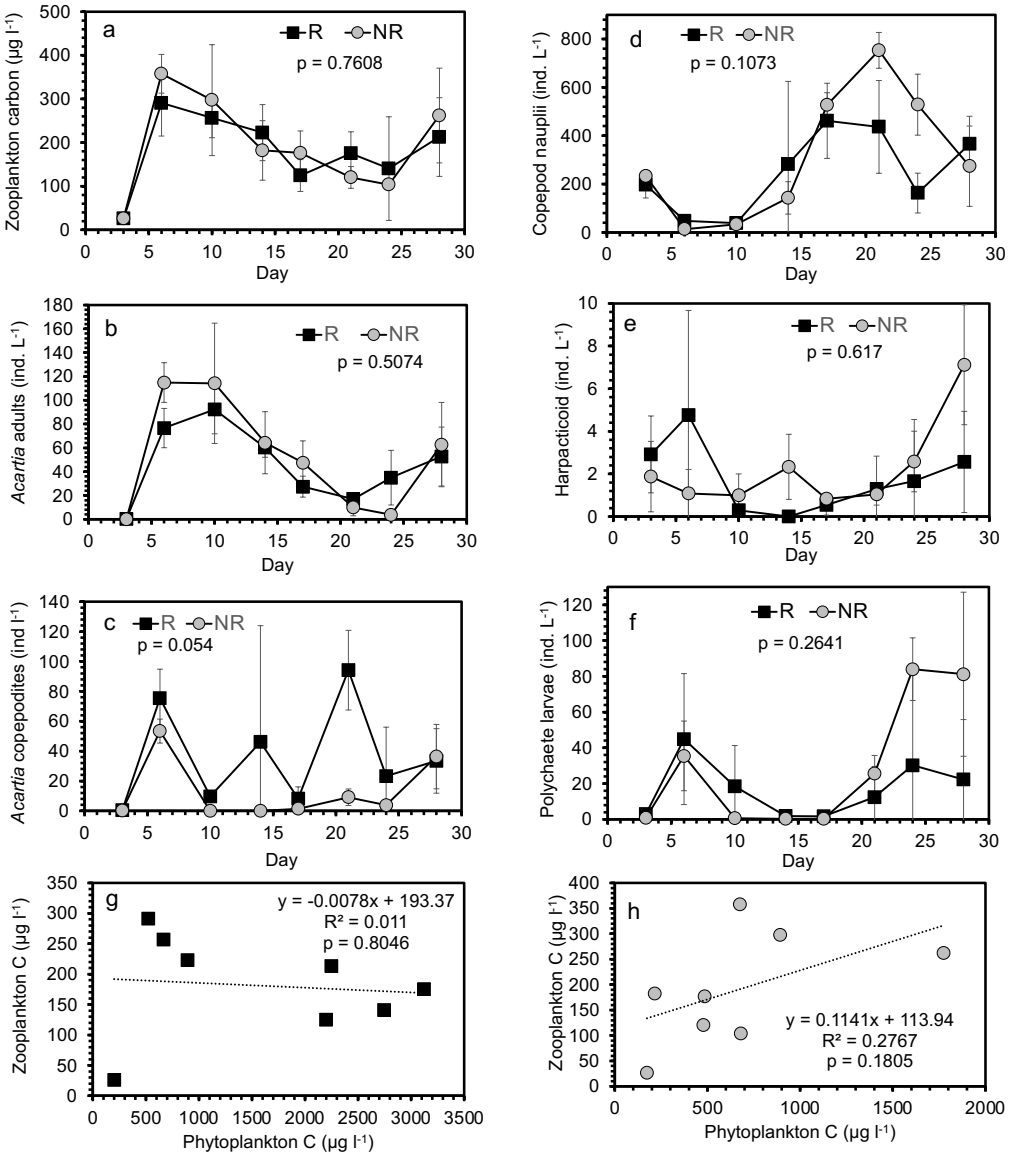

Fig. S4. Zooplankton abundance of main taxa over the experiment in resuspension tanks (R) and non-resuspension tanks (NR). *n* = 3, means ± SD. (a) Total zooplankton carbon (all taxa), (b) *Acartia tonsa* adults, (c) *Acartia tonsa* copepodites, (d) copepod nauplii, (e) harpacticoids, and (f) polychaete larvae. Relationship of mesozooplankton biomass to phytoplankton biomass in (g) resuspension and (h) non-resuspension tanks (common carbon unit). Statistical difference is indicated as $p \leq 0.05$. All tanks received a daily addition of oyster biodeposits.

