

Exposure to oil from the 2015 Refugio spill alters the physiology of a common harmful algal bloom species, *Pseudo-nitzschia australis*, and the ubiquitous coccolithophore, *Emiliana huxleyi*

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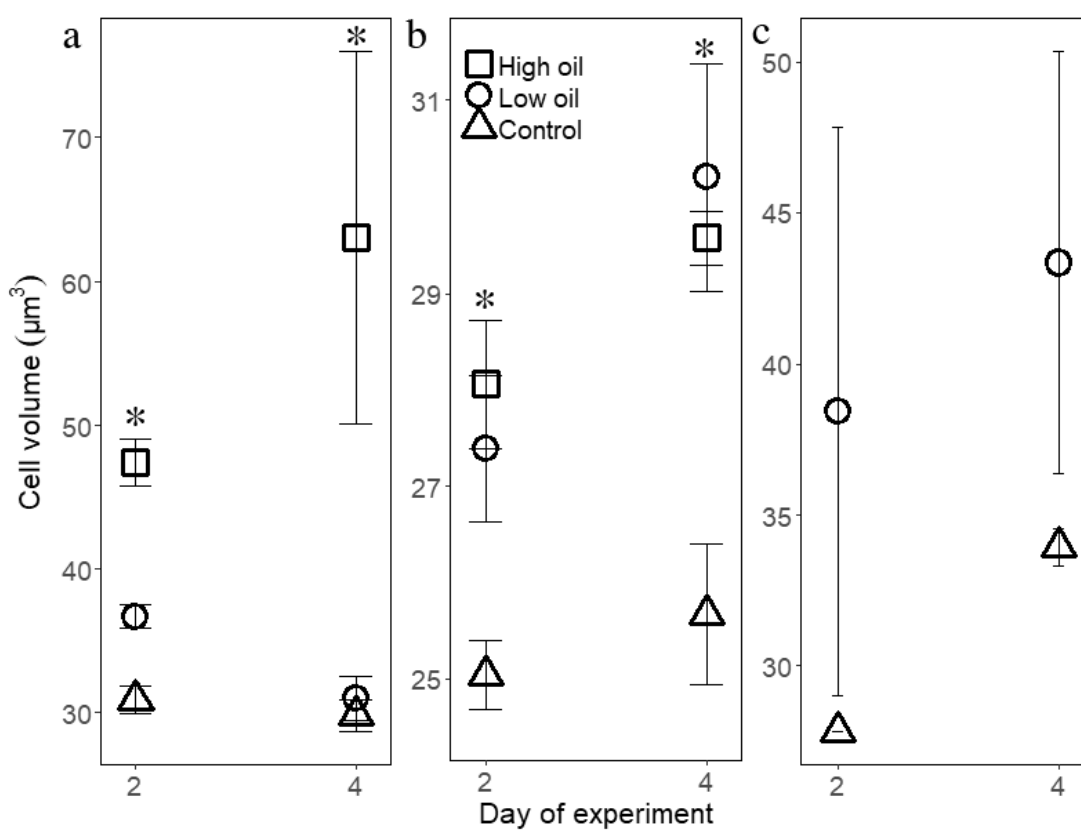


Figure S1. *E. huxleyi* cell volumes measured during days 2 and 4 of experiments 1 (a), 2 (b), and 4 (c). Asterisks represent significant differences between treatments at each time point ($\alpha = 0.05$). Error bars are ± 1 standard deviation from the mean (n = 3).

