Supporting Information

Hopkins et al. 10.1073/pnas.0907163107

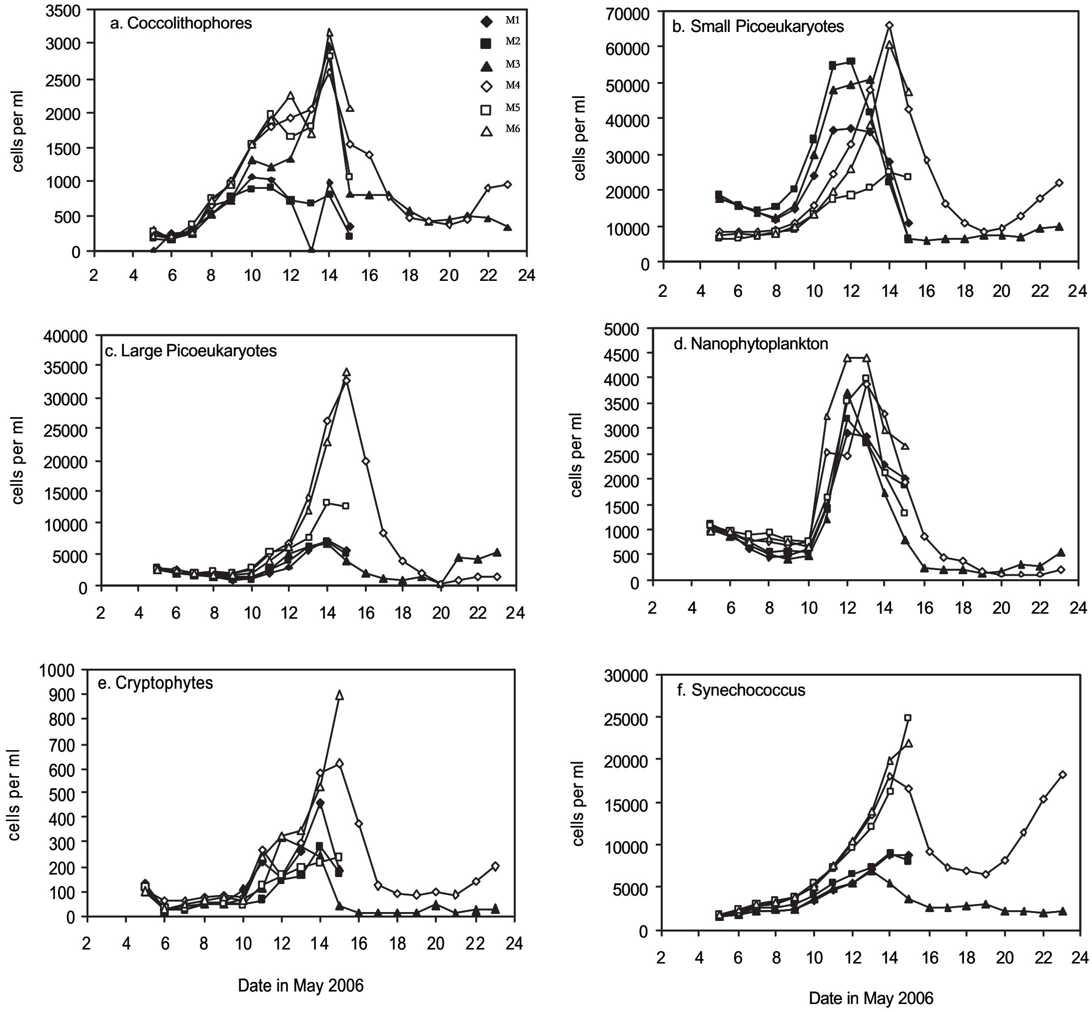


Fig. S1. Microplankton species cell counts (cell per milliliter). (*a*) Coccolithophores (*b*) small picoeukaryotes, (*c*) large picoeukaryotes, (*d*) nanophytoplankton, (*e*) cryptophytes, and (*f*) *Synechococcus*. Data produced by Isabelle Mary of the National Oceanography Center (NOCS) from flow cytometric analysis. Because of reaeration and alteration of experimental conditions of M1, M2, M5, and M6 on May 15, data for these mesocosms are not included. The unaltered M3 and M4 are plotted for the whole experiment. Vertical gray lines indicate the three phases of the bloom.

