

Supplementary information for

Inorganic carbon fixation by deep prokaryotes as an unaccounted-for CO₂ sink in Antarctic waters

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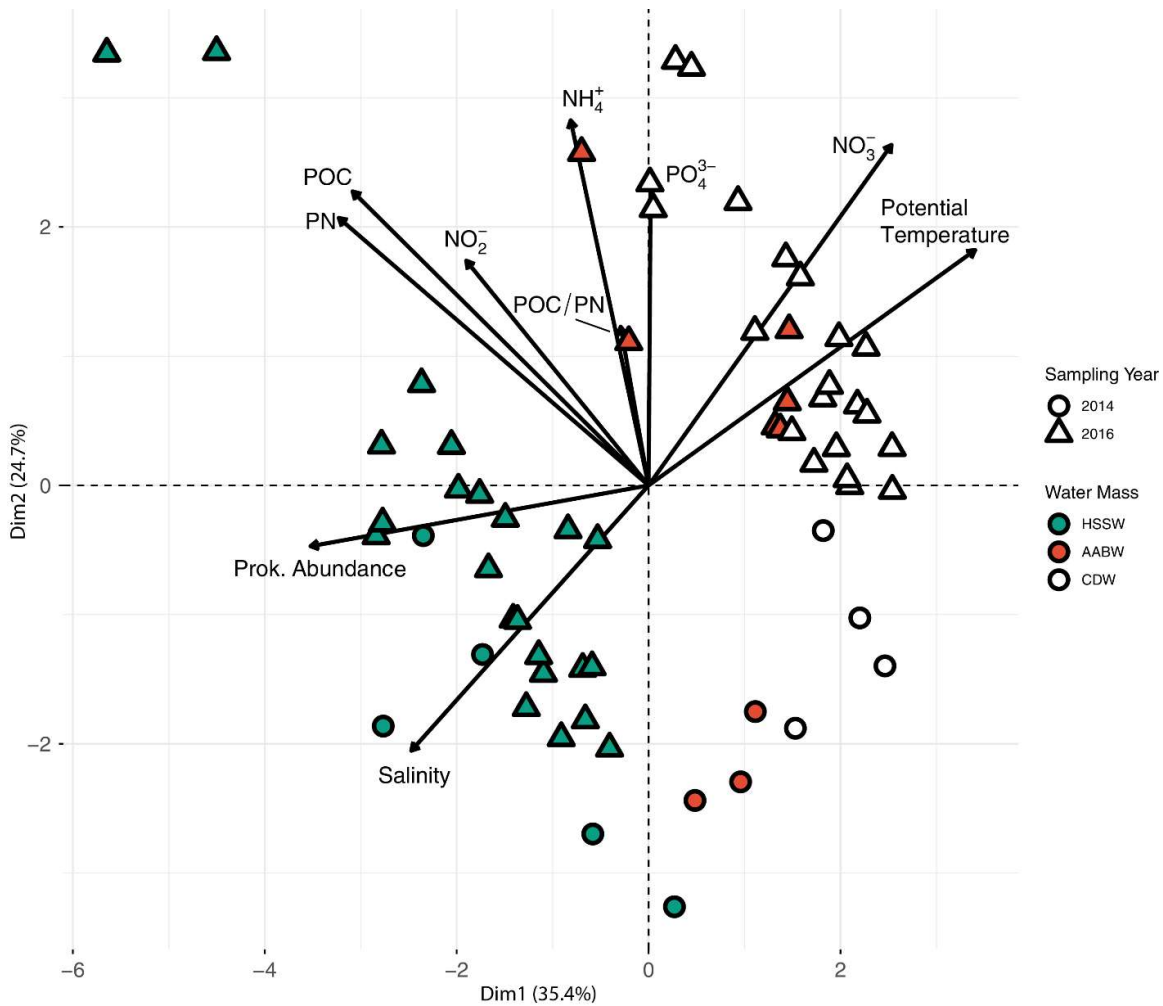
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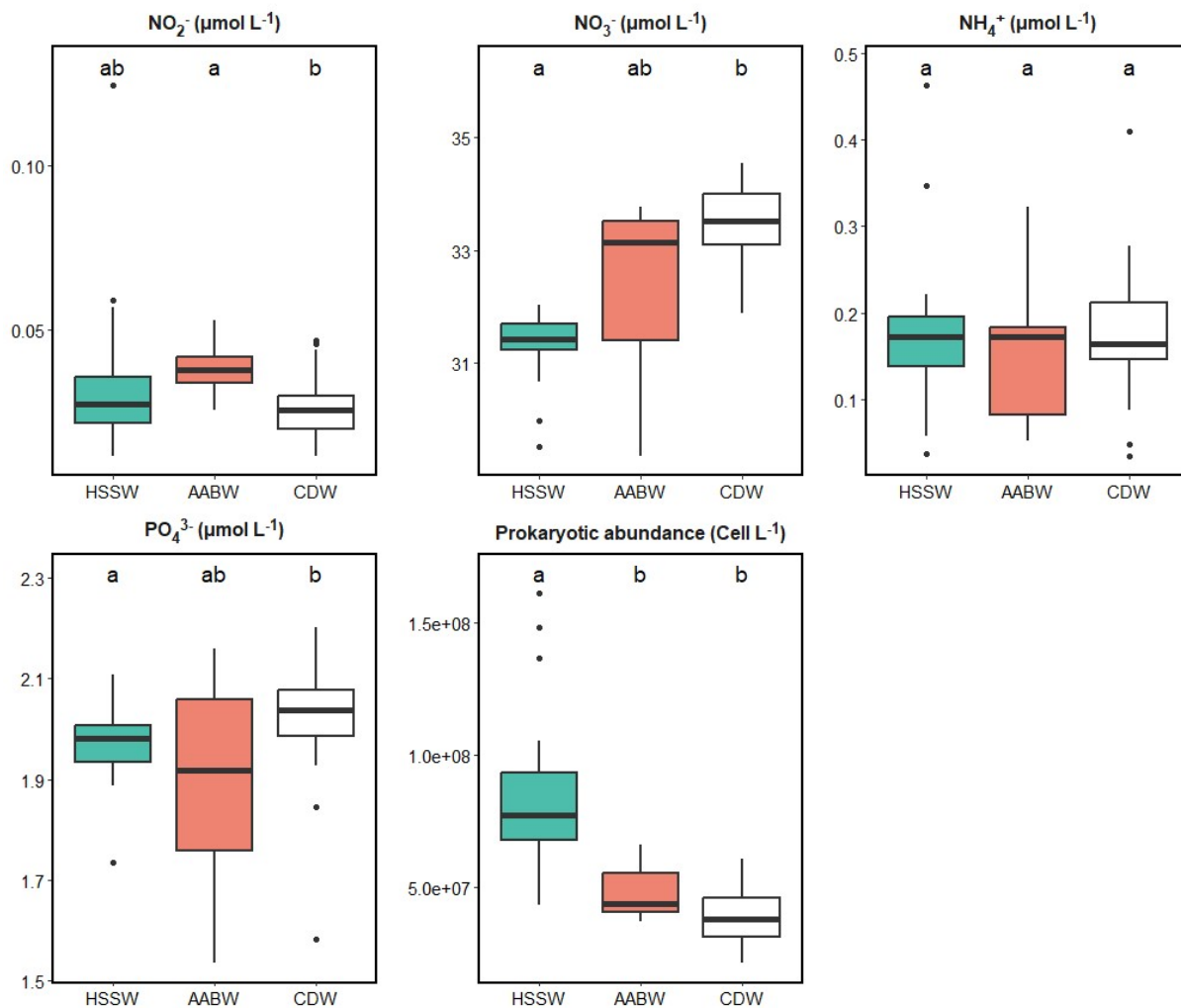
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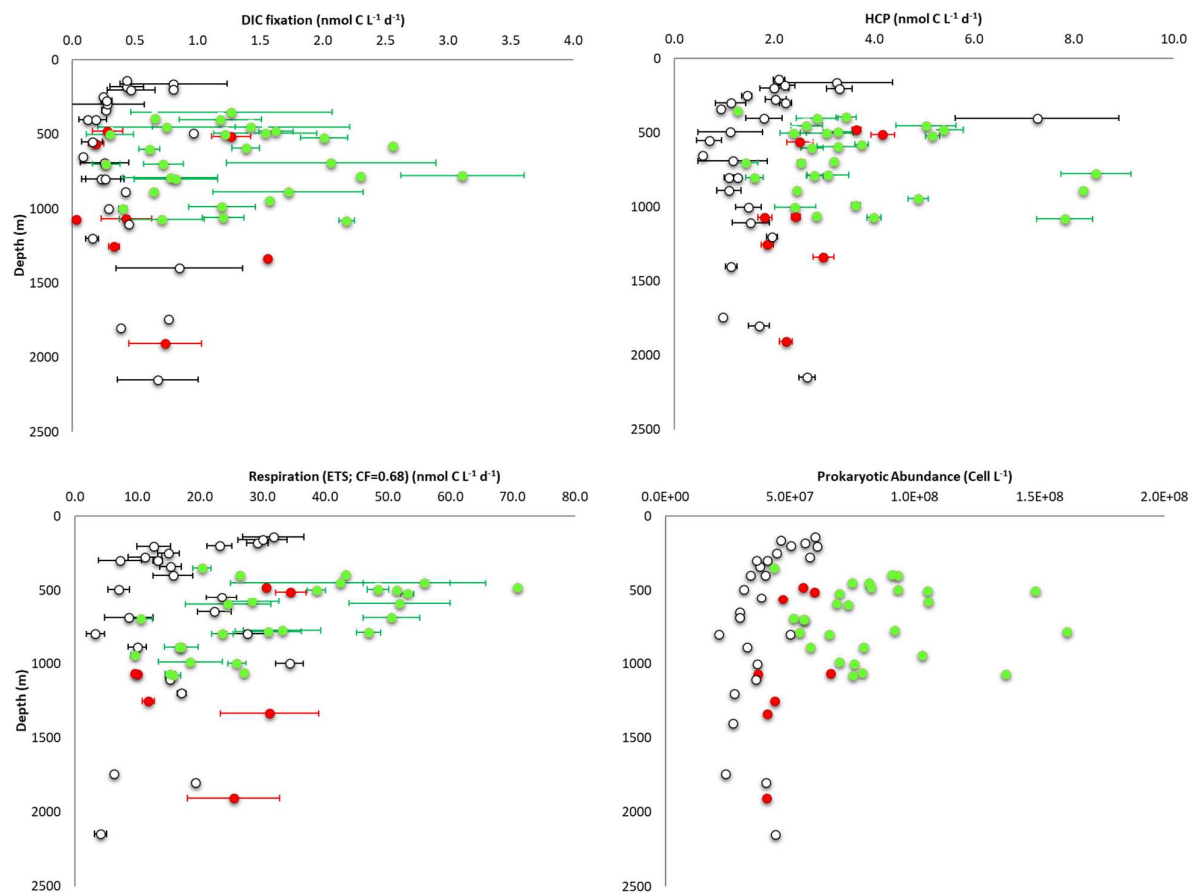
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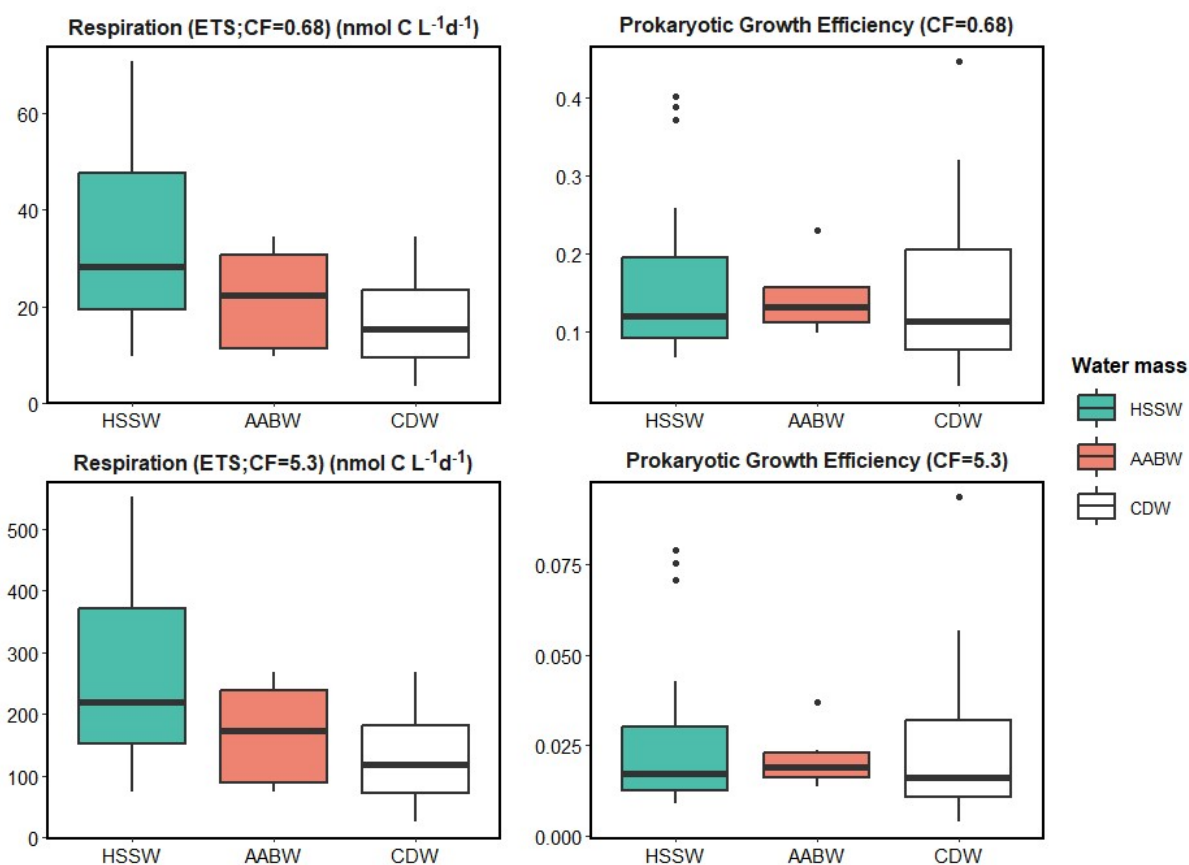
Supplementary Figure 1: Interannual variability of the biogeochemical settings of High Salinity Shelf Water – HSSW, Circumpolar Deep Water – CDW and Antarctic Bottom Water – AABW. The Principal Component Analysis biplot was obtained using the following variables: Potential temperature, Salinity, Prokaryotic abundance and the concentration of nitrite (NO_2^-), ammonium (NH_4^+), nitrate (NO_3^-), phosphate (PO_4^{3-}) Particulate Organic Carbon (POC), Particulate Nitrogen (PN), as well as the POC/PN ratio. Samples for Dissolved Organic Carbon were not collected in 2014 and therefore the dissolved organic pool was excluded from the analysis. Samples collected in 2014 and in 2016 are indicated by circles and triangles, respectively whereas different colours denote different water masses. The Principal Component Analysis (PCA) was computed using the `prcomp` function in base R with the standardised (Z-transformed) set of environmental variables as input. On the PCA biplot (built with `ggplot1`), both samples' scores (as circles or triangles) and variable loadings (arrows) on the first two principal components (PC1 and PC2; 60.1% of variance explained) are visualised. The Mann-Whitney test was run to highlight significant differences between the two years for each water mass. The outcomes highlighted lower concentrations of NH_4^+ in AABW ($U=0^*$) and CDW ($U=0^{**}$), of NO_3^- in AABW ($U=0^*$) and CDW ($U=3^{***}$), of POC in AABW ($U=0^*$) and CDW ($U=4^{**}$), and of PN in AABW ($U=0^*$) and CDW ($U=4^{**}$) in 2014 compared to 2016; $^*p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.