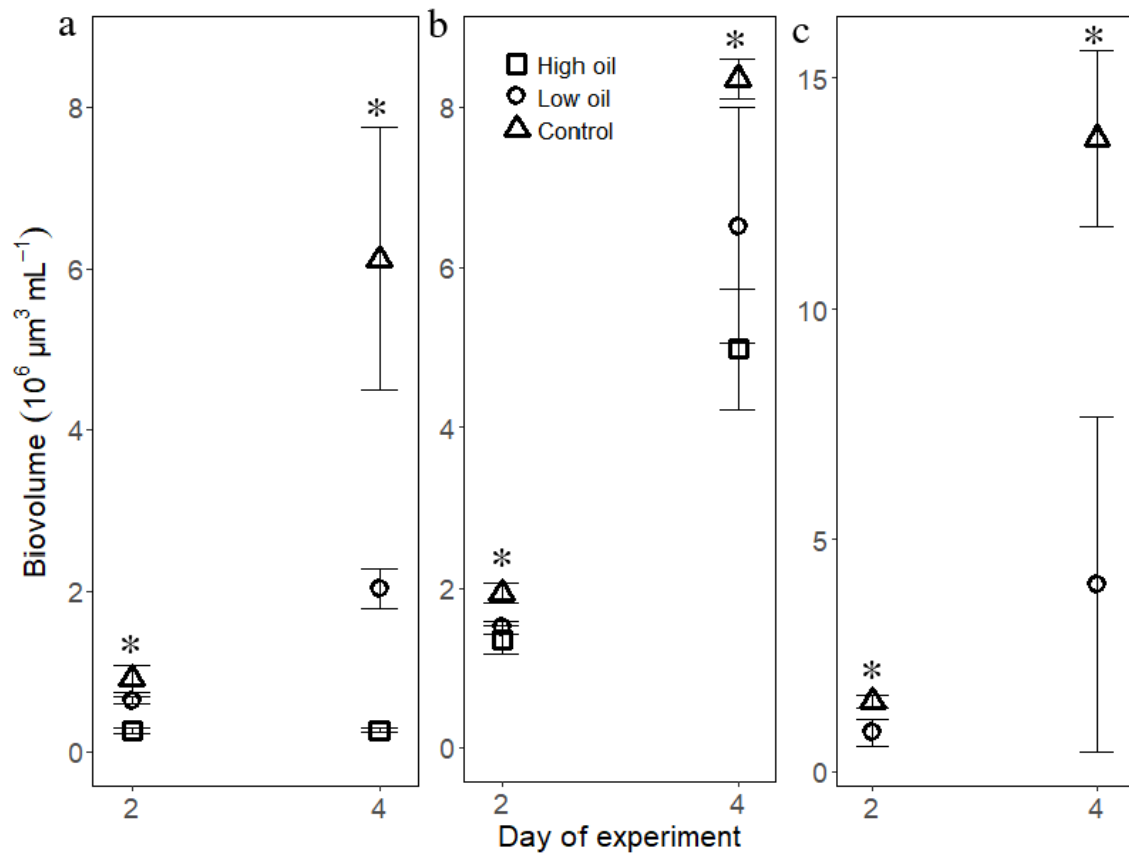


Figure S2. Biovolume measurements from *E. huxleyi* cultures in experiments 1 (a), 2 (b), and 4 (c). Asterisks represent significant differences between treatments at each time point ($\alpha = 0.05$). Error bars are ± 1 standard deviation from the mean ($n = 3$).