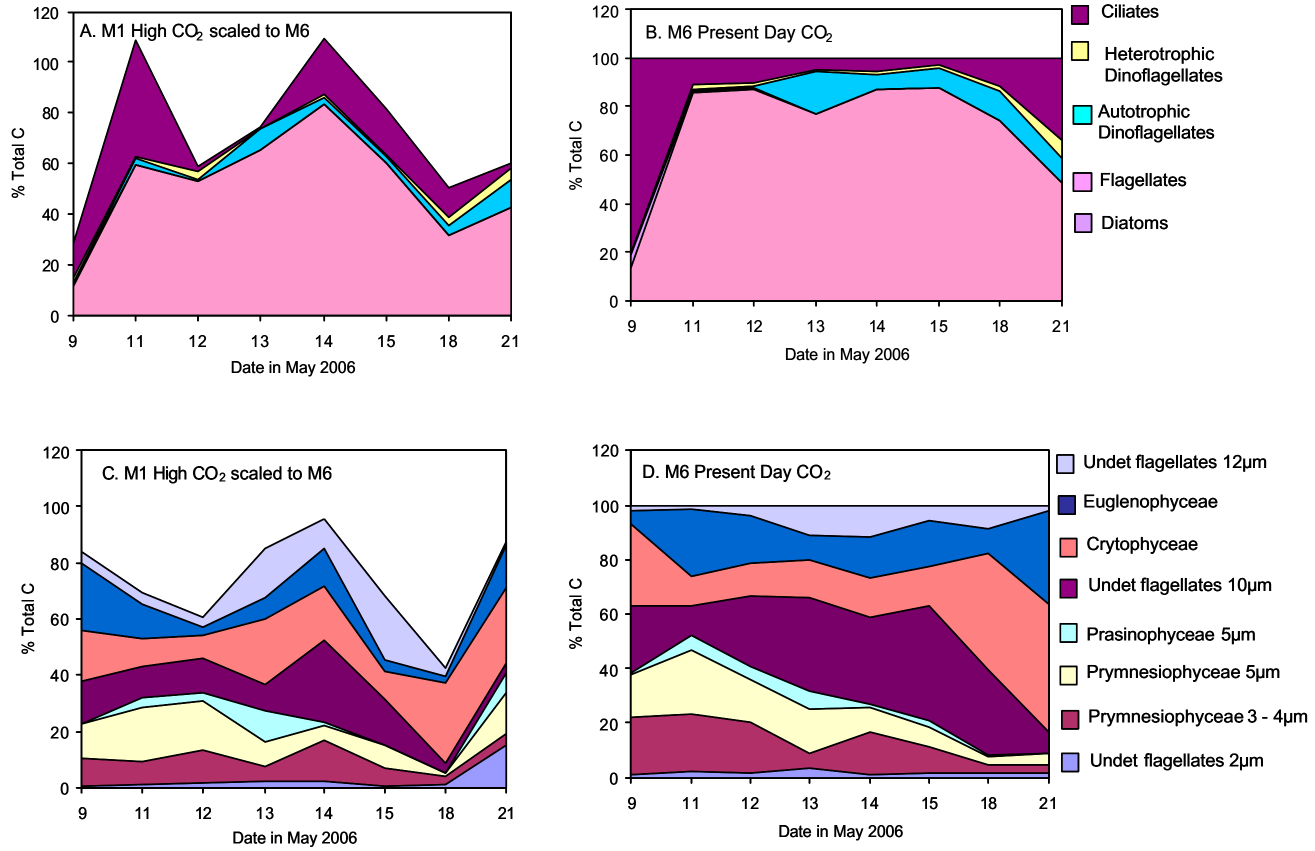
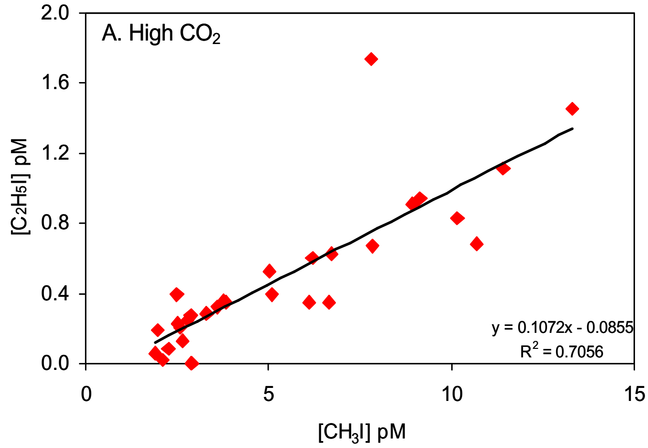


