



Supplement of

Upwelled plankton community modulates surface bloom succession and nutrient availability in a natural plankton assemblage

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Table S1. Overview of key variables on Day 1 (mean \pm s.d.) for each of the six treatment combinations. Asterisk (*) indicates that the mean and s.d. were calculated for $n = 3$ as some data were missing. % contribution of the various phytoplankton groups refers to the contribution to total FL3 (Chl *a*) fluorescence. F_v/F_m refers to the maximum quantum efficiency of photosystem II. $E_2:E_3$ is a proxy of dissolved organic matter (DOM) molecular weight. All abbreviations are described in the Materials and Methods in the main manuscript (Sect. 2).

Variable	Nutrient level HN (n = 4 per treatment)			Nutrient level LN (n = 4 per treatment)		
	Organic	Inorganic	Biology	Organic	Inorganic	Biology
[NO _x] ($\mu\text{mol L}^{-1}$)	8.08 \pm 0.30	7.75 \pm 0.51	7.32 \pm 0.19	2.49 \pm 0.08	2.07 \pm 0.40	3.17 \pm 0.25
[DIP] ($\mu\text{mol L}^{-1}$)	2.02 \pm 0.01	1.85 \pm 0.02	2.06 \pm 0.02	2.14 \pm 0.02	2.07 \pm 0.05	2.14 \pm 0.02
[DSi] ($\mu\text{mol L}^{-1}$)	10.60 \pm 0.06	5.69 \pm 0.43	11.24 \pm 0.08	17.35 \pm 0.32	5.97 \pm 0.04	17.11 \pm 0.06
NO _x :DIP (mol:mol)	4.01 \pm 0.16	4.20 \pm 0.25	3.57 \pm 0.11	1.16 \pm 0.03	1.00 \pm 0.17	1.49 \pm 0.12
[Chl <i>a</i>] ($\mu\text{g L}^{-1}$)	2.61 \pm 0.79	3.06 \pm 0.39	3.16 \pm 0.47	3.41 \pm 0.76	2.89 \pm 1.33	2.99 \pm 0.71
% nanoplankton	34 \pm 15	35 \pm 18	21 \pm 4	23 \pm 7	29 \pm 10	36 \pm 14
% large microplankton	32 \pm 17	24 \pm 18	26 \pm 10	35 \pm 13	27 \pm 19	16 \pm 14
% cryptophytes	10 \pm 5	16 \pm 16	34 \pm 7	18 \pm 6	20 \pm 17	24 \pm 12
% small microplankton	9 \pm 5	7 \pm 4	5 \pm 3	11 \pm 2	11 \pm 3	9 \pm 3
% picoeukaryotes	5 \pm 1	6 \pm 3	3 \pm 1	4 \pm 1	4 \pm 1	4 \pm 1
% <i>Synechococcus</i>	6 \pm 2	7 \pm 4	4 \pm 1	5 \pm 1	5 \pm 2	6 \pm 1
F_v/F_m	0.49 \pm 0.01	0.49 \pm 0.03*	0.48 \pm 0.03	0.50 \pm 0.01*	0.48 \pm 0.07*	0.50 \pm 0.03
$E_2:E_3$	5.61 \pm 1.35*	5.00 \pm 0.21	5.31 \pm 0.76	4.83 \pm 0.65*	4.48 \pm 0.66	3.11 \pm 0.53*
LAP activity (AMC L ⁻¹ h ⁻¹)	1.44 \pm 0.09	1.80 \pm 0.14	1.43 \pm 0.10	1.57 \pm 0.04	1.71 \pm 0.08	1.14 \pm 0.07

Table S2a: Fixed effects for final simplified model for log-transformed Chl a concentrations.

Source	Numerator df	Denominator df	F-value	p-value
<i>Bloom</i>				
Intercept	1	36	2752.335	<.0001
Deep water component	2	18	0.3093	0.7378
Nutrient level	1	18	7.7081	0.0125
Day	2	36	113.8446	<.0001
Deep water component:Nutrient level	2	18	0.0496	0.9518
Deep water component:Day	4	36	2.9642	0.0325
Nutrient level:Day	2	36	23.6595	<.0001
Deep water component:Nutrient level:Day	4	36	5.0041	0.0026
<i>Post-bloom</i>				
Intercept	1	36	320.3131	<.0001
Deep water component	2	18	2.0019	0.1640
Nutrient level	1	18	23.4398	0.0001
Day	2	36	23.5053	<.0001
Deep water component:Nutrient level	2	18	6.2807	0.0085
Deep water component:Day	4	36	0.8018	0.5321
Nutrient level:Day	2	36	0.0836	0.9200
Deep water component:Nutrient level:Day	4	36	2.9089	0.0349

Table S2b: Posthoc comparisons for Chlorophyll a concentrations. Only the significant comparisons ($p_{\text{adjusted}} < 0.05$) are reported. Df = degrees of freedom. Chlorophyll a concentrations were log transformed to satisfy assumptions.