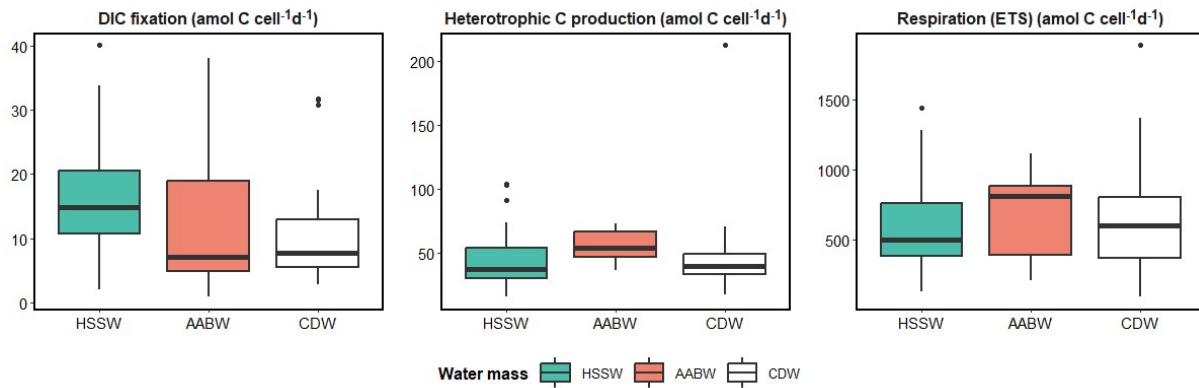
Supplementary Figure 2: Box-whiskers plots [box = interquartile range with median; whiskers = range without outliers] of concentrations of nitrite (NO₂⁻), nitrate (NO₃⁻), ammonium (NH₄⁺), phosphate (PO₄³⁻), and of prokaryotic abundance in High Salinity Shelf Water (HSSW), Antarctic Bottom Water (AABW) and Circumpolar Deep Water (CDW). Letters above boxes refer to results of the Kruskal-Wallis ANOVA, followed by the post hoc Dunn's test ($p < 0.05$). Different letters indicate significant differences among water masses.



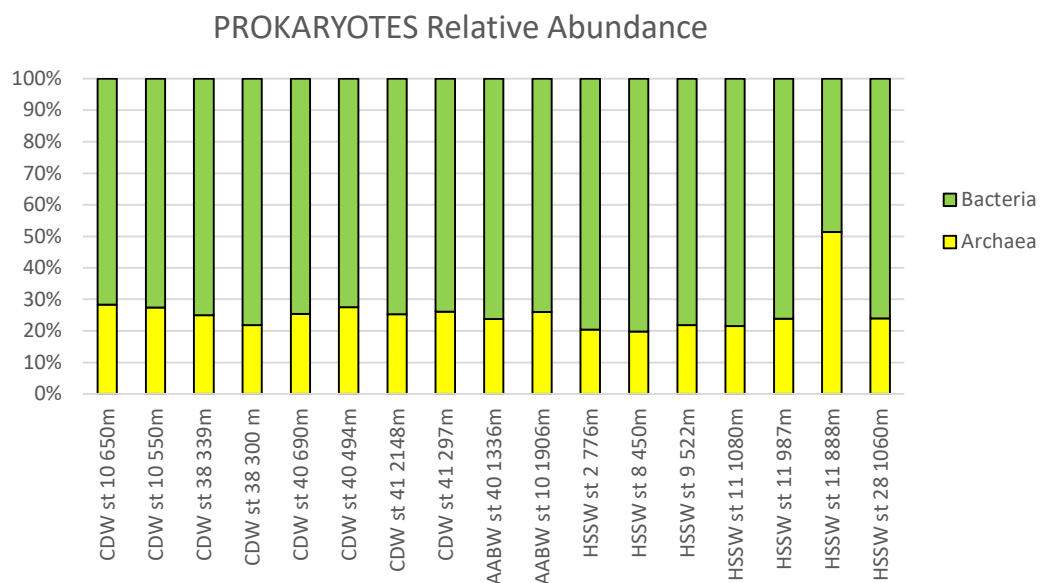
Supplementary Figure 3: Depth profiles of DIC fixation rates, Heterotrophic C Production, Respiration and Prokaryotic abundance in High Salinity Shelf Water (HSSW, green), Antarctic Bottom Water (AABW, red) and Circumpolar Deep Water (CDW, white). Error bars represent the standard deviation among replicates.