Fig. S2. Phytoplankton percentage biomass for overall groups (ciliates, heterotrophic dinoflagellates, autotrophic dinoflagellates, diatoms, and flagellates, *A* and *B*). Flagellates (*C* and *D*). Data provided by Claire Widdicombe (PML). Counts were made on the following days: May 9, 11, 12, 13, 14, 15, 18, and 21. Flagellates were the dominant group under both treatments: 71% of total biomass in high CO_2 M1 and 66% in ambient CO_2 M6. The flagellates under high CO_2 were dominated by Crytophyceae (24%) and under the ambient control by "undetermined flagellates, 10 µm" (30%). Data for the high CO_2 M6 is scaled to the ambient control M1 to show how the total biomass in M1 changed in relation to M6.



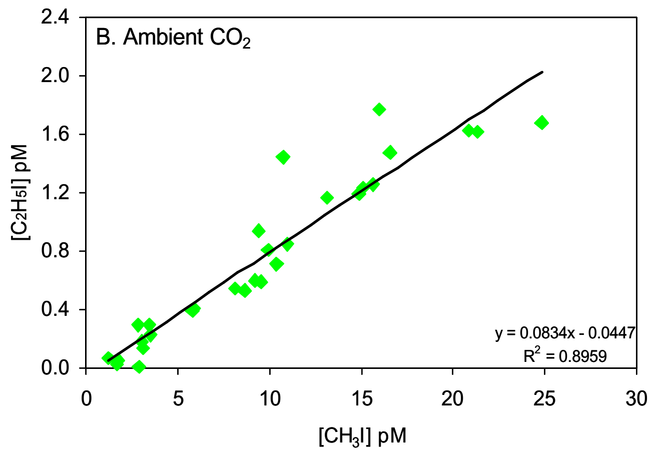


Fig. S3. Correlations between [CH_3I] and [C_2H_5I] under (*A*) high CO_2 and (*B*) ambient CO_2. After reaeration of M1, M2, M5, and M6 on May 15, only data for M3 and M4 are plotted.

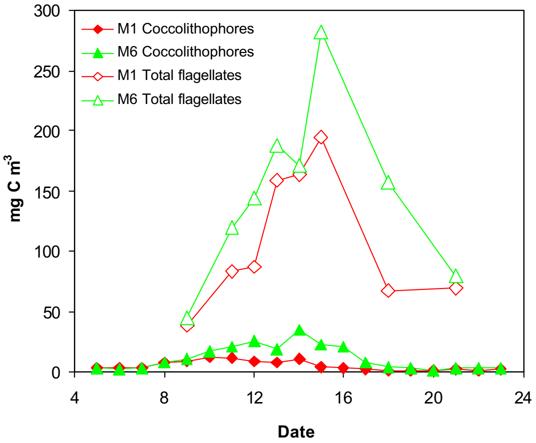


Fig. S4. Total flagellate biomass (mg C m^{-3}) under high CO_2 (M1, open diamonds) and under the ambient control (M6, open triangles), and coccolithophore biomass (mg C m^{-3}) under high CO_2 (M1, closed diamonds) and under the ambient control (M6, closed triangles). Coccolithophore cell counts from flow cytometric analysis were converted to biomass using the conversion factor of Menden-Deuer and Lessard [Menden-Deuer S, Lessard J (2000) Carbon to volume relationships for dinoflagellates, diatoms, and other protist plankton. *Limnol Oceanogr* 45:569–579]. Contribution of coccolithophores to total flagellate biomass is 6% under high CO_2 and 12% under the ambient control.