Contrast	Nutrient level	Deep water component	Day	Estimate	Standard error (SE)	Df	t	P_{adjusted}
biology – organic	low nitrate		4	-0.4990	0.1801	18	-2.7701	0.0322
high nitrate – low nitrate	--	organic	4	1.0917	0.1801	18	6.0599	0.0000
high nitrate – low nitrate	--	inorganic	4	0.5962	0.1801	18	3.3095	0.0040
organic – biology	low nitrate	--	8	-1.1857	0.2673	18	-4.4355	0.0009
organic - inorganic	low nitrate	--	8	-1.1344	0.2673	18	-4.2437	0.0014
high nitrate – low nitrate	--	biology	8	1.0268	0.2673	18	3.8410	0.0012
high nitrate – low nitrate	--	inorganic	8	0.8524	0.2673	18	3.1888	0.0051
high nitrate – low nitrate	--	biology	10	0.7376	0.2673	18	2.7591	0.0129
high nitrate – low nitrate	--	inorganic	10	0.7867	0.2673	18	2.9431	0.0087

Table S3a: Fixed effects for final simplified model for NO_x:DIP drawdown

Source	Numerator df	Denominator df	F-value	p-value
<i>Bloom</i>				
Intercept	1	41	844.8836	<0.0001
Deep water component	2	20	3.6185	0.0456
Nutrient level	1	20	1.4927	0.2360
Day	2	41	14.3952	<0.0001
Nutrient level:Day	2	41	6.9759	0.0025
<i>Post-bloom</i>				
Intercept	1	113	1779.1842	<0.0001
Deep water component	2	18	0.3913	0.6818
Nutrient level	1	18	60.5336	<0.0001
Day	5	113	9.0240	<.0001
Deep water component:Nutrient level	2	18	3.2552	0.0323

Table S3b: Posthoc comparisons for NO_x:DIP drawdown. Only the significant comparisons (p_{adjusted} < 0.05) are reported. Df = degrees of freedom.

Contrast	Nutrient level	Deep water component	Day(s)	Estimate	Standard error (SE)	Df	t	p _{adjusted}
organic – biology	low nitrate	--	2,3,4	-3.2464	1.2666	20	-2.5630	0.0467
organic - biology	high nitrate	--	2,3,4	-3.2464	1.2666	20	-2.5630	0.0467
high nitrate – low nitrate	--	biology	2	-4.1752	1.7596	20	-2.3728	0.0278
high nitrate – low nitrate	--	organic	2	-4.1752	1.7596	20	-2.3728	0.0278
high nitrate – low nitrate	--	inorganic	2	-4.1752	1.7596	20	-2.3728	0.0278
high nitrate – low nitrate	--	biology	3	3.6772	1.6849	20	2.1824	0.0412
high nitrate – low nitrate	--	organic	3	3.6772	1.6849	20	2.1824	0.0412
high nitrate – low nitrate	--	inorganic	3	3.6772	1.6849	20	2.1824	0.0412
high nitrate – low nitrate	--	organic	5,6,7,8,9,10	3.8075	0.6894	18	5.5230	<0.0001
high nitrate – low nitrate	--	biology	5,6,7,8,9,10	1.4581	0.6894	18	2.1151	0.0486
high nitrate – low nitrate	--	inorganic	5,6,7,8,9,10	3.9803	0.6876	18	5.7886	<0.0001

Table S4a: Fixed effects for final simplified model for leucine aminopeptidase (LAP) activity.