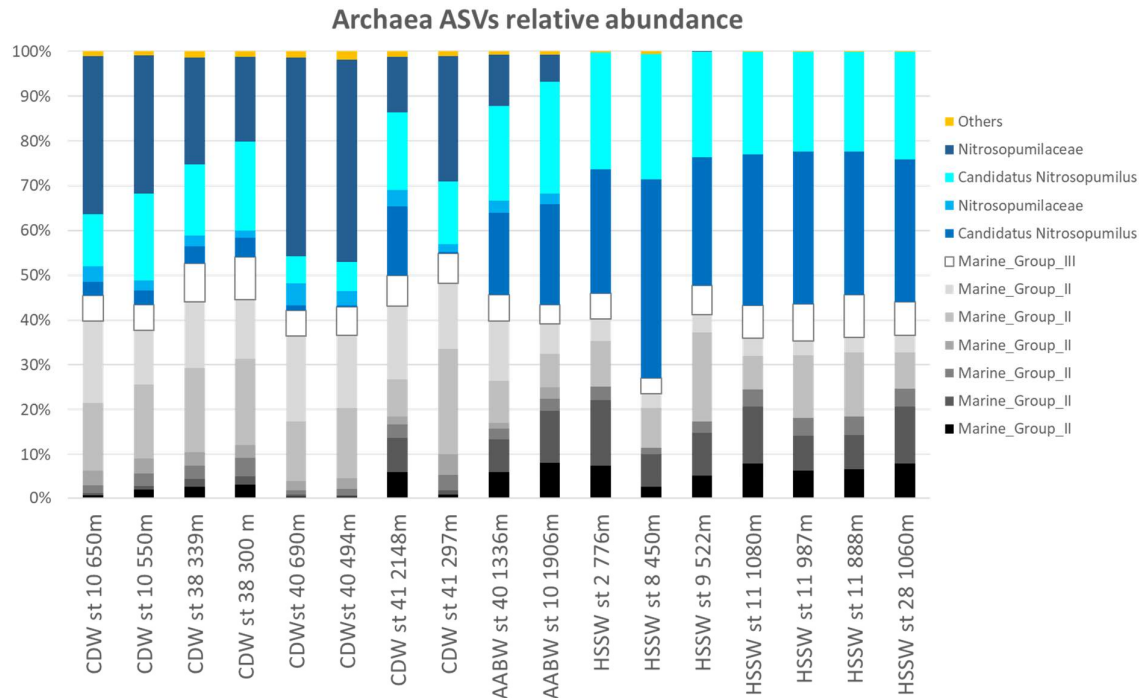
Supplementary Figure 4: Box-whiskers plots [box = interquartile range with median; whiskers = range without outliers] of Respiration Rates and Prokaryotic Growth Efficiency computed with two Conversion Factors (CF = 0.68 and 5.3) in High Salinity Shelf Water (HSSW), Antarctic Bottom Water (AABW) and Circumpolar Deep Water (CDW).



Supplementary Figure 5: Box-whiskers plots [box = interquartile range with median; whiskers = range without outliers] of per cell normalized activities within the three water masses: AABW (Antarctic Bottom Water), CDW (Circumpolar Deep Water) and HSSW (High Salinity Shelf Water). No statistical difference among water masses was assessed when examining the datasets through the Kruskal Wallis ANOVA.



Supplementary Figure 6: Bar plot of the relative abundance of Bacteria and Archaea in selected samples within the Ross Sea deep water masses: AABW (Antarctic Bottom Water), CDW (Circumpolar Deep Water) and HSSW (High Salinity Shelf Water).



Supplementary Figure 7: Bar plot of the relative abundance of archaeal amplicon sequence variants (ASVs) in selected samples within the Ross Sea deep water masses: AABW (Antarctic Bottom Water), CDW (Circumpolar Deep Water) and HSSW (High Salinity Shelf Water). The legend reports the nomenclature of highest available taxonomic level.

Supplementary Table 1: Dates, coordinates, depths, physical, chemical and microbiological data used in the manuscript

