



Supplement of

Warming and ocean acidification may decrease estuarine dissolved organic carbon export to the ocean

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Supplement:

Table S1. Measured total alkalinity (TA) and DIC used to calculate pH (Free scale) using CO₂SYS directly compared to the measured pH from the cores using HACH multiprobe meter with pH probe. Mean absolute difference was used to estimate uncertainty in *p*CO₂ calculations via CO₂SYS. Data used in a manuscript currently under review.

TA (μ M)	DIC(μ M)	pH (calculated)	pH (measured)	absolute difference
2141.19	1932.80	8.06	8.09	0.03
2197.35	1978.28	8.08	8.08	0.00
2143.33	1933.06	8.07	8.08	0.01
2240.94	2001.74	8.11	8.09	0.02
2166.91	2006.67	7.94	7.92	0.02
2209.33	2064.23	7.90	7.85	0.05
2148.92	1967.39	7.99	7.94	0.05
2257.76	2085.57	7.96	7.92	0.04
2170.53	1982.56	8.00	7.98	0.02
2198.29	2025.73	7.96	7.91	0.05
2143.47	1952.13	8.01	7.98	0.03
2237.67	2046.81	7.99	7.95	0.04
2192.08	1967.57	8.05	8.10	0.05
2183.91	1952.66	8.06	8.09	0.03
2178.07	1954.05	8.05	8.09	0.04
2219.11	1981.98	8.07	8.09	0.02
2213.20	2043.19	7.92	7.89	0.03
2194.63	2044.33	7.87	7.86	0.01
2216.06	2028.52	7.96	7.89	0.07
2232.28	2076.57	7.88	7.86	0.02
2203.72	2006.91	7.98	7.97	0.01
2185.34	2013.86	7.92	7.91	0.01
2173.92	1964.42	8.01	8.00	0.01
2225.09	2037.00	7.95	7.95	0.00
2198.59	2096.54	7.79	7.82	0.03
2258.32	2160.21	7.78	7.82	0.04
2233.00	2141.65	7.76	7.80	0.04
2200.45	2105.66	7.77	7.80	0.03
2541.41	2435.35	7.77	7.60	0.17
2290.22	2223.37	7.67	7.60	0.07
2243.17	2180.95	7.66	7.60	0.06
2220.31	2157.39	7.67	7.61	0.06
2493.40	2356.90	7.84	7.68	0.16
2261.24	2176.89	7.72	7.68	0.04
2234.05	2138.49	7.76	7.71	0.05
2204.96	2110.97	7.75	7.73	0.02

2227.68	2113.68	7.77	7.81	0.04
2234.09	2106.89	7.81	7.82	0.01
2205.53	2085.13	7.79	7.83	0.04
2250.33	2166.16	7.69	7.64	0.05
2341.82	2215.36	7.80	7.63	0.17
2256.07	2160.85	7.72	7.62	0.10
2225.33	2141.49	7.70	7.62	0.08
2242.14	2120.23	7.81	7.72	0.09
2346.98	2172.34	7.92	7.71	0.21
2255.08	2126.14	7.82	7.71	0.11
2258.32	2091.91	7.91	7.77	0.14
4477.45	4119.12	8.06	8.12	0.06
4344.54	4009.16	8.04	8.10	0.06
4465.28	4109.47	8.05	8.10	0.05
4394.50	4048.37	8.05	8.11	0.06
4339.08	4013.06	8.02	7.97	0.05
4222.14	3934.02	7.98	7.96	0.02
4359.09	4040.09	8.01	7.96	0.05
4298.21	3979.27	8.01	7.97	0.04
4318.94	3974.06	8.04	8.01	0.03
4216.27	3898.43	8.01	7.97	0.04
4339.12	4006.14	8.02	7.99	0.03
4280.18	3943.36	8.03	8.01	0.02
4291.14	3931.18	8.02	8.12	0.10
4284.22	3928.93	8.02	8.11	0.09
4266.35	3917.71	8.01	8.08	0.07
4422.70	3958.88	8.13	8.11	0.02
4218.32	3915.94	7.97	7.97	0.00
4205.44	3913.13	7.96	7.95	0.01
4187.63	3909.22	7.94	7.93	0.01
4317.32	4000.77	7.98	7.96	0.02
4187.10	3913.14	7.92	7.99	0.07
4190.22	3876.99	7.97	7.99	0.02
4422.61	3873.70	8.21	7.96	0.25
4310.09	3948.82	8.03	8.03	0.00

Mean 0.05

Table S2. Overlapping mean control rates (\pm SD) in current and high- $p\text{CO}_2$ incubations for dark and light cycles. Units for dark and light rates ($\mu\text{mol-C}$ or $-\text{O}_2 \text{ m}^{-2} \text{ h}^{-1}$) and net rates (mmol-C or $-\text{O}_2 \text{ m}^{-2} \text{ d}^{-1}$). Scaled means in Table S3 applied to significantly different means (*) only.

	Dark		Light		Net	
	Current	Future	Current	Future	Current	Future
DIC	1199.89	1077.53	-860.79	-612.94	4.07	5.57
	(± 149.43)	(± 230.56)	(± 218.92)	(± 121.31)	(± 2.18)	(± 2.35)
DOC	-570.91	-549.43	610.01	580.51	0.47	0.36
	(± 86.07)	(± 7.76)	(± 60.25)	(± 116.67)	(± 0.92)	(± 1.47)
O₂	-1018.02*	-787.07*	700.20*	525.47*		
	(± 38.20)	(± 16.23)	(± 11.66)	(± 51.03)		
P/R					0.84	0.83
					(± 0.01)	(± 0.04)

Table S3. Scaled means (\pm SD) for R and NPP rates ($\mu\text{mol-O}_2 \text{ m}^{-2} \text{ h}^{-1}$) under current and high- $p\text{CO}_2$ incubations. CON* is the overlapping control present both weeks (note: current control and CON current are the same).