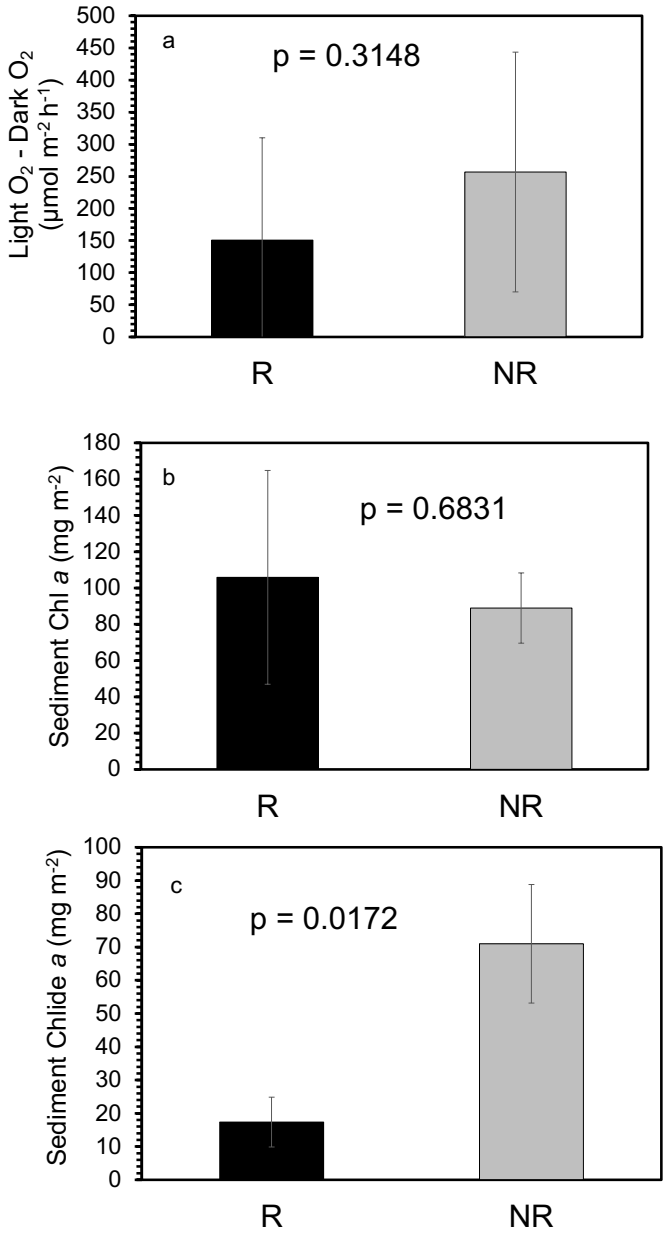

Fig. S5. (a) Dissolved oxygen (O_2) flux in the light minus dissolved oxygen flux in the dark to estimate microphytobenthos activity. (b) Sediment Chlorophyll (Chl) *a* levels and (c) sediment chlorophyllide (Chlide) levels in the 0-1 cm depth section of sediment at the end of the experiment (Day 30), as measured using HPLC. Sediment chl a and chlorophyllide cores were taken while mixing was on, and mixing was briefly turned off to collect the sediment core. R: resuspension tanks, NR: non-resuspension tanks. The *p*-values indicate statistical difference at $p \leq 0.05$, $n = 3$ for each system, reported are means ± SD. All tanks received a daily addition of oyster biodeposits.

Table S1. Linear relationship of optical backscatter sensor volts (OBS_V and total suspended solids (TSS) concentrations in five tanks. R1, R2, R3: resuspension tanks; NR5, NR6: non-resuspension tanks, all tanks with daily biodeposit additions. No OBS-3 sensor was deployed in non-resuspension tank 4.

	Regression	R^2	n	p-value
R1	TSS = 95.01 x OBS_V + 17.576	0.94	24	<0.0001
R2	TSS = 182.08 x OBS_V + 28.817	0.94	16	<0.0001
R3	TSS = 224.9 x OBS_V + 25.505	0.92	24	<0.0001
NR5	TSS = 369.55 x OBS_V + 14.365	0.77	8	0.0042
NR6	TSS = 107.37 x OBS_V + 24.845	0.92	19	<0.0001

Table S2. Means (± SD) of variables analyzed over the experiment for resuspension tanks (R) and non-resuspension tanks (NR), all with daily biodeposit additions (n = 3 per treatment). All systems contained muddy sediments. Repeated measures analyses for mixing-on and mixing-off data, respectively, were performed using SAS 9.4. Samples from different dates were assessed as repeated measurement for each treatment, and p-values were calculated for testing effects of both treatment (p) and time X treatment (p2). The Greenhouse-Geisser (Greenhouse & Geisser 1959) correction was applied to p2, as necessary. Significance was defined as the $p \leq 0.05$ level. Significant differences are highlighted in **bold**. Included in the analysis were all days including day 1 on which no biodeposits had been added yet to any systems.