Station	Date	Longitude °E	Latitude °N	Bot. Depth (n	Depth	WM	θ	Salinity	DOC	DON	DOC/DON	POC	PN
					m		°C		μmol L ⁻¹	μmol L ⁻¹		μmol L ⁻¹	μmol L ⁻¹
010	2016-01-29	172.8354	-71.8170	1910	1906 ^{OA}	AABW	-0.1235	34.6744	44.58	2.45	18.21	0.54	0.07
010	2016-01-29	172.8354	-71.8170	1910	1800	AABW	-0.0594	34.6762	41.75	2.52	16.55	0.51	0.06
038	2016-02-12	173.0458	-72.3998	517	513	AABW*	-0.8328	34.691	56.92	2.37	23.98	1.20	0.14
038	2016-02-12	173.0458	-72.3998	517	478	AABW*	-0.6655	34.6825	70.00	2.63	26.64	1.13	0.12
040	2016-02-15	177.4346	-71.8436	1340	1336 ^Δ	AABW	-0.2251	34.6743	53.67	2.59	20.75	0.69	0.08
040	2016-02-15	177.4346	-71.8436	1340	1253	AABW	-0.2005	34.6757	54.42	2.40	22.71	0.61	0.09
A6	2014-01-13	-176.7683	-75.0758	580	563 ^O	AABW	-0.7968	34.6273	n.d.	3.07		0.33	0.04
A7	2014-01-16	-176.6252	-75.0357	1080	1070 ^O	AABW	-0.1681	34.6736	n.d.	7.17		0.27	0.03
A8	2014-01-16	-176.6214	-75.0339	1165	1066 ^O	AABW	-1.7370	34.6645	n.d.	3.46		0.35	0.05
						average	-0.53	34.67	53.56	3.18	21.47	0.63	0.08
						st.dev.	0.54	0.02	10.02	1.54	3.74	0.33	0.04
009	2016-01-28	173.0038	-72.3941	506	180 ^O	CDW	0.3965	34.6433	n.d.	2.73		1.24	0.18
009	2016-01-28	173.0038	-72.3941	506	160 ^O	CDW	0.5142	34.5953	n.d.	3.45		1.08	0.14
009	2016-01-28	173.0038	-72.3941	506	140 ^O	CDW	0.3847	34.5744	n.d.	2.89		0.98	0.13
010	2016-01-29	172.8354	-71.8170	1876	1200	CDW	0.606	34.7014	41.58	2.74	15.17	0.29	0.05
010	2016-01-29	172.8354	-71.8170	1876	1000	CDW	0.7269	34.7055	100.08	2.71	36.91	0.26	0.04
010	2016-01-29	172.8354	-71.8170	1876	800	CDW	0.8665	34.7101	n.d.	2.01		0.59	0.08
010	2016-01-29	172.8354	-71.8170	1876	650 ^{OA}	CDW	0.9986	34.71	n.d.	1.73		0.57	0.09
010	2016-01-29	172.8354	-71.8170	1876	550 ^{OA}	CDW	1.0004	34.7059	53.50	2.52	21.20	0.37	0.05
010	2016-01-29	172.8354	-71.8170	1876	400 ^O	CDW	0.8431	34.674	44.00	n.d.		0.49	0.06
038	2016-02-12	173.0458	-72.3998	505	339	CDW	1.0747	34.6932	61.08	2.06	29.68	0.80	0.10
038	2016-02-12	173.0458	-72.3998	505	300 ^Δ	CDW	1.0018	34.6749	57.58	2.33	24.71	0.86	0.12
038	2016-02-12	173.0458	-72.3998	505	250 ^O	CDW	0.854	34.65	63.75	2.54	25.15	0.86	0.12
038	2016-02-12	173.0458	-72.3998	505	200 ^O	CDW	0.5021	34.5944	54.67	2.18	25.12	1.44	0.14
040	2016-02-15	177.4346	-71.8436	1330	1105	CDW	0.2416	34.6863	55.17	3.20	17.22	0.44	0.06
040	2016-02-15	177.4346	-71.8436	1330	888	CDW	0.8626	34.7091	61.67	2.50	24.68	0.40	0.06
040	2016-02-15	177.4346	-71.8436	1330	690 ^{OA}	CDW	1.0932	34.7169	62.75	3.90	16.08	0.60	0.07
040	2016-02-15	177.4346	-71.8436	1330	494 ^{OA}	CDW	1.2493	34.7183	58.42	3.12	18.71	0.65	0.08
040	2016-02-15	177.4346	-71.8436	1330	275 ^O	CDW	1.4312	34.7105	57.00	2.29	24.92	0.82	0.10
040	2016-02-15	177.4346	-71.8436	1330	203 ^O	CDW	1.2439	34.6728	56.33	0.95	59.04	1.15	0.18
041	2016-02-15	176.7548	-70.9968	2234	2148 ^{OA}	CDW	-0.0358	34.6796	57.17	3.33	17.18	0.57	0.06
041	2016-02-15	176.7548	-70.9968	2234	297 ^{OA}	CDW	1.3596	34.7137	52.17	3.43	15.23	0.52	0.07
A28	2014-01-24	172.3536	-70.7655	1750	1743 ^O	CDW	0.3425	34.6998	n.d.	3.22		0.22	0.05