Source	Numerator df	Denominator df	F-value	p-value
<i>Bloom</i>				
Intercept	1	18	2279.311	<.0001
Deep water component	2	18	16.8631	0.0001
Nutrient level	1	18	0.0434	0.8373
Day	1	18	98.3344	<.0001
Deep water component:Nutrient level	2	18	8.8878	0.0021
Deep water component:Day	2	18	7.3699	0.0046
Nutrient level:Day	1	18	7.147	0.0155
Deep water component:Nutrient level:Day	2	18	3.4128	0.0554
<i>Post-bloom</i>				
Intercept	1	54	188.6426	<.0001
Deep water component	2	18	2.6025	0.1017
Nutrient level	1	18	36.5563	<.0001
Day	3	54	45.5477	<.0001
Deep water component:Nutrient level	2	18	0.1743	0.8415
Deep water component:Day	6	54	3.6863	0.0038
Nutrient level:Day	3	54	7.1365	0.0004
Deep water component:Nutrient level:Day	6	54	3.0033	0.0132

Table S4b: Posthoc comparisons for leucine aminopeptidase (LAP) activity. Here only the significant comparisons ($p_{\text{adjusted}} < 0.05$) are reported. Df = degrees of freedom.

Contrast	Nutrient level	Deep water component	Day	Estimate	Standard error (SE)	Df	t	p_{adjusted}
organic – biology	low nitrate	--	10	-0.7329	0.1811	18	-4.0475	0.0021
biology - inorganic	high nitrate	--	5	-0.5784	0.1811	18	-3.1942	0.0133
high nitrate – low nitrate	--	organic	5	0.3942	0.1811	18	2.1769	0.0430
high nitrate – low nitrate	--	inorganic	5	0.4950	0.1811	18	2.7338	0.0136
high nitrate – low nitrate	--	organic	7	0.6376	0.1811	18	3.5210	0.0024
high nitrate – low nitrate	--	biology	7	0.9808	0.1811	18	5.4165	0.0000
high nitrate – low nitrate	--	inorganic	7	0.4420	0.1811	18	2.4407	0.0252
high nitrate – low nitrate	--	biology	9	0.5415	0.1811	18	2.9906	0.0078

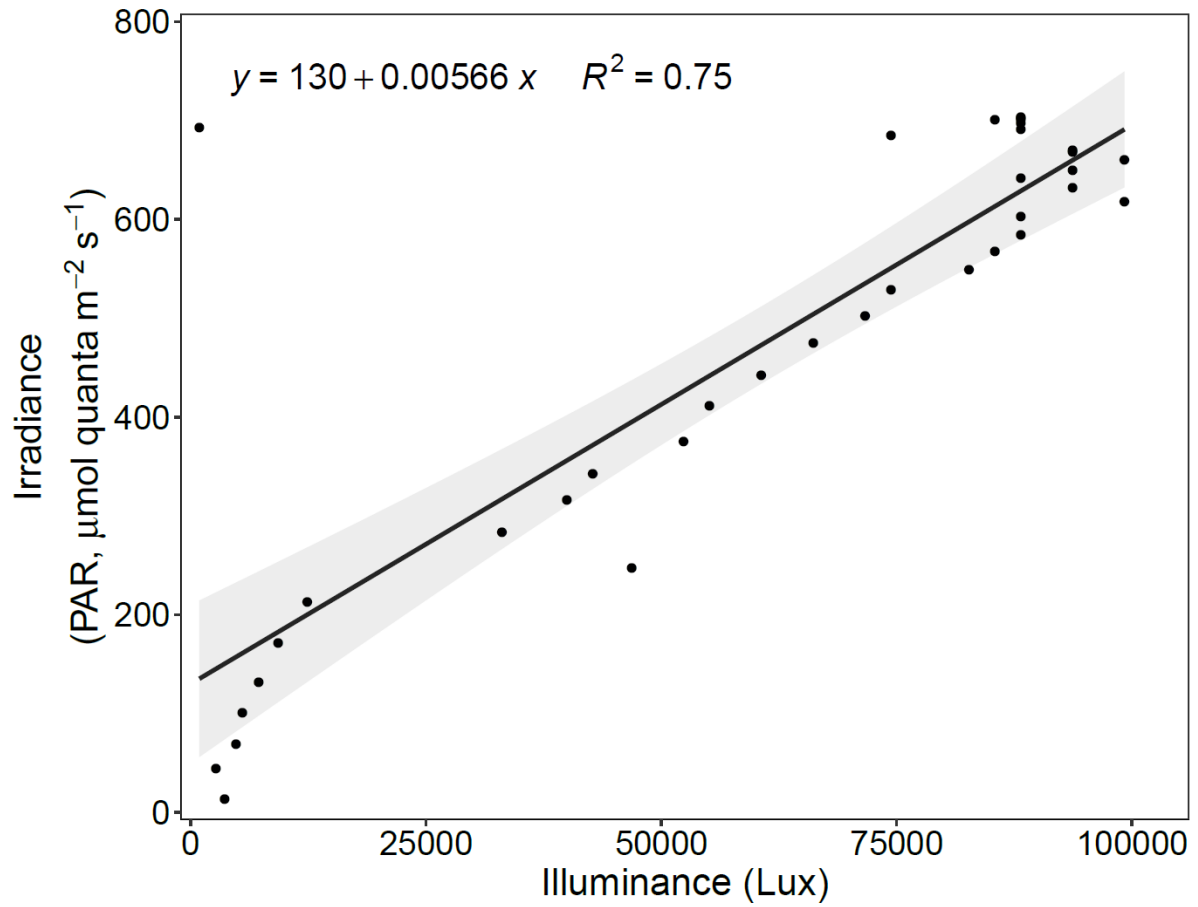
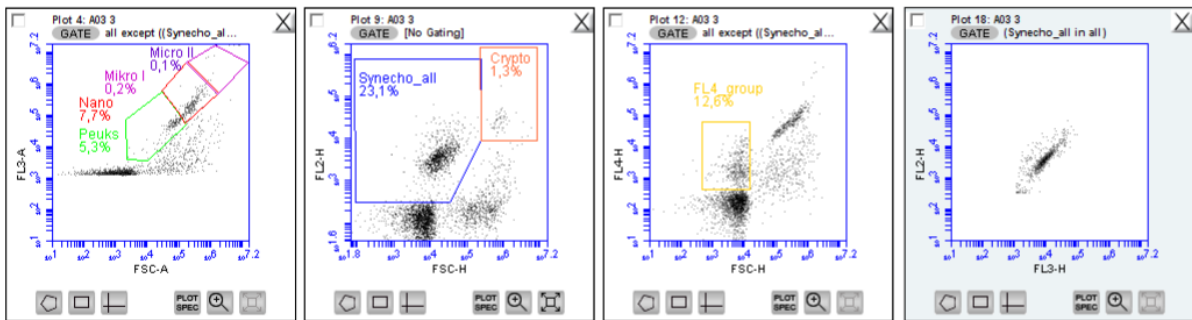