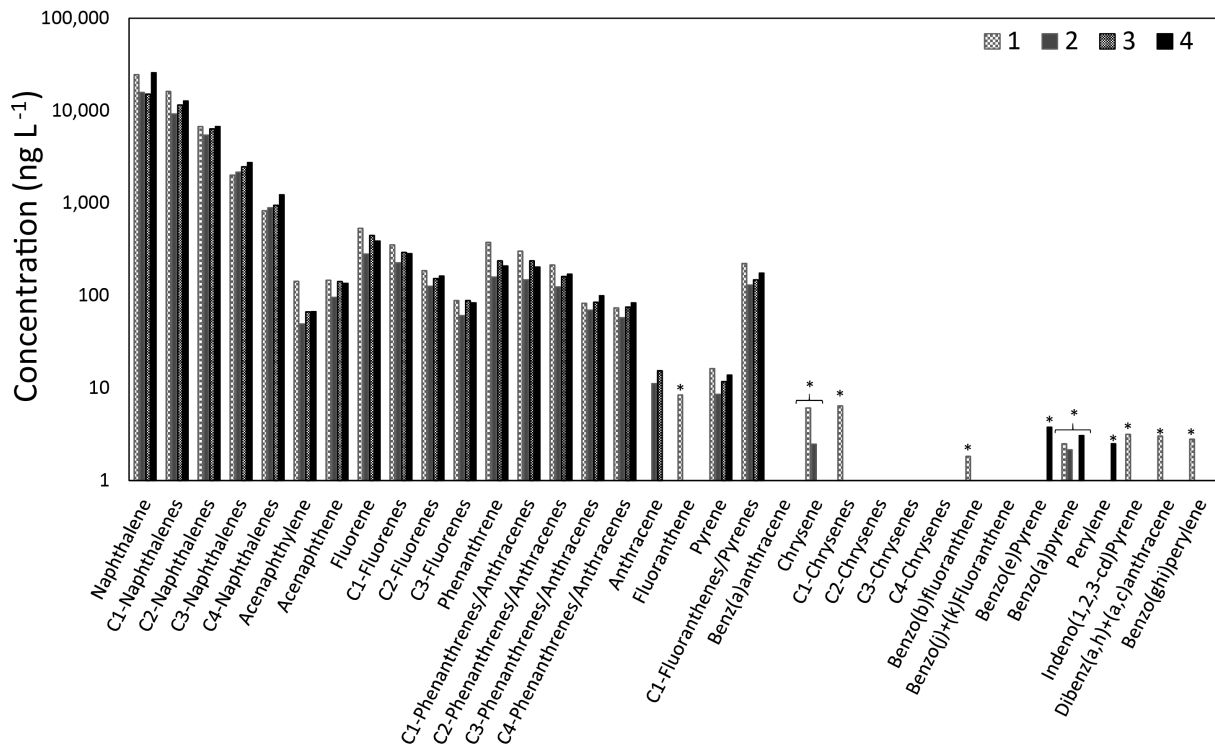


Figure S3. Concentrations of measured polycyclic aromatic hydrocarbons (PAHs) in the four independent experiments conducted. Asterisks represent PAH concentrations that were below the quantitation limit but above the detection limit of the method and are considered estimated.