Table S1. Summary of the statistical analyses performed on flow cytometry phytoplankton count data for Mesocosms 1 to 6

	Mean (± SD)	Data transformation	Normality: Anderson-Darling (normal $P > 0.05$)	Test of equal variances: Levene's statistic (equal $P > 0.05$)	Test of significance (significantly different $P < 0.05$)
Coccolithophores	High CO_2: 728.9 ± 556 Present CO_2: 1,252 ± 802	Square root	High CO_2: 0.458, $P = 0.250$ Present CO_2: 0.565, $P = 0.134$	4.88 $P = 0.03$	**Two-sample *t* test T = 3.17 df = 68 *P* = 0.002[a]**
Small picoeukaryotes	High CO_2: 22,503 ± 15,303 Present CO_2: 20739 ± 15491	Log	High CO_2: 0.567, $P = 0.132$ Present CO_2: 0.849, $P = 0.026$	0.05 $P = 0.822$	Mann-Whitney W = 1,431 $P = 0.822$
Large picoeukaryotes	High CO_2: 3,067 ± 2,089 Present CO_2: 7683 ± 9098	Log	High CO_2: 0.906, $P = 0.019$ Present CO_2: 0.641, $P = 0.087$	9.30 $P = 0.003$	**Two-sample *t* test T = −2.33 df = 59 *P* = 0.023[a]**
Large picoeukaryotes phase 2 Bloom May 10–17	High CO_2: 3,905 ± 2,128 Present CO_2: 12157 ± 9924	Square root	High CO_2: 0.654, $P = 0.075$ Present CO_2: 0.496, $P = 0.189$	8.16 $P = 0.007$	**Two-sample *t* test T = 4.05 df = 25 *P* < 0.001[a]**
Nanophytoplankton	High CO_2: 1212 ± 1,006 Present CO_2: 1617 ± 1318	Log	High CO_2: 0.389, $P = 0.367$ Present CO_2: 1.176, $P < 0.005$	1.07 $P = 0.305$	Mann-Whitney W = 1,175 $P = 0.1188$
Cryptophytes	High CO_2: 109.1 ± 108 Present CO_2: 194.6 ± 194	Log	High CO_2: 0.634, $P = 0.091$ Present CO_2: 0.495, $P = 0.202$	0.19 $P = 0.668$	**Two-sample *t* test T = 2.93 df = 72 *P* = 0.005[b]**
Synechococcus	High CO_2: 4135 ± 2,286 Present CO_2: 9126 ± 6245	Log	High CO_2: 1.014, $P = 0.01$ Present CO_2: 0.513, $P = 0.182$	18.40 $P < 0.001$	**Mood's median $\chi^2 = 9.14$ df = 1 *P* = 0.03**

Text in bold illustrates differences considered significant at a threshold of $P < 0.05$.
[a]*t* test performed NOT assuming equal variances considered significant at a threshold of $P < 0.05$.
[b]*t* test performed assuming equal variances.

Table S2. Biomass (g C m^{-3}) of ciliates, heterotrophic dinoflagellates, autotrophic dinoflagellates, diatoms, flagellates, and total biomass in high CO_2 M1 and present day CO_2 M6, and the percentage change in biomass in M1 relative to M6

	High CO_2 M1 (g C m^{-3})	Present day CO_2 M6 (g C m^{-3})	% difference under high CO_2
Ciliates	245.0	412.9	−41
Heterotrophic dinoflagellates	33.2	30.6	+8
Autotrophic dinoflagellates	62.4	126.3	−51
Diatoms	3.7	19.6	−81
Flagellates	861.2	1185.5	−27
Total	1205.6	1774.9	−32

Table S3. Summary of the statistical analyses performed on all data for mesocosms 1 to 6

