

Supplementary Data

Perturbing phytoplankton: A tale of isotopic fractionation in two coccolithophore species

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Treatment	Treatment	AVG HCO ₃ ⁻ (μmol Kg ⁻¹)	AVG CO ₃ ²⁻ (μmol Kg ⁻¹)	AVG pCO ₂ (μatm]	AVG CO ₂ (μmol kg ⁻¹)	AVG pH (NBS)	AVG Omega	TPC raw μg	POC raw μg	13C- TPC	13C-POC
200A	200	1010.30	83.60	248.00	8.60	8.14	2.04	299.9	154.9	-18.6	-25.8
	200	1010.30	83.60	248.00	8.60	8.14	2.04	298.1	149.7	-18.5	-26.3
200B	200	1087.75	55.15	421.25	14.60	7.93	1.35	295.0	180.6	-19.0	-25.0
	200	1087.75	55.15	421.25	14.60	7.93	1.35	292.5	167.0	-18.5	-25.4
280A	280	1425.25	117.90	327.15	11.40	8.15	2.88	283.1	133.7	-18.6	-26.4
	280	1425.25	117.90	327.15	11.40	8.15	2.88	279.8	159.2	-18.7	-25.6
280B	280	1445.20	105.45	371.00	12.75	8.10	2.57	420.8	263.7	-18.7	-23.3
	280	1445.20	105.45	371.00	12.75	8.10	2.57	413.7	217.5	-18.5	-21.9
380A	380	1908.10	153.25	450.90	15.65	8.14	3.74	450.7	288.3	-18.5	-22.9
	380	1908.10	153.25	450.90	15.65	8.14	3.74	449.3	269.5	-18.4	-23.1
380B	380	1939.15	141.55	497.80	17.30	8.10	3.45	356.5	220.0	-18.3	-23.2
	380	1939.15	141.55	497.80	17.30	8.10	3.45	355.5	224.5	-17.9	-23.6
950A	950	4889.95	353.70	1126.00	44.35	8.09	8.63	472.6	347.9	-18.6	-22.5
	950	4889.95	353.70	1126.00	44.35	8.09	8.63	473.0	312.5	-18.5	-22.6
950B	950	4878.60	361.40	1237.50	43.00	8.10	8.82	470.7	239.9	-18.8	-23.6
	950	4878.60	361.40	1237.50	43.00	8.10	8.82	456.4	359.3	-18.4	-22.1
1400A	1400	7183.55	486.70	1993.90	69.25	8.06	11.87	452.2	291.2	-18.2	-22.6
	1400	7183.55	486.70	1993.90	69.25	8.06	11.87	444.9	206.9	-18.5	-29.5
1400B	1400	7159.20	503.55	1907.45	66.25	8.08	12.28	445.2	263.4	-18.9	-23.2
	1400	7159.20	503.55	1907.45	66.25	8.08	12.28	449.2	282.7	-18.6	-23.2

Red=10 or more % difference

Blue=remarks

Gephyrocapsa oceanica TPC, POC, POC, stable carbon isotopes, PON

PON _{tpc} raw µg	PON _{poc} raw µg	Blank TPC µg	Blank POC µg	Blank PON µg	TPC µg	POC µg	PON _{tpc} µg	PON _{poc} µg	TPC pg ml-1	POC pg ml-1	PON _{tpc} pg ml-1	PON _{poc} pg ml-1	
21.2	18.5	3.2			2.3	297.3	152.7	19.8	16.9	849500.0	436214.3	56642.9	48285.7
21.1	18.5	3.0			2.4	295.5	147.5	19.7	16.9	844357.1	421357.1	56357.1	48285.7
19.8	20.8	2.2			0.4	292.4	178.4	18.4	19.2	835500.0	509642.9	52642.9	54857.1
20.8	19.7	1.9			0.4	289.9	164.8	19.4	18.1	828357.1	470785.7	55500.0	51714.3
20.4	16.8		1.3		0.6	280.5	131.5	19.0	15.2	801500.0	375642.9	54357.1	43428.6
20.2	18.8		1.7		0.5	277.2	157.0	18.8	17.2	792071.4	448500.0	53785.7	49142.9
27.6	24.6		2.9		2.6	418.2	261.5	26.2	23.0	1194928.6	747071.4	74928.6	65714.3
27.3	21.5		3.0		2.7	411.1	215.3	25.9	19.9	1174642.9	615071.4	74071.4	56857.1
28.0	25.1					448.1	286.1	26.6	23.5	1280357.1	817357.1	76071.4	67142.9
28.0	24.1	2.6			1.4	446.7	267.3	26.6	22.5	1276357.1	763642.9	76071.4	64285.7
24.0	22.4		2.2		1.6	353.9	217.8	22.6	20.8	1011214.3	622214.3	64642.9	59428.6
23.2	22.3					352.9	222.3	21.8	20.7	1008357.1	635071.4	62357.1	59142.9
30.8	30.3					470.0	345.7	29.4	28.7	1342928.6	987642.9	84071.4	82000.0
30.6	26.6					470.4	310.3	29.2	25.0	1344071.4	886500.0	83500.0	71428.6
30.8	23.2					468.1	237.7	29.4	21.6	1337500.0	679071.4	84071.4	61714.3
30.0	29.6					453.8	357.1	28.6	28.0	1296642.9	1020214.3	81785.7	80000.0
29.5	25.8					449.6	289.0	28.1	24.2	1284642.9	825642.9	80357.1	69142.9
29.4	26.4					442.3	204.7	28.0	24.8	1263785.7	584785.7	80071.4	70857.1
28.6	23.0					442.6	261.2	27.2	21.4	1264642.9	746214.3	77785.7	61142.9
28.9	26.1					446.6	280.5	27.5	24.5	1276071.4	801357.1	78642.9	70000.0