Figure S1: Relationship between PAR and measured Lux over a six hour period submersed in ~1 m water depth to estimate PAR from the incubators. The black line indicates the linear regression with the corresponding equation and R^2 included in the figures panel and the grey shaded band indicating the 95% Confidence Interval (CI).

Day 1: low nitrate/biology



Day 4: high nitrate/inorganic

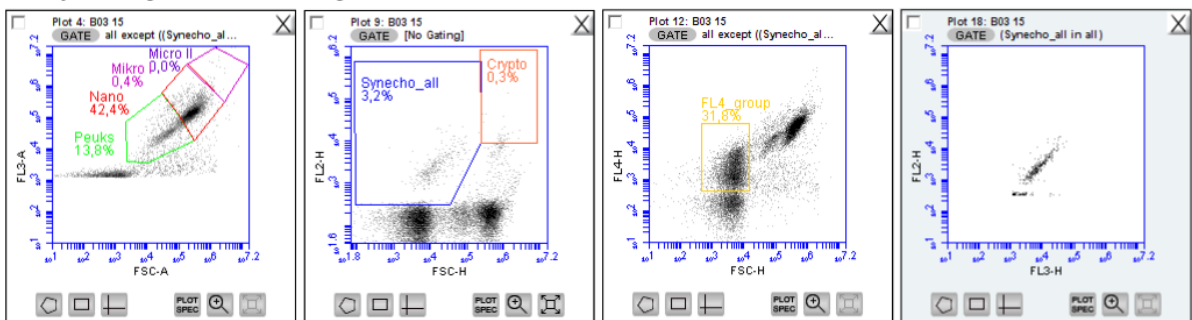


Figure S2: Flow cytometry cytograms to indicate gating of different groups by size (FSC/forward scatter vs. FL3-A/Chlorophyll, Plot 4), taxonomic groups (FSC/forward scatter vs. FL2-H/phycoerythrin, Plot 9), morphology (FSC/forward scatter vs. FL4-H/Phycocyanin, Plot 12) and fluorescence for Synechococcus (FL3-H/Chlorophyll vs. FL2-H/phycoerythrin, Plot 18). Note the Mikro II group (large microphytoplankton) is barely visible on the cytogram. “Peuks” = picoeukaryotes, “Nano” = nanophytoplankton, “Mikro I” = small microphytoplankton, “Mikro II” = large microphytoplankton, “Synecho_all” = Synechococcus, “Crypto” = cryptophytes, “FL4_group” = FL4 gated group. Further details on gating procedures can be found in the Materials and Methods section in the main manuscript (Sect. 2.4).