Offset	Actual R		Scaled R		Actual NPP		Scaled NPP	
	Current	Future	Current	Future	Current	Future	Current	Future
$\Delta -3^\circ\text{C}$	-858.9	-645.2	-761.5	-739.9	674.6	742.5	590.5	866.0
	(± 110.68)	(± 54.7)	(± 98.1)	(± 62.8)	(± 137.8)	(± 138.9)	(± 120.6)	(± 162.0)
control	-1018.0	-871.4	-902.5	-999.2	700.2	902.9	612.8	1053.0
	(± 38.2)	(± 62.2)	(± 33.9)	(± 71.3)	(± 11.7)	(± 41.2)	(± 10.2)	(± 48.0)
$\Delta +3^\circ\text{C}$	-1124.8	-895.9	-997.2	-1027.3	-182.0	465.5	-163.5	542.9
	(± 54.8)	(± 68.5)	(± 48.6)	(± 78.5)	(± 265.3)	(± 219.9)	(± 228.1)	(± 256.4)
$\Delta +5^\circ\text{C}$	-1315.8	-1024.4	-1166.4	-1174.7	-445.8	-515.8	-390.1	-601.6
	(± 85.1)	(± 62.7)	(± 75.5)	(± 71.9)	(± 110.8)	(± 149.1)	(± 96.9)	(± 173.8)
CON*	-1018.0	-787.1	-902.5	-902.5	700.2	525.5	612.8	612.8
	(± 38.2)	(± 16.3)	(± 33.9)	(± 18.6)	(± 11.7)	(± 51.0)	(± 10.2)	(± 59.5)

Table S4. Gross primary productivity (GPP) and productivity to respiration ratio (P/R) calculated for each temperature under both current and high- $p\text{CO}_2$.

	Current- $p\text{CO}_2$		High- $p\text{CO}_2$	
	GPP	P/R	GPP	P/R
$\Delta -3^\circ\text{C}$	1351.95	0.89	1605.82	1.09
	(± 185.26)	(± 0.07)	(± 111.28)	(± 0.16)
Control	1515.38	0.84	2052.23	1.03
	(± 37.02)	(± 0.01)	(± 108.95)	(± 0.03)
$\Delta +3^\circ\text{C}$	833.69	0.42	1570.14	0.77
	(± 182.21)	(± 0.11)	(± 267.41)	(± 0.13)
$\Delta +5^\circ\text{C}$	776.29	0.33	573.08	0.25
	(± 172.36)	(± 0.05)	(± 133.81)	(± 0.07)

Table S5. Dark and light fluxes of dissolved inorganic carbon (DIC) for each temperature under both current and high- $p\text{CO}_2$.

	Current- $p\text{CO}_2$		High- $p\text{CO}_2$	
	Dark	light	Dark	light
$\Delta\text{-3}^\circ\text{C}$	676.54 (± 224.38)	-555.01 (± 235.63)	836.97 (± 117.45)	-635.29 (± 380.41)
CON	1199.89 (± 149.43)	-860.79 (± 218.92)	1056.09 (± 165.03)	-1243.32 (± 162.03)
$\Delta\text{+3}^\circ\text{C}$	1242.65 (± 163.32)	131.95 (± 73.50)	1135.09 (± 183.11)	-616.91 (± 87.93)
$\Delta\text{+5}^\circ\text{C}$	1355.29 (± 179.32)	585.27 (± 363.97)	1359.88 (± 193.20)	1424.76 (± 202.41)

Table S6. Dark and light fluxes dissolved organic carbon (DOC) for each temperature under both current and high- $p\text{CO}_2$.

	Current- $p\text{CO}_2$		High- $p\text{CO}_2$	
	Dark	Light	Dark	Light
$\Delta\text{-3}^\circ\text{C}$	320.93 (± 64.79)	-0.64 (± 3.98)	-1223.88 (± 227.07)	43.31 (± 299.53)
CON	-570.91 (± 86.07)	610.01 (± 60.25)	-760.14 (± 237.39)	-148.24 (± 537.23)
$\Delta\text{+3}^\circ\text{C}$	-480.34 (± 381.25)	189.38 (± 238.78)	-1182.04 (± 183.18)	-405.17 (± 820.27)
$\Delta\text{+5}^\circ\text{C}$	-719.96 (± 380.98)	-15.84 (± 14.23)	-881.39 (± 352.69)	-782.00 (± 340.26)

Supplementary methods:

Dissolved inorganic nitrogen (DIN) samples were collected at the start and end of the flux incubations and syringe-filtered (0.45 μm cellulose acetate) into duplicate 10 mL polyethylene vials with a headspace, and stored frozen. Samples were analysed colorimetrically using a LachatTM flow-injection system as described in Eyre and Pont (2003).

Table S7. DIN concentrations (μM) (mean \pm SD) at the start (minimum) and end of the full incubation cycle.

Treatment	Current- $p\text{CO}_2$		High- $p\text{CO}_2$	
	Start	End	Start	End
$\Delta-3$ °C	1.19 (\pm 0.01)	2.02 (\pm 0.45)	1.85 (\pm 0.27)	6.66 (\pm 1.36)
Control	1.85 (\pm 0.16)	4.00 (\pm 0.27)	2.42 (\pm 1.01)	6.11 (\pm 1.39)
$\Delta+3$ °C	1.88 (\pm 0.42)	4.47 (\pm 2.10)	1.97 (\pm 0.31)	9.61 (\pm 1.36)
$\Delta+5$ °C	2.37 (\pm 0.18)	15.52 (\pm 1.81)	2.40 (\pm 0.58)	14.68 (\pm 4.42)