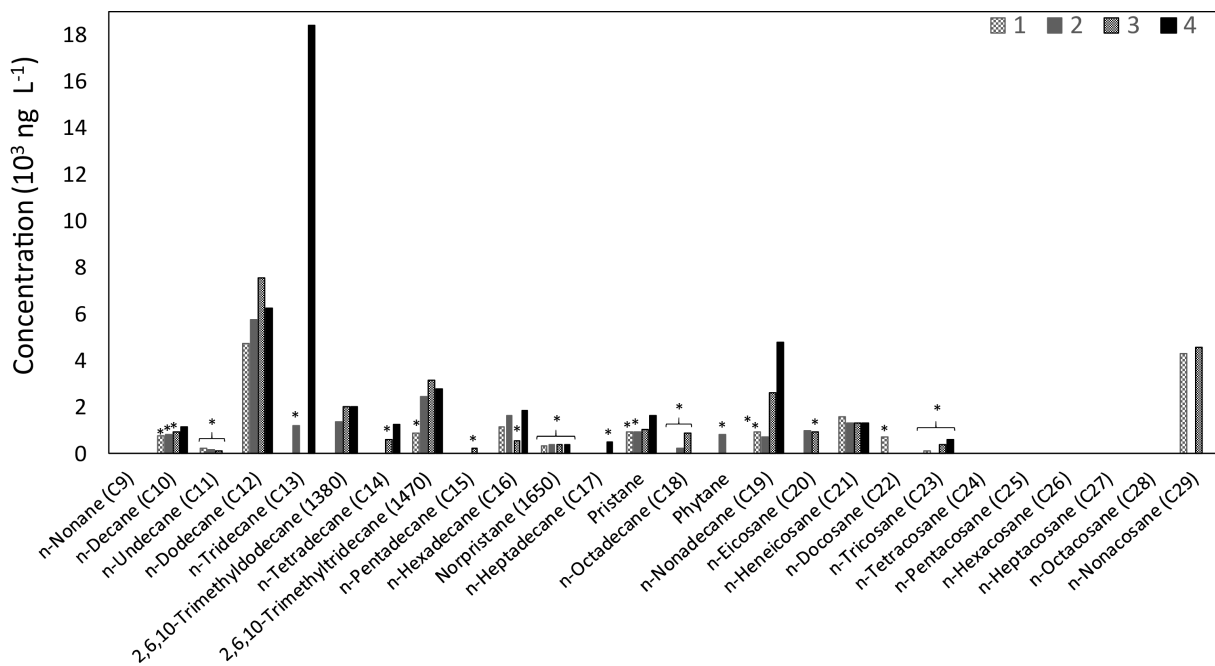


Figure S4. Concentrations of measured saturated hydrocarbons (SHs) in the four independent experiments conducted. Asterisks represent SH concentrations that were below the quantitation limit but above the detection limit of the method and are considered estimated.

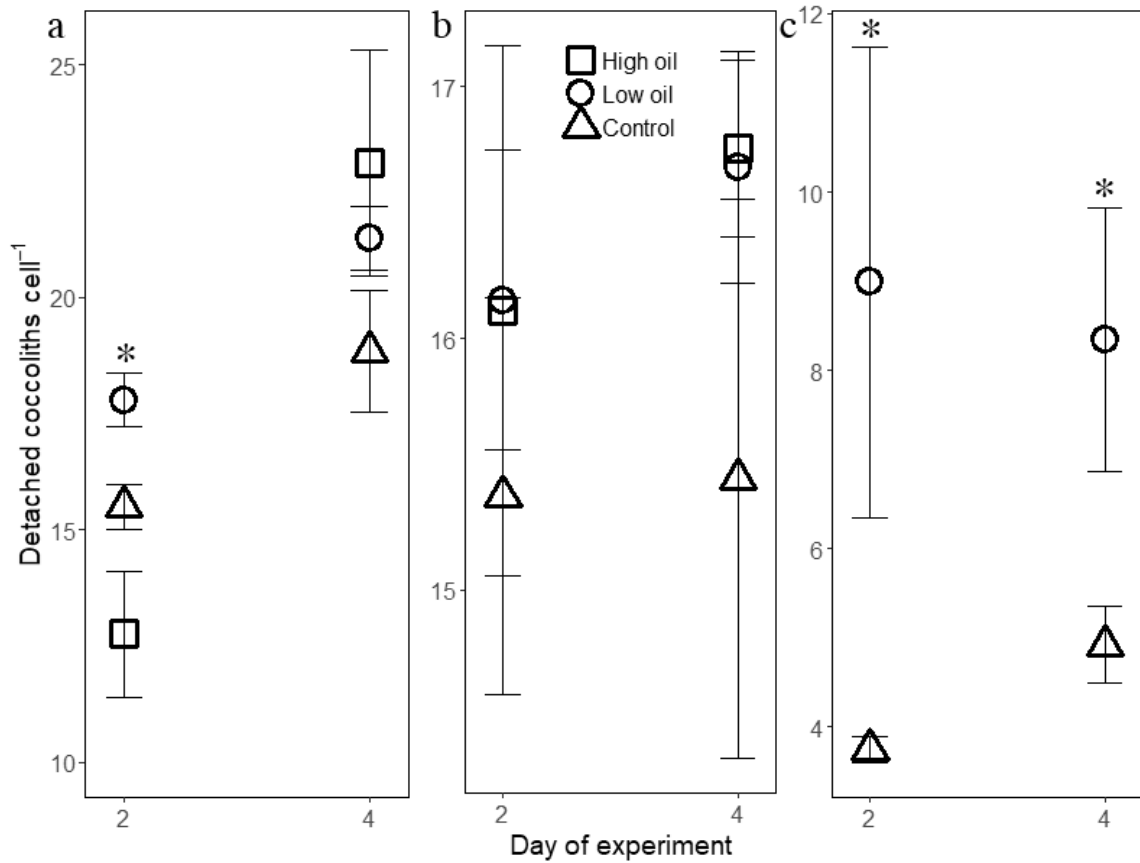


Figure S5. Detached coccolith to cell ratios in *E. huxleyi* cultures in experiments 1 (a), 2 (b), and 4 (c). Asterisks represent significant differences among treatments at each time point ($\alpha = 0.05$). Error bars are ± 1 standard deviation from the mean ($n = 3$).