A29	2014-01-24	172.3554	-70.7687	1730	800 ^O	CDW	0.9096	34.7172	n.d.	4.55		0.36	0.04
A30	2014-01-25	172.1657	-71.2575	1500	1400 ^O	CDW	0.1761	34.6865	n.d.	5.55		0.22	0.03
A31	2014-01-25	172.1682	-71.2708	1500	400 ^O	CDW	1.1458	34.7160	n.d.	4.83		0.33	0.05
						average	0.79	34.68	58.56	2.95	24.73	0.64	0.09
						st.dev.	0.39	0.04	12.62	1.02	11.24	0.34	0.04
002	2016-01-25	167.9008	-76.5712	777	776 ^{OA}	HSSW	-1.9148	34.7889	46.58	3.40	13.70	1.44	0.20
002	2016-01-25	167.9008	-76.5712	777	500 ^O	HSSW	-1.9069	34.7512	47.08	3.46	13.60	1.26	0.15
004	2016-01-25	167.8286	-76.6513	790	783	HSSW	-1.9154	34.7906	45.33	3.37	13.45	1.00	0.11
004	2016-01-25	167.8286	-76.6513	790	600 ^O	HSSW	-1.9059	34.7676	46.92	3.09	15.21	1.03	0.14
004	2016-01-25	167.8286	-76.6513	790	400	HSSW	-1.8986	34.7386	49.00	3.42	14.35	1.16	0.15
007	2016-01-27	175.9833	-74.1383	584	578 ^O	HSSW	-1.9091	34.7641	n.d.	n.d.		2.94	0.34
007	2016-01-27	175.9833	-74.1383	584	500 ^O	HSSW	-1.9085	34.7389	48.50	n.d.		1.22	0.16
008	2016-01-27	170.8507	-72.9394	506	450 ^Δ	HSSW	-1.912	34.7765	51.42	2.90	17.72	1.17	0.12
008	2016-01-27	170.8507	-72.9394	506	350 ^O	HSSW	-1.9178	34.739	46.83	3.30	14.21	0.86	0.11
009	2016-01-28	173.0038	-72.3941	528	522 ^{OA}	HSSW	-1.9106	34.7715	51.00	4.13	12.36	1.47	0.15
009	2016-01-28	173.0038	-72.3941	528	480 ^O	HSSW	-1.9109	34.7714	46.92	3.78	12.42	0.86	0.13
009	2016-01-28	173.0038	-72.3941	528	450 ^O	HSSW	-1.9088	34.7605	47.08	3.36	14.00	1.67	0.23
011	2016-01-31	164.5524	-75.1283	1085	1080 ^{OA}	HSSW	-1.9184	34.8003	43.92	2.86	15.37	0.63	0.10
011	2016-01-31	164.5524	-75.1283	1085	987 ^{OA}	HSSW	-1.92	34.7971	n.d.	2.97		0.53	0.08
011	2016-01-31	164.5524	-75.1283	1085	888 ^{OA}	HSSW	-1.9182	34.7905	n.d.	3.26		0.58	0.08
011	2016-01-31	164.5524	-75.1283	1085	790 ^O	HSSW	-1.9155	34.7817	46.25	2.96	15.60	0.66	0.10
011	2016-01-31	164.5524	-75.1283	1085	691 ^O	HSSW	-1.9083	34.7669	43.75	3.29	13.30	0.67	0.10
011	2016-01-31	164.5524	-75.1283	1085	592 ^O	HSSW	-1.895	34.7597	69.42	2.78	24.99	0.84	0.13
011	2016-01-31	164.5524	-75.1283	1085	494 ^O	HSSW	-1.8681	34.7554	43.88	2.56	17.13	0.69	0.11
011	2016-01-31	164.5524	-75.1283	1085	395 ^O	HSSW	-1.8623	34.7529	n.d.	2.29		0.76	0.11
028	2016-02-06	164.5218	-75.1302	1062	800 ^O	HSSW	-1.9177	34.7892	n.d.	2.10		0.62	0.08
028	2016-02-06	164.5218	-75.1302	1062	1000	HSSW	-1.9199	34.7983	n.d.	2.47		0.60	0.09
028	2016-02-06	164.5218	-75.1302	1062	1060 ^Δ	HSSW	-1.9188	34.8001	n.d.	3.28		0.62	0.10
A3	2014-01-11	164.6848	-75.1099	1076	1070 ^O	HSSW	-1.9174	34.7739	n.d.	3.40		1.11	0.15
A4	2014-01-11	164.7091	-75.1121	1103	700 ^O	HSSW	-1.9221	34.7483	n.d.	3.65		0.37	0.05
A25	2014-01-22	166.8090	-74.7509	954	944 ^O	HSSW	-1.9183	34.7731	n.d.	2.79		0.85	0.12
A26	2014-01-22	166.7998	-74.7559	928	700 ^O	HSSW	-1.9201	34.7558	n.d.	3.76		0.57	0.08
A58	2014-02-02	168.3131	-77.1704	892	888 ^O	HSSW	-1.9065	34.7317	n.d.	4.11		1.04	0.17
						average	-1.91	34.77	48.37	3.18	15.16	0.97	0.13
						st.dev.	0.01	0.02	6.04	0.51	3.12	0.50	0.06