Variable, Mixing-on / Mixing-off analyzed	R Mean ± SD	NR Mean ± SD	Days	p	p2
(a) Chlorophyll *a* (Chl *a*), phaeophytin					
Chl *a*, mixing-on (µg l^{-1})	27.21 ± 19.63	26.81 ± 23.42	1-29	0.9084	0.0524
Phaeophytin mixing-on (µg l^{-1})	**93.8 ± 65.77**	19.87 ± 17.23	1-29	**0.0162**	0.2723
Ratio Chl *a* : phaeophytin mixing-on	0.4 ± 0.19	**1.43 ± 0.37**	1-29	**0.0025**	0.3249
Ratio particulate carbon : Chl *a* mixing-on	0.05 ± 0.06	0.05 ± 0.06	1-29	0.1839	**0.0354**
Ratio Chl *a*: particulate organic carbon mixing-on	33.94 ± 20.39	41.97 ± 22.2	1-29	0.1687	0.0608
Chl *a* mixing-off (µg l^{-1})	26.59 ± 8.51	**47.90 ± 13.05**	1-29	**0.0346**	**0.0313**
Phaeophytin mixing-off (ug l^{-1})	23.44 ± 7.52	29.33 ± 10.61	1-29	0.2729	0.0713
Ratio Chl *a* to Phaeophytin mixing-off	1.2 ± 0.26	**1.78 ± 0.33**	1-29	**0.0038**	0.295
Ratio particulate carbon to Chl *a* mixing-off	0.03 ± 0.01	0.02 ± 0.00	1-29	0.0599	0.1112
Ratio Chl *a* : particulate carbon mixing-off	42.48 ± 12.23	70.67 ± 20.53	1-29	0.0558	**0.049**
(b) Zooplankton					
Adult *Acartia tonsa* mixing-on (ind l^{-1})	45.19 ± 30.98	52.19 ± 46.15	3-28	0.5074	0.2068
Copepodites mixing-on (ind l^{-1})	36.29 ± 33.68	13.02 ± 20.39	3-28	0.054	0.1732
Copepod nauplii mixing-on (ind l^{-1})	249.3 ± 164.7	313.4 ± 264.8	3-28	0.1073	0.1224
Harpacticoid copepods mixing-on (ind l^{-1})	1.76 ± 1.60	2.23 ± 2.08	3-28	0.617	0.1127
Polychaete larvae mixing-on (ind l^{-1})	16.84 ± 15.42	28.54 ± 35.94	3-28	0.2641	0.139
Zooplankton Carbon mixing-on (µg l^{-1})	181.0 ± 84.14	190.7 ± 109.7	3-28	0.7608	0.46
Zooplankton Nitrogen mixing-on (µg N l^{-1})	42.43 ± 19.72	44.69 ± 25.72	3-28	0.7608	0.46
(c) Phytoplankton Pigment Ratios, HPLC					
Ratio Fucoxanthin : Chl *a*, mixing-on	**0.212 ± 0.075**	0.143 ± 0.073	1-29	**0.0031**	**0.0014**
Ratio Peridinin : Chl *a*, mixing-on	**0.019 ± 0.013**	0.007 ± 0.013	1-29	**0.0016**	**0.0422**
Ratio Alloxanthin : Chl *a*, mixing-on	**0.036 ± 0.011**	0.014 ± 0.012	1-29	**0.0036**	**0.0265**
Ratio Zeaxanthin : Chl *a*, mixing-on	**0.064 ± 0.049**	0.054 ± 0.043	1-29	**0.051**	**0.0263**
Ratio Lutein : Chl *a*, mixing-on	0.044 ± 0.02	0.037 ± 0.027	1-29	0.1724	**0.0092**
Ratio Chl b : Chl *a*, mixing-on	0.116 ± 0.025	0.111 ± 0.039	1-29	0.4567	**0.0009**
Ratio Prasinophyceae : Chl *a*, mixing-on	0.008 ± 0.005	0.007 ± 0.004	1-29	0.1612	**0.0159**
HPLC Chl a (µg l^{-1}), mixing-on	31.53 ± 16.78	27.52 ± 24.98	1-29	0.1179	**0.0296**
(d) Other					
Dissolved organic carbon, DOC, mixing-on (µmol l^{-1})	244.07 ± 39.05	**280.76 ± 28.84**	1-29	**0.0268**	0.2738
CDOM Absorbance at 440 nm mixing-on (m^{-1})	0.037 ±0.003	**0.044 ± 0.004**	1-29	**0.0005**	**0.0095**
Ratio DOC: DON mixing-on	12.98 ± 5.19	9.97 ± 1.28	1-29	0.1823	0.4017

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