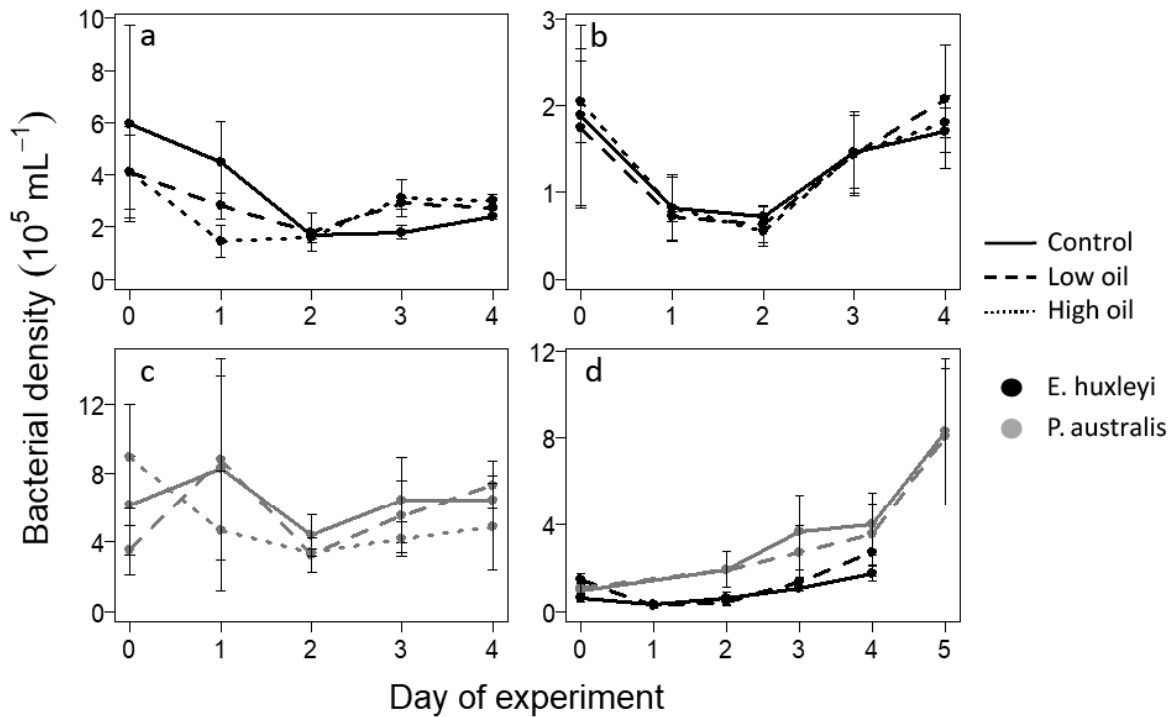


Figure S6. Bacterial densities measured each day in experiment 1 (a), 2 (b), 3 (c), and 4 (d). Error bars are ± 1 standard deviation from the mean ($n = 3$).

Table S1. Mean \pm standard deviation (n = 3) of the initial and final measured nutrient concentrations for each independent experiment.