* Water mass generated from the mixing of CDW and HSSW at the shelf break

^O Bacterial community structure analysed in this sample

^Δ Archaeal and Prokaryotic community structures analysed in this sample

Acronyms: WM = water mass; θ = potential temperature; DOC = Dissolved Organic C; DON = Dissolved Organic N; POC = Particulate Organic C; PN = Particulate Nitrogen; n.d. = not determined

Supplementary Table 1 (continued)

Station	Depth	WM	POC/PN	DIC fix	DIC fix	Prok Abund	HCP	HCP	Respiration ETS 0.68	Respiration ETS 0.68	spiration ETS	Respiration ETS 5.3
	m			nmol C L ⁻¹ d ⁻¹	st. dev.	cell L ⁻¹	nmol C L ⁻¹ d ⁻¹	st. dev.	nmol C L ⁻¹ d ⁻¹	st. dev.	nmol C L ⁻¹ d ⁻¹	st. dev.
010	1906 ^{OA}	AABW	7.73	0.74	0.29	4.07E+07	2.24	0.13	25.40	7.37	197.97	57.48
010	1800	AABW	8.51	0.39	0.04	4.05E+07	1.70	0.21	19.34	0.49	150.77	3.81
038	513	AABW*	8.69	1.27	0.16	5.98E+07	4.18	0.24	34.54	2.44	269.20	19.04
038	478	AABW*	9.06	0.28	0.12	5.53E+07	3.65	0.09	30.57	0.24	238.25	1.90
040	1336 ^A	AABW	8.67	1.56	0.02	4.09E+07	2.99	0.21	31.12	7.85	242.54	61.18
040	1253	AABW	7.02	0.33	0.04	4.39E+07	1.86	0.12	11.74	0.98	91.54	7.61
A6	563 ^O	AABW	9.05	0.19	0.06	4.71E+07	2.51	0.26	n.d.		n.d.	
A7	1070 ^O	AABW	7.89	0.03	0.00	3.72E+07	1.81	0.14	10.07	0.41	78.52	3.17
A8	1066 ^O	AABW	7.66	0.43	0.20	6.63E+07	2.43	0.09	9.61	0.44	74.92	3.42
		average	8.25	0.58		4.79E+07	2.60		21.55		167.96	
		st.dev.	0.71	0.51		1.01E+07	0.86		10.22		79.68	
009	180 ^O	CDW	7.01	0.43	0.14	5.59E+07	2.21	0.21	29.19	1.71	227.49	13.33
009	160 ^O	CDW	7.75	0.81	0.43	4.63E+07	3.25	1.11	30.05	3.91	234.24	30.46
009	140 ^O	CDW	7.52	0.43	0.05	6.00E+07	2.10	0.12	31.78	4.89	247.70	38.08
010	1200	CDW	5.95	0.16	0.05	2.75E+07	1.96	0.11	17.10	0.73	133.28	5.71
010	1000	CDW	6.51	0.29	0.08	3.69E+07	1.48	0.26	34.37	2.20	267.90	17.13
010	800	CDW	7.16	0.23	0.15	2.15E+07	1.09	0.10	27.64	3.42	215.40	26.65
010	650 ^{OA}	CDW	6.64	0.08	0.02	2.99E+07	0.57	0.04	22.28	2.69	173.67	20.94
010	550 ^{OA}	CDW	6.95	0.16	0.09	3.85E+07	0.70	0.25	23.49	2.44	183.09	19.04
010	400 ^O	CDW	8.86	0.12	0.07	3.42E+07	7.27	1.64	15.72	3.18	122.51	24.75
038	339	CDW	8.27	0.27	0.03	3.80E+07	0.93	0.03	15.37	1.71	119.82	13.33
038	300 ^A	CDW	7.43	0.28	0.29	3.66E+07	1.13	0.30	13.30	0.73	103.66	5.71
038	250 ^O	CDW	7.44	0.24	0.04	4.46E+07	1.45	0.10	15.03	1.71	117.13	13.33
038	200 ^O	CDW	10.30	0.80	0.21	5.04E+07	2.00	0.29	23.14	1.95	180.39	15.23
040	1105	CDW	7.00	0.45	0.12	3.63E+07	1.53	0.37	15.20	0.49	118.46	3.81
040	888	CDW	6.82	0.42	0.12	3.28E+07	1.09	0.24	10.02	1.47	78.08	11.42
040	690 ^{OA}	CDW	8.71	0.26	0.19	2.98E+07	1.17	0.69	8.64	3.91	67.31	30.46
040	494 ^{OA}	CDW	8.13	0.97	0.09	3.13E+07	1.12	0.65	7.08	1.71	55.20	13.33
040	275 ^O	CDW	7.96	0.27	0.04	5.80E+07	2.03	0.21	11.23	2.69	87.51	20.94
040	203 ^O	CDW	6.41	0.47	0.19	6.10E+07	3.30	0.26	12.61	2.69	98.28	20.94
041	2148 ^{OA}	CDW	9.51	0.68	0.32	4.42E+07	2.66	0.16	4.15	0.98	32.31	7.61
041	297 ^{OA}	CDW	7.07	n.d.		4.08E+07	2.23	0.12	7.25	3.42	56.55	26.66
A28	1743 ^O	CDW	4.37	0.77	0.21	2.41E+07	0.98	0.01	6.33	0.41	49.36	3.17
A29	800 ^O	CDW	8.15	0.26	0.15	5.00E+07	1.28	0.04	3.31	1.42	25.80	11.11
A30	1400 ^O	CDW	8.13	0.85	0.51	2.70E+07	1.14	0.11	n.d.		n.d.	
A31	400 ^O	CDW	6.76	0.19	0.09	4.01E+07	1.80	0.36	n.d.		n.d.	
		average	7.47	0.41		3.98E+07	1.86		16.71		130.22	
		st.dev.	1.20	0.26		1.12E+07	1.34		9.33		72.71	
002	776 ^{OA}	HSSW	7.27	3.12	0.49	9.20E+07	8.44	0.70	33.15	6.14	258.41	47.86
002	500 ^O	HSSW	8.19	0.30	0.19	1.48E+08	2.39	0.26	38.68	1.47	301.47	11.42
004	783	HSSW	9.09	2.30	0.00	1.61E+08	3.07	0.42	30.94	5.23	241.19	40.78
004	600 ^O	HSSW	7.53	0.62	0.08	7.33E+07	2.76	0.22	24.52	6.84	191.11	53.29
004	400	HSSW	7.66	1.18	0.33	9.32E+07	2.87	0.42	26.42	0.24	205.92	1.90
007	578 ^O	HSSW	8.60	2.56	0.00	1.05E+08	3.75	0.13	28.32	4.40	220.72	34.26
007	500 ^O	HSSW	7.75	1.22	0.00	1.05E+08	3.06	0.53	51.46	3.72	401.07	28.97
008	450 ^A	HSSW	9.51	1.43	0.79	7.48E+07	2.65	0.32	55.95	9.77	436.06	76.13
008	350 ^O	HSSW	7.77	1.27	0.80	4.36E+07	1.27	0.05	20.38	1.47	158.81	11.42
009	522 ^{OA}	HSSW	9.64	2.01	0.19	6.98E+07	5.17	0.14	53.18	0.98	414.53	7.61
009	480 ^O	HSSW	6.74	1.62	0.14	8.24E+07	5.40	0.39	70.80	5.81	551.80	45.28
009	450 ^O	HSSW	7.19	0.75	0.55	8.17E+07	5.04	0.60	42.48	17.58	331.08	137.04
011	1080 ^{OA}	HSSW	6.64	2.19	0.06	7.50E+07	7.82	0.56	15.71	1.22	122.47	9.52
011	987 ^{OA}	HSSW	6.83	1.20	0.27	6.97E+07	3.64	0.09	18.48	5.13	144.01	39.97
011	888 ^{OA}	HSSW	6.94	0.65	0.00	5.81E+07	2.46	0.04	17.10	2.69	133.24	20.94
011	790 ^O	HSSW	6.85	0.78	0.38	5.39E+07	2.81	0.17	46.97	1.95	366.08	15.23
011	691 ^O	HSSW	6.49	2.07	0.84	5.15E+07	3.19	0.01	50.62	4.52	394.55	35.22
011	592 ^O	HSSW	6.48	1.39	0.11	6.88E+07	3.28	0.43	51.98	8.06	405.11	62.81
011	494 ^O	HSSW	6.40	1.54	0.41	9.31E+07	3.28	0.30	48.52	1.71	378.19	13.32
011	395 ^O	HSSW	7.22	0.66	0.02	9.08E+07	3.45	0.20	43.34	0.24	337.81	1.90
028	800 ^O	HSSW	7.31	0.83	0.33	6.56E+07	1.61	0.18	23.66	1.71	184.38	13.32
028	1000	HSSW	6.57	0.40	0.03	7.57E+07	2.42	0.41	25.90	1.47	201.88	11.42
028	1060 ^A	HSSW	5.93	1.21	0.17	7.88E+07	2.85	0.01	27.11	0.24	211.30	1.90
A3	1070 ^O	HSSW	7.27	0.71	0.34	1.36E+08	4.00	0.14	15.25	0.81	118.88	6.34
A4	700 ^O	HSSW	7.72	0.27	0.11	5.56E+07	1.43	0.25	n.d.		n.d.	
A25	944 ^O	HSSW	6.95	1.58	0.32	1.03E+08	4.89	0.20	9.64	0.61	75.14	4.76
A26	700 ^O	HSSW	7.51	0.73	0.16	5.55E+07	2.54	0.08	10.59	1.85	82.54	14.39
A58	888 ^O	HSSW	6.20	1.72	0.60	7.94E+07	8.19	0.05	16.69	0.41	130.10	3.17
		average	7.37	1.30		8.36E+07	3.70		33.25		259.18	
		st.dev.	0.94	0.72		2.83E+07	1.88		16.29		126.99	