Cells ml-1	μ d-1	TPC pg cell-1	POC pg cell-1	PONtpc pg cell-1	PONpoc pg cell-1	PIC pg cell-1	PIC/POC	POC/PON	TPCprod pg cell-1 day-1	POCprod pg cell-1 day-1
13536	0.86	62.76	32.23	4.18	3.57	30.89	0.98	8.88	54.1	27.8
13536	0.86	62.38	31.13	4.16	3.57				53.8	26.8
12650	0.90	66.05	40.29	4.16	4.34	27.01	0.70	9.20	59.3	36.2
12650	0.90	65.48	37.22	4.39	4.09				58.8	33.4
11141	0.83	71.94	33.72	4.88	3.90	34.53	0.93	8.90	59.8	28.0
11141	0.83	71.10	40.26	4.83	4.41				59.1	33.5
14709	0.81	81.24	50.79	5.09	4.47	34.25	0.74	11.11	65.5	41.0
14709	0.81	79.86	41.82	5.04	3.87				64.4	33.7
14118	0.87	90.69	57.89	5.39	4.76	34.56	0.62	12.03	79.1	50.5
14118	0.87	90.41	54.09	5.39	4.55				78.9	47.2
19687	0.94	51.37	31.61	3.28	3.02	19.36	0.61	10.60	48.1	29.6
19687	0.94	51.22	32.26	3.17	3.00				48.0	30.2
18091	1.10	74.23	54.59	4.65	4.53	22.47	0.43	12.22	81.5	59.9
18091	1.10	74.30	49.00	4.62	3.95				81.5	53.8
17198	1.26	77.77	39.49	4.89	3.59	27.18	0.55	11.99	97.8	49.7
17198	1.26	75.39	59.32	4.76	4.65				94.8	74.6
17146	0.90	74.92	48.15	4.69	4.03	33.19	0.81	10.07	67.5	43.4
17146	0.90	73.71	34.11	4.67	4.13				66.4	30.7
18397	0.90	68.74	40.56	4.23	3.32	26.99	0.64	11.80	61.9	36.5
18397	0.90	69.36	43.56	4.27	3.81				62.5	39.2

PONtpcprod pg cell-1 1 day-1	PONpocpro pg cell-1 day-1	PICprod pg cell-1 day-1	d13C-DIC t0	d13C-DIC tfin	d13C-CO2 (0/00)	ep_CO2
3.6	3.1	26.6	-7.25	-6.70	-16.7	9.3
3.6	3.1				-16.7	9.8
3.7	3.9	24.3	-7.25	-6.70	-16.7	8.5
3.9	3.7				-16.7	8.9
4.1	3.2	28.7	-7.18	-6.93	-17.0	9.7
4.0	3.7				-17.0	8.9
4.1	3.6	27.6	-7.18	-6.75	-16.8	6.7
4.1	3.1				-16.8	5.2
4.7	4.1	30.2	-7.22	-6.68	-16.7	6.3
4.7	4.0				-16.7	6.5
3.1	2.8	18.1	-7.22	-6.70	-16.7	6.6
3.0	2.8				-16.7	7.0
5.1	5.0	24.7	-7.15	-6.90	-16.9	5.7
5.1	4.3				-16.9	5.8
6.1	4.5	34.2	-7.15	-6.89	-16.9	6.8
6.0	5.9				-16.9	5.3
4.2	3.6	29.9	-7.10	-6.92	-17.0	5.8
4.2	3.7				-17.0	12.9
3.8	3.0	24.3	-7.10	-6.90	-16.9	6.4
3.9	3.4				-16.9	6.4