Parameter	Mean		SD		Normality: (Anderson-Darling) $P > 0.05$ = normal distribution		Transformation	Test of equal variances: (Levene's statistic) $P > 0.05$ = equal variances	Two-sample *t* test: $P < 0.05$ = significant difference between means	Boxplot (similarity in shape)	Mann-Whitney nonparametric test W: $P < 0.05$ = significant difference between means	Mood's Median nonparametric test χ^2: $P < 0.05$ = significant difference between medians
	High CO_2	Ambient CO_2	High CO_2	Ambient CO_2	High CO_2	Ambient CO_2						
DMS	8.63	14.28	7.54	12.75	0.781 $P = 0.033$	0.617 $P = 0.089$	None	3.94 $P = 0.050$				**4.17, df = 1, $P = 0.041$**
DMS					1.334 $P < 0.005$	0.887 $P = 0.022$	Square root	0.90 $P = 0.345$		Similar	**1993 $P = 0.0142$**	
DMSP	155.80	192.30	73.10	103.90	0.662 $P = 0.079$	0.694 $P = 0.065$	None	4.34 $P = 0.040$	1.83, df = 85, $P = 0.07$[a]			
CH_3I	5.42	10.59	3.04	5.55	0.911 $P = 0.019$	0.530 $P = 0.167$	None	10.53 $P = 0.002$				**20.51, df = 1, $P < 0.001$**
CH_3I			3.59	7.27	0.389 $P = 0369$	0.594 $P = 116$	Square root	2.33 $P = 0.131$	4.64, df = 84, $P < 0.001$[a,b]			
C_2H_5I	0.51	0.82	0.38	0.55	1.225 $P < 0.005$	0.462 $P = 0.246$	None	6.54 $P = 0.012$				**8.37, df = 1, $P = 0.004$**
C_2H_5I					0.246 $P = 0.745$	0.246 $P = 0.743$	Square root	2.66 $P = 0.107$	2.73, df = 85, $P = 0.008$[a,b]			
CH_2I_2	107.60	166.0	151.40	218.90	4.868 $P < 0.005$	4.116 $P < 0.005$	None	2.13 $P = 0.148$		Similar	1701 $P = 0.1444$	
CH_2I_2					2.860 $P < 0.005$	2.655 $P < 0.005$	Square root	1.28 $P = 0.261$		Similar	1701 $P = 0.1444$	
CH_2ClI	183.60	235.60	170.80	205.50	1.618 $P < 0.005$	1.413 $P < 0.005$	None	1.19 $P = 0.278$		Not similar		2.28, df = 1, $P = 0.131$
CH_2ClI					1.278 $P < 0.005$	2.148 $P < 0.005$	Square root	0.44 $P = 0.508$		Not similar		2.28, df = 1, $P = 0.131$
$CHBr_3$	31.93	28.57	21.99	19.30	2.170 $P < 0.005$	2.824 $P < 0.005$	None	0.71 $P = 0.400$		Similar	2047 $P = 0.1285$	
$CHBr_3$					2.823 $P < 0.005$	3.487 $P < 0.005$	Square root	0.10 $P = 0.758$		Similar	2047 $P = 0.1285$	
CH_2Br_2	2.44	2.40	1.15	0.82	0.520 $P = 0.176$	0.725 $P = 0.054$	None	2.37 $P = 0.128$	−0.17, df = 83, $P = 0.868$[b]			
$CHBr_2Cl$	0.60	0.47	0.18	0.10	0.529 $P = 0.168$	0.752 $P = 0.047$	None	6.85 $P = 0.1011$		Not similar		**16.79, df = 1, $P < 0.001$**
$CHBr_2Cl$					2.088 $P < 0.005$	0.460 $P = 0.249$	Square root	3.52 $P = 0.064$		Similar	**2391 $P < 0.001$**	
Chl-a	2.55	3.20	1.75	2.92	0.610 $P = 0.107$	2.472 $P < 0.005$	None	4.32 $P = 0.040$				0.17, df = 1, $P = 0.683$

Text in boldface indicates differences considered significant at a threshold of $P < 0.05$.
[a]*t* test performed NOT assuming equal variances considered significant at a threshold of $P < 0.05$.
[b]*t* test performed assuming equal variances.