Exp ID	Species (strain)	Growth media	Initial conc 100% WAF (μM) [NO ₃ ⁻ +NO ₂ ⁻] [PO ₄ ³⁻] [SiO ₄ ⁴⁻]	Final conc 100% WAF (μM) [NO ₃ ⁻ +NO ₂ ⁻] [PO ₄ ³⁻] [SiO ₄ ⁴⁻]	Initial conc 50% WAF (μM) [NO ₃ ⁻ +NO ₂ ⁻] [PO ₄ ³⁻] [SiO ₄ ⁴⁻]	Final conc 50% WAF (μM) [NO ₃ ⁻ +NO ₂ ⁻] [PO ₄ ³⁻] [SiO ₄ ⁴⁻]	Initial conc control (μM) [NO ₃ ⁻ +NO ₂ ⁻] [PO ₄ ³⁻] [SiO ₄ ⁴⁻]	Final conc control (μM) [NO ₃ ⁻ +NO ₂ ⁻] [PO ₄ ³⁻] [SiO ₄ ⁴⁻]
1	<i>E. huxleyi</i> (150604 A9)	mod f	98.2 \pm 0.3 5.48 \pm 0.03 NA	96.6 \pm 0.9 3.21 \pm 0.08 NA	98.1 \pm 0.6 5.46 \pm 0.03 NA	94.4 \pm 0.1 3.0 \pm 0.1 NA	97.6 \pm 0.6 5.42 \pm 0.06 NA	82 \pm 4 2.1 \pm 0.3 NA
2	<i>E. huxleyi</i> (150604 A9)	mod f	95.7 \pm 0.5 5.50 \pm 0.04 NA	94 \pm 9 3.1 \pm 0.8 NA	96.1 \pm 0.3 5.58 \pm 0.07 NA	83 \pm 4 2.4 \pm 0.1 NA	96.7 \pm 0.3 5.6 \pm 0.1 NA	60 \pm 2 0.8 \pm 0.2 NA
3	<i>P. australis</i> (HAB 207)	f/2	840 \pm 14 30.4 \pm 0.2 89.5 \pm 0.3	844 \pm 1 29.6 \pm 0.1 99 \pm 1	843 \pm 3 30.7 \pm 0.1 90.5 \pm 0.1	844 \pm 2 29.6 \pm 0.1 97 \pm 1	849 \pm 1 30.7 \pm 0.2 88 \pm 2	837 \pm 2 29.2 \pm 0.1 86.6 \pm 0.4
4	<i>E. huxleyi</i> (150604 A9)	f/2	--	--	856 \pm 2 34.7 \pm 0.3 97 \pm 1	860 \pm 11 31.5 \pm 0.6 105 \pm 1	866 \pm 5 34.6 \pm 0.4 99 \pm 3	867 \pm 8 29.1 \pm 0.4 102 \pm 3
4	<i>P. australis</i> (HAB 197)	f/2	--	--	868 \pm 3 34.9 \pm 0.1 96.6 \pm 0.6	867 \pm 9 31.7 \pm 0.3 103.7 \pm 0.5	865 \pm 5 34.7 \pm 0.2 94.7 \pm 0.3	812 \pm 5 28 \pm 1 75 \pm 3

Table S2. Statistical analyses (one-way ANOVA + FDR post hoc) of physiological parameters.

Variable	Exp #	Day	SS	Df	F	p - Value	FDR q -Value		
							H v C	L v C	H v L
Cell volume	1	2	420.4	2	144.90	< 0.001	0.0011	0.0002	0.0002
		4	2135.0	2	18.80	0.0026	0.0030	0.8537	0.0030
	2	2	15.0	2	19.60	0.0023	0.0030	0.0053	0.2376
		4	36.1	2	27.12	0.0010	0.0017	0.0015	0.3801
	4	2	168.5	1	3.80	0.1230			
		4	133.0	1	5.42	0.0804			
Biovolume	1	2	6.3e11	2	30.63	0.0007	0.0006	0.0196	0.0054
		4	5.4e13	2	29.74	0.0008	0.0009	0.0029	0.0645
	2	2	5.6e11	2	16.10	0.0039	0.0048	0.0096	0.2216
		4	1.7e13	2	9.35	0.0143	0.015	0.0858	0.0961
	4	2	6.8e11	1	12.67	0.0236			
		4	1.4e14	1	16.69	0.0150			
Dissolved DA	3	1	6.2e-5	2	6.93	0.0276	0.0320	0.0320	0.8127
		2	6.7e-6	2	1.16	0.3864	---	---	---
		3	1.7e-5	2	77.02	0.0006	0.0009	0.0012	0.1069
		4	1.4e-4	2	12.89	0.0067	0.0101	0.0101	0.5571
	4	4	2.8e-5	1	53.14	0.0019			
		5	1.0e-4	1	54.01	0.0018			
Cellular DA	3	2	0.43	2	0.904	0.4538	---	---	---
		4	33.2	2	5.42	0.0452	0.053	0.053	0.8027
	4	3	0.37	1	0.24	0.6486			
		5	9.4	1	14.01	0.0201			
<i>P. australis</i> TEP	3	2	15.2	2	1.18	0.3706	---	---	---
		4	195.2	2	10.14	0.0119	0.0153	0.0153	0.7073
	4	3	33.2	1	16.16	0.0159			
		5	227.1	1	37.66	0.0036			
<i>E. huxleyi</i> TEP	1	2	0.003	2	8.16	0.0194	0.0219	0.2234	0.0596
		4	0.014	2	10.26	0.0116	0.0129	0.8672	0.0129
	2	2	1.8e-11	2	6.03	0.0367	0.0408	0.1281	0.2124
		4	3.8e-8	2	0.06	0.9411	---	---	---
	4	2	0.019	1	3.11	0.1524			
		4	0.007	1	2.06	0.2246			
CaCO ₃	1	2	92.4	2	62.78	<0.0001	0.0002	0.2287	0.0002
		4	246.4	2	38.72	0.0004	0.0005	0.7704	0.0005
	2	2	0.126	2	5.95	0.0377	0.0524	0.0524	0.6437
		4	0.008	2	0.70	0.5351	---	---	---
	4	2	3.36	1	4.63	0.0977			
		4	1.02	1	2.55	0.1854			
Coccolith:cell	1	2	38.2	2	23.83	0.0014	0.0141	0.0203	0.0015
		4	25.1	2	12.53	0.0612	---	---	---
	2	2	1.15	2	0.83	0.4806	---	---	---
		4	3.2	2	1.62	0.1185	---	---	---
	4	2	41.2	1	11.79	0.0264			
		4	17.5	1	14.75	0.0184			