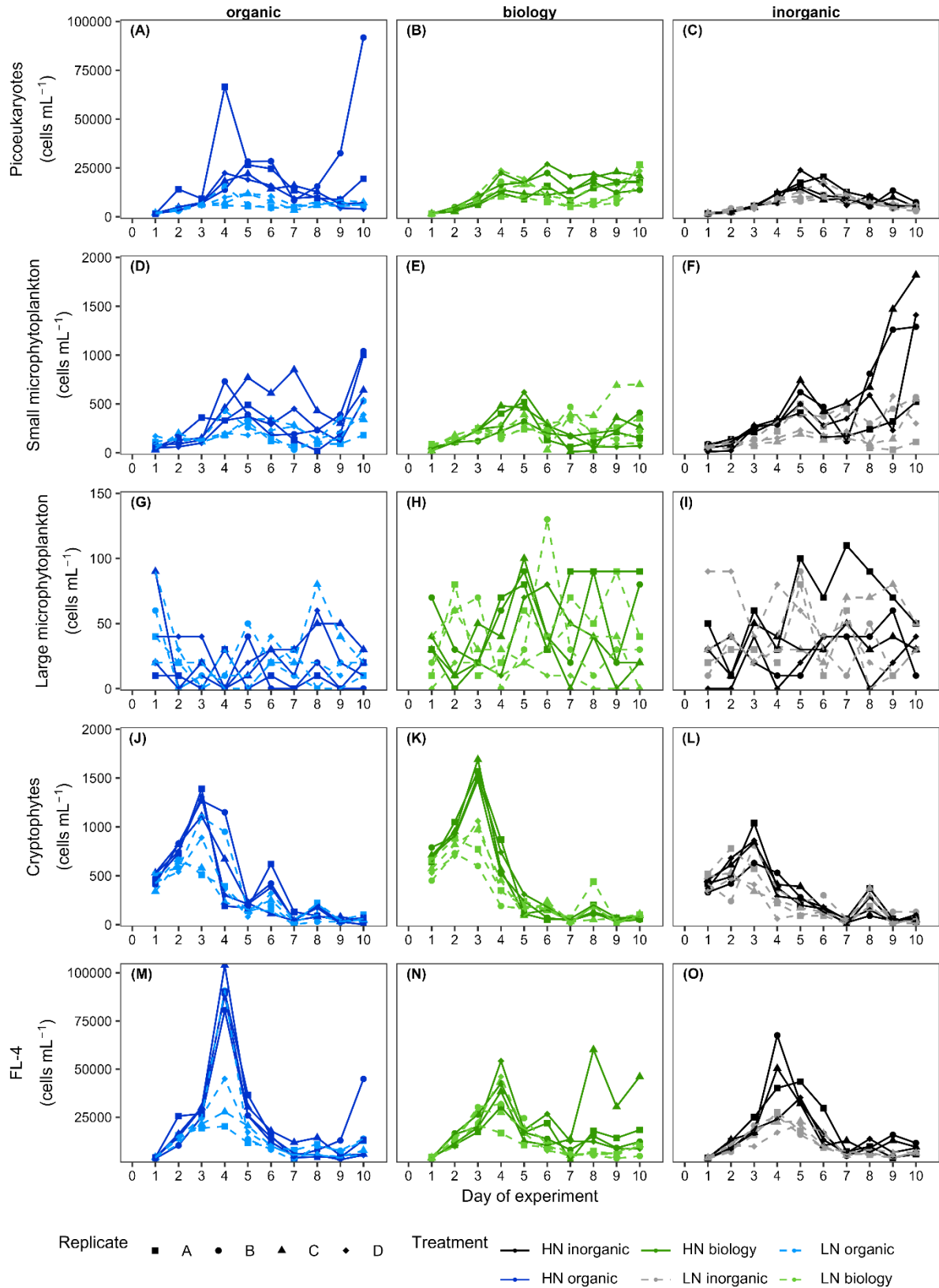


Figure S3: Abundances of phytoplankton groups identified in flow cytometric analyses, picoeukaryotes (A-C), small microphytoplankton (D-F), large microphytoplankton (G-I), cryptophytes (J-L), and the FL4 group (M-O), measured daily over the 10-day long study period.