Table S4. Summary of the statistical analyses performed on data for mesocosms 1 to 6 for the period of bloom May 10 to 17

Parameter	Mean		SD		Normality: (Anderson-Darling) $P > 0.05$ = normal distribution		Transformation	Test of equal variances: (Levene's statistic) $P > 0.05$ = equal variances	Two-sample t test: $P < 0.05$ = significant difference between means	Boxplot (Similarity in shape)	Mann-Whitney nonparametric test W: $P < 0.05$ = significant difference between means	Mood's Median nonparametric test χ^2: $P < 0.05$ = significant difference between medians
	High CO_2	Ambient CO_2	High CO_2	Ambient CO_2	High CO_2	Ambient CO_2						
DMS	6.1	14.1	3.96	7.46	0.471 $P = 0.217$	0.329 $P = 0.487$	None	9.84 $P = 0.003$	**4.75, df = 24, $P < 0.001$**[a]			
DMSP	177.9	243.3	64.0	113.8	0.259 $P = 0.675$	0.422 $P = 0.289$	None	5.09 $P = 0.030$	**2.18, df = 28, $P = 0.038$**[a]			
CH_3I	6.88	11.88	3.28	6.80	0.201 $P = 0.859$	0.431 $P = 0.271$	None	8.11 $P = 0.008$	**2.75, df = 22, $P = 0.012$**[a]			
C_2H_5I	0.64	0.92	0.44	0.58	0.496 $P = 0.188$	0.873 $P = 0.020$	None	2.36 $P = 0.134$		Not similar		0.11, df = 1, $P = 0.738$
CH_2I_2	203.8	285.1	176.5	243.9	0.663 $P = 0.069$	0.504 $P = 0.176$	None	2.28 $P = 0.140$	1.13, df = 33, $P = 0.265$[b]			
CH_2ClI	174.8	189.6	198.2	220.1	1.429 $P < 0.005$	1.416 $P < 0.005$	None	0.20 $P = 0.621$		Similar	307.5 $P = 0.5974$	
$CHBr_3$	42.33	38.85	11.99	11.77	1.864 $P < 0.005$	1.229 $P = 0.006$	None	0.00 $P = 0.973$		Similar	381.0 $P = 0.0622$	
CH_2Br_2	1.703	1.804	0.86	0.47	0.556 $P = 0.129$	0.259 $P = 0.671$	None	5.24 $P = 0.029$	0.44, df = 26, $P = 0.667$[a]			
$CHBr_2Cl$	0.52	0.43	0.10	0.09	0.390 $P = 0.345$	0.540 $P = 0.141$	None	0.50 $P = 0.484$	**−2.82, df = 33, $P = 0.008$**[b]			
Chl-a	3.12	5.22	1.78	3.38	0.452 $P = 0.245$	0.664 $P = 0.070$	None	7.07 $P = 0.011$	**2.45, df = 28, $P = 0.021$**[a]			

Text in boldface indicates differences considered significant at a threshold of $P < 0.05$.
[a] t test performed NOT assuming equal variances considered significant at a threshold of $P < 0.05$.
[b] t test performed assuming equal variances.

Table S5. Absolute and relative analytical error calculated from triplicate samples taken from M1 (high CO_2) and M6 (ambient CO_2) on alternate days

Compound	M1 mean	Absolute error (±)	Relative error % (±)	M6 mean	Absolute error (±)	Relative error % (±)
DMS nM	4.61	0.20	5.60	7.02	0.32	6.33
DMSP nM	149.79	28.26	16.33	263.16	47.73	22.91
CH_3I pM	5.01	0.817	16.71	9.36	0.47	10.82
C_2H_5I pM	0.45	0.091	17.97	0.80	0.089	21.71
CH_2I_2pM	92.23	7.26	17.76	209.42	20.06	10.83
CH_2ClI pM	165.84	25.14	10.75	252.53	14.42	6.42
$CHBr_3$ pM	31.05	2.50	7.63	26.49	1.18	4.79
CH_2Br_2 pM	2.12	0.44	25.86	2.14	0.16	7.16
$CHBr_2Cl$ pM	0.57	0.056	8.00	0.43	0.035	7.83