Variable	Exp #	Day	SS	Df	F	<i>p</i> - Value	FDR <i>q</i> -Value		
							H v C	L v C	H v L
<i>E. huxleyi</i> bacteria	1	0	4.4e11	2	3.40	0.1028	---	---	---
		1	3.1e11	2	0.62	0.5692	---	---	---
		2	2.3e10	2	1.34	0.3313	---	---	---
		3	7.8e10	2	1.01	0.4193	---	---	---
		4	8.9e10	2	1.31	0.3368	---	---	---
	2	0	1.3e9	2	0.09	0.9110	---	---	---
		1	2.0e8	2	0.11	0.9008	---	---	---
		2	4.7e8	2	0.83	0.4803	---	---	---
		3	1.3e7	2	0.003	0.9969	---	---	---
		4	2.3e9	2	0.59	0.5856	---	---	---
	4	0	1.1e10	1	20.28	0.0108			
		1	9.8e6	1	0.14	0.7310			
		2	3.8e8	1	0.66	0.4627			
		3	1.3e9	1	3.25	0.1458			
		4	1.3e10	1	2.12	0.2188			
	<i>P. australis</i> bacteria	3	0	4.4e11	2	3.40	0.1028	---	---
1			3.1e11	2	0.62	0.5692	---	---	---
2			2.3e10	2	1.34	0.3313	---	---	---
3			7.8e10	2	1.01	0.4193	---	---	---
4			8.9e10	2	1.31	0.3368	---	---	---
4		0	3.2e8	1	0.45	0.5382			
		2	6713	1	0.00	0.9993			
		3	1.3e10	1	0.59	0.4859			
		4	3.1e9	1	0.15	0.7169			
		5	6.7e8	1	0.01	0.9403			

Results from one-way ANOVA and, when applicable, FDR post hoc tests of treatment (high oil, low oil, control) on physiological parameters. *E. huxleyi* cell volume, *E. huxleyi* biovolume, *P. australis* dissolved domoic acid (DA), *P. australis* cellular DA, *P. australis* transparent exopolymer particles (TEP), *E. huxleyi* TEP, *E. huxleyi* CaCO₃, *E. huxleyi* coccolith:cell, *E. huxleyi* bacterial density, *P. australis* bacterial density. Values in **bold** represent significant effects ($p < 0.05$ or $q < 0.05$). Note, experiment 4 has only two treatments (low oil, control) so no post hoc tests are necessary.