Treatment	Treatment	AVG HCO3- (µmol Kg-1]	AVG CO32- (µmol Kg-1]	AVG pCO2 (µatm]	AVG CO2 (µmol kg-1]	AVG pH (NBS)	AVG Omega	TPC raw µg	POC raw µg	13C-TPC	13C-POC	PONtpc raw µg
200A	200	1016.15	77.30	261.95	9.10	8.11	1.89	361.3	165.7	-18.5	-26.5	23.4
	200	1016.15	77.30	261.95	9.10	8.11	1.89	362.2	252.8	-18.3	-21.8	23.3
200B	200	1066.40	53.55	420.15	14.60	7.92	1.31	437.0	301.9	-18.4	-21.7	29.1
	200	1066.40	53.55	420.15	14.60	7.92	1.31	436.8	317.1	-18.7	-21.7	29.6
280A	280	1429.45	114.90	335.80	11.70	8.14	2.81	285.0	323*	-18.2	-22.4	18.6
	280	1429.45	114.90	335.80	11.70	8.14	2.81	300.6	165.2	-18.0	-22.9	19.5
280B	280	1442.80	107.10	364.10	12.65	8.10	2.61	289,3*	229.7	-18.0	-22.1	18,3*
	280	1442.80	107.10	364.10	12.65	8.10	2.61	363.6	244.1	-18.1	-21.7	22.7
380A	380	1934.65	141.05	497.25	17.30	8.10	3.44	370.6	234.2	-17.4	-23.3	22.5
	380	1934.65	141.05	497.25	17.30	8.10	3.44	372.3		-17.4		23.4
380B	380	1942.80	131.45	539.65	18.75	8.06	3.21	347.4	219.7	-17.2	-24.2	22.0
	380	1942.80	131.45	539.65	18.75	8.06	3.21	364.3	221.6	-17.3	-24.2	22.8
950A	950	4906.75	353.55	1286.30	44.70	8.09	8.63	267.7	155.7	-19.5	-26.8	24.4
	950	4906.75	353.55	1286.30	44.70	8.09	8.63	265.3	165.2	-19.9	-23.7	24.7
950B	950	4886.55	375.60	1189.50	41.30	8.12	9.16	263.3	156.5	-20.0	-27.5	24.0
	950	4886.55	375.60	1189.50	41.30	8.12	9.16	260.2	153.4	-19.7	-27.8	24.7
1400A	1400	7167.55	515.05	1868.10	64.90	8.09	12.56	310.9	193.6	-20.9	-27.8	31.1
	1400	7167.55	515.05	1868.10	64.90	8.09	12.56	308.2	188.4	-20.9	-28.3	30.3
1400B	1400	7168.25	526.75	1827.55	63.45	8.10	12.84	298.5	207.1	-21.0	-27.9	29.0
	1400	7168.25	526.75	1827.55	63.45	8.10	12.84	306.2	196.0	-21.3	-28.0	29.7

Red=10 or more % difference between duplicates

Blue=remarks in labbook

Red*=excluded

**Coccolithus braarudii TPC, POC, POC, stable carbon isotopes, PON
Growth rates (coulter counter (CC) and manual microscopy counts)
%collapsed spheres and %malformation**

PONpoc raw	Blank TPC	Blank POC	Blank PON	TPC	POC	PONtpc	PONpoc	TPC	POC	PONtpc	PONpoc	
µg	µg	µg	µg	µg	µg	µg	µg	pg ml-1	pg ml-1	pg ml-1	pg ml-1	
23.7	4.2			0.8	358.3	163.8	23.0	23.4	1023642.9	468071.4	65785.7	66714.3
23.4	3.1			0.6	359.2	250.9	22.9	23.1	1026214.3	716928.6	65500.0	65857.1
28.8	2.4			0.1	434.0	300.0	28.7	28.5	1239928.6	857214.3	82071.4	81285.7
29.0	2.4			0.0	433.8	315.2	29.2	28.7	1239357.1	900642.9	83500.0	81857.1
26.1			2.0	0.4	282.0		18.2	25.8	805642.9		52071.4	73571.4
19.0			1.2	0.3	297.6	163.3	19.1	18.7	850214.3	466642.9	54642.9	53285.7
21.3			1.0	0.4		227.8		21.0		650928.6		59857.1
21.7			3.3	0.3	360.6	242.2	22.3	21.4	1030214.3	692071.4	63785.7	61000.0
24.9					367.6	232.3	22.1	24.6	1050214.3	663700.0	63214.3	70142.9
	3.0			0.4	369.3		23.0		1055071.4		65785.7	
26.8			1.9	0.4	344.4	217.8	21.6	26.4	983928.6	622300.0	61785.7	75514.3
34.1					361.3	219.7	22.4	33.7	1032214.3	627757.1	64071.4	96285.7
22.5					264.7	153.8	24.0	22.2	756214.3	439500.0	68642.9	63285.7
17.9					262.3	163.3	24.3	17.6	749357.1	466642.9	69500.0	50142.9
23.2					260.3	154.6	23.6	22.9	743642.9	441785.7	67500.0	65285.7
23.9					257.2	151.5	24.3	23.6	734785.7	432928.6	69500.0	67285.7
29.7					307.9	191.7	30.7	29.4	879642.9	547785.7	87785.7	83857.1
29.2					305.2	186.5	29.9	28.9	871928.6	532928.6	85500.0	82428.6
30.4					295.5	205.2	28.6	30.1	844214.3	586357.1	81785.7	85857.1
29.2					303.2	194.1	29.3	28.9	866214.3	554642.9	83785.7	82428.6

**Cells ml-1
(as counted
by CC)**

	μ d-1 (CC)	Cells ml-1 (LM counts)	μ d-1 (LM counts)	TPC pg cell-1	POC pg cell-1	PONtpc pg cell-1	PONpoc pg cell-1	PIC pg cell-1	PIC/POC	POC/PON	POC/PONtpc	TPCprod pg cell-1 day-1
1803	0.62	2355	0.67	434.67	198.76	27.93	28.33	183.62	0.73	8.94	9.03	292.4
1803	0.62	2355	0.67	435.76	304.43	27.81	27.96					293.1
2106	0.57	3170	0.67	391.14	270.41	25.89	25.64	113.79	0.41	10.77	10.62	263.5
2106	0.57	3170	0.67	390.96	284.11	26.34	25.82					263.3
1257	0.61	1540	0.64	523.14		33.81	47.77	234.60	0.77	7.36	8.75	336.5
1257	0.61	1540	0.64	552.09	303.01	35.48	34.60					355.1
1545	0.60	2253	0.64		288.92		26.57	159.22	0.53	11.11	10.53	
1545	0.60	2253	0.64	457.26	307.18	28.31	27.08					294.2
2103	0.64	2566	0.67	409.28	258.65	24.64	27.34	151.58	0.59	9.46	10.29	274.5
2103	0.64	2566	0.67	411.17		25.64						275.8
1893	0.62	2120	0.66	464.12	293.54	29.14	35.62	180.68	0.61	7.28	9.93	306.7
1893	0.62	2120	0.66	486.89	296.11	30.22	45.42					321.8
1511	0.49	877	0.47	862.27	501.14	78.27	72.16	341.75	0.66	7.99	6.56	409.2
1511	0.49	877	0.47	854.46	532.09	79.25	57.18					405.5
1597	0.49	948	0.41	784.43	466.02	71.20	68.87	318.41	0.69	6.60	6.38	320.4
1597	0.49	948	0.41	775.09	456.68	73.31	70.98					316.6
2059	0.51											
2059	0.51											
1657	0.57	667	0.27	1265.69	879.10	122.62	128.72	426.86	0.50	6.78	6.89	347.5
1657	0.57	667	0.27	1298.67	831.55	125.62	123.58					356.5

POCprod pg cell-1 day-1	PONtpcprod pg cell-1 day-1	PONpocprod pg cell-1 day-1	PICprod pg cell-1 day-1	d13C-DIC t0 (‰)	d13C-DIC tfin (‰)	d13C-CO2 (‰)	ep_CO2	%collapsed sphers	N_intact spheres	N_collapsed spheres	%blocky morphologies (malformation)
133.7	18.8	19.1	123.5	-7.25	-6.49	-18.4	7.0	14.1	269	44	10.2
204.8	18.7	18.8				-18.4	2.7				
182.1	17.4	17.3	76.6	-7.25	-6.55	-18.4	2.5	24.5	234	76	8.8
191.4	17.7	17.4				-18.4	2.5				
	21.7	30.7	150.9	-7.18	-6.89	-18.8		18.0	250	55	12.4
194.9	22.8	22.3				-18.8	3.6				
185.9		17.1	102.4	-7.18	-6.81	-18.7	2.8	19.0	247	58	15.3
197.6	18.2	17.4				-18.7	2.4				
173.5	16.5	18.3	101.7	-7.22	-			21.6	240	66	17.4
	17.2										
194.0	19.3	23.5	119.4	-7.22	-6.70	-18.6	4.6	16.8	272	55	16.0
195.7	20.0	30.0				-18.6	4.6				
237.8	37.1	34.2	162.2	-7.15	-6.95	-18.8	6.9	79.5	63	245	76.1
252.5	37.6	27.1				-18.8	4.2				
190.3	29.1	28.1	130.1	-7.15	-6.97	-18.8	7.5	82.9	55	267	74.4
186.5	29.9	29.0				-18.8	7.8				
				-7.10	-6.95	-18.8	7.5	98.1	6	308	90.9
						-18.8	8.0				
241.4	33.7	35.3	117.2	-7.10	-7.53	-19.4	7.0	95.1	16	312	88.5
228.3	34.5	33.9				-19.4	7.2				