Acronyms: WM = water mass; POC = Particulate Organic C; PN = Particulate Nitrogen; DIC fix = Dissolved Inorganic C fixation; HCP = Heterotrophic C Production; n.d. =not determined

Supplementary Table 1 (continued)

Station	Depth m	WM	PGE 0.68	PGE 5.3	DIC fix:HCP	N-NO ₂ μmol L ⁻¹	N-NO ₃ μmol L ⁻¹	P-PO ₄ μmol L ⁻¹	N-NH ₄ μmol L ⁻¹	SiO ₂ μmol L ⁻¹	TDN μmol L ⁻¹	TDP μmol L ⁻¹	DOP μmol L ⁻¹
010	1906 ^{0Δ}	AABW	0.10	0.01	0.33	0.034	33.35	2.06	0.17	93.04	36.00	2.27	0.21
010	1800	AABW	0.10	0.01	0.23	0.038	33.57	2.09	0.22	103.02	36.35	2.26	0.17
038	513	AABW*	0.14	0.02	0.30	0.040	33.04	2.16	0.32	84.51	35.78	2.23	0.07
038	478	AABW*	0.11	0.02	0.08	0.043	33.14	1.90	0.18	88.95	35.99	2.23	0.33
040	1336 ^Δ	AABW	0.13	0.02	0.52	0.026	33.51	1.92	0.17	94.2	36.30	2.31	0.39
040	1253	AABW	0.16	0.02	0.18	0.028	33.76	1.97	0.18	97.43	36.36	2.27	0.30
A6	563 ⁰	AABW			0.08	0.053	31.41	1.54	0.08	77.24	34.61	2.05	0.51
A7	1070 ⁰	AABW	0.15	0.02	0.02	0.042	29.36	1.76	0.08	77.87	36.66	2.20	0.45
A8	1066 ⁰	AABW	0.23	0.04	0.18	0.036	31.19	1.69	0.05	76.41	34.74	2.13	0.44
		average	0.14	0.02	0.21	0.04	32.48	1.90	0.16	88.07	35.87	2.22	0.32
		st.dev.	0.04	0.01	0.16	0.01	1.50	0.20	0.08	9.64	0.72	0.08	0.15
009	180 ⁰	CDW	0.08	0.01	0.20	0.046	33.61	2.04	0.16	88.6	36.56	2.29	0.25
009	160 ⁰	CDW	0.12	0.02	0.25	0.039	32.00	2.14	0.41	71.84	35.90	n.d.	n.d.
009	140 ⁰	CDW	0.07	0.01	0.21	0.047	33.55	2.08	0.15	83.09	36.65	2.31	0.23
010	1200	CDW	0.11	0.02	0.08	0.020	33.89	2.07	0.16	117.01	36.82	2.30	0.24
010	1000	CDW	0.05	0.01	0.20	0.015	34.07	2.10	0.21	116.27	37.00	2.29	0.19
010	800	CDW	0.05	0.01	0.21	0.018	34.00	2.10	0.14	113.52	36.17	2.27	0.17
010	650 ^{0Δ}	CDW	0.03	0.00	0.15	0.024	34.31	2.07	0.23	112.15	36.30	2.29	0.22
010	550 ^{0Δ}	CDW	0.04	0.00	0.23	0.028	34.12	2.09	0.17	108.28	36.84	2.31	0.21
010	400 ⁰	CDW	0.32	0.06	0.02	0.026	33.93	2.10	0.16	99.76	n.d.	n.d.	n.d.
038	339	CDW	0.07	0.01	0.29	0.024	34.56	1.84	0.14	92.36	36.78	2.26	0.42
038	300 ^Δ	CDW	0.10	0.01	0.25	0.027	34.26	2.08	0.17	96.49	36.79	2.35	0.27
038	250 ⁰	CDW	0.10	0.01	0.17	0.029	34.05	2.04	0.21	93.37	36.83	2.31	0.27
038	200 ⁰	CDW	0.11	0.02	0.40	0.042	33.84	1.96	0.25	89.01	36.31	2.28	0.31
040	1105	CDW	0.12	0.02	0.30	0.023	33.11	1.93	0.25	102.21	36.58	2.29	0.36
040	888	CDW	0.13	0.02	0.39	0.023	33.33	2.02	0.16	105.3	36.01	2.28	0.26
040	690 ^{0Δ}	CDW	0.14	0.02	0.22	0.017	33.48	1.97	0.24	105.57	37.64	2.33	0.36
040	494 ^{0Δ}	CDW	0.23	0.04	0.87	0.014	33.48	1.99	0.15	99.46	36.76	2.27	0.29
040	275 ⁰	CDW	0.17	0.03	0.13	0.023	33.41	2.05	0.21	93.48	35.92	2.45	0.39
040	203 ⁰	CDW	0.23	0.04	0.14	0.044	33.52	1.98	0.28	92.11	34.79	2.40	0.42
041	2148 ^{0Δ}	CDW	0.45	0.09	0.26	0.019	32.98	2.01	0.17	103.03	36.50	2.34	0.33
041	297 ^{0Δ}	CDW				0.012	33.33	2.03	0.15	95.61	36.92	2.25	0.23
A28	1743 ⁰	CDW	0.22	0.03	0.78	0.026	33.04	2.01	0.05	108.39	36.34	2.29	0.28
A29	800 ⁰	CDW	0.32	0.06	0.20	0.027	31.92	1.58	0.13	89.66	36.62	1.90	0.32
A30	1400 ⁰	CDW			0.75	0.031	32.16	2.03	0.04	102.70	37.77	2.27	0.24
A31	400 ⁰	CDW			0.10	0.030	31.89	2.20	0.09	93.32	36.84	2.30	0.10
		average	0.15	0.02	0.28	0.03	33.43	2.02	0.18	98.90	36.57	2.28	0.26
		st.dev.	0.11	0.02	0.22	0.01	0.76	0.12	0.08	10.79	0.59	0.11	0.12
002	776 ^{0Δ}	HSSW	0.26	0.04	0.37	0.124	31.78	2.04	0.46	75.92	35.76	2.14	0.10
002	500 ⁰	HSSW	0.06	0.01	0.13	0.025	31.62	1.99	0.14	73.11	35.24	2.08	0.10
004	783	HSSW	0.15	0.02	0.75	0.029	31.95	2.06	0.19	77.84	35.54	2.09	0.03
004	600 ⁰	HSSW	0.12	0.02	0.22	0.033	31.87	2.04	0.16	73.59	35.14	2.12	0.08
004	400	HSSW	0.13	0.02	0.41	0.059	31.74	2.03	0.22	69.75	35.44	2.07	0.05
007	578 ⁰	HSSW	0.18	0.03	0.68	0.057	32.03	2.06	0.20	75.98	n.d.	n.d.	n.d.
007	500 ⁰	HSSW	0.08	0.01	0.40	0.026	32.03	2.03	0.20	72.5	n.d.	n.d.	n.d.
008	450 ^Δ	HSSW	0.07	0.01	0.54	0.029	31.42	2.00	0.19	72.64	34.54	2.17	0.18
008	350 ⁰	HSSW	0.11	0.02	1.00	0.023	31.49	2.00	0.20	73.63	35.01	2.13	0.13
009	522 ^{0Δ}	HSSW	0.12	0.02	0.39	0.023	31.46	1.99	0.13	72.87	35.74	2.20	0.21
009	480 ⁰	HSSW	0.09	0.01	0.30	0.022	31.31	2.00	0.17	71.79	35.28	2.16	0.17
009	450 ⁰	HSSW	0.12	0.02	0.15	0.021	31.49	1.99	0.16	72.17	35.03	2.16	0.17
011	1080 ^{0Δ}	HSSW	0.39	0.08	0.28	0.036	31.64	1.98	0.14	77.82	34.68	2.04	0.06
011	987 ^{0Δ}	HSSW	0.21	0.03	0.33	0.018	31.30	1.95	0.18	75.62	34.48	2.01	0.06
011	888 ^{0Δ}	HSSW	0.15	0.02	0.26	0.015	31.30	1.96	0.12	76.74	34.69	2.03	0.07
011	790 ⁰	HSSW	0.07	0.01	0.28	0.024	31.35	1.91	0.20	70.67	34.53	2.03	0.13
011	691 ⁰	HSSW	0.09	0.01	0.65	0.026	31.25	1.97	0.35	70.11	34.92	2.11	0.15
011	592 ⁰	HSSW	0.08	0.01	0.42	0.029	31.45	1.89	0.14	73.54	34.40	2.06	0.18
011	494 ⁰	HSSW	0.09	0.01	0.47	0.036	31.42	1.94	0.19	75.12	34.22	2.06	0.12
011	395 ⁰	HSSW	0.09	0.01	0.19	0.053	31.24	1.94	0.19	72.17	33.77	1.99	0.05
028	800 ⁰	HSSW	0.09	0.01	0.51	0.017	31.69	1.95	0.19	74.3	34.00	2.01	0.05
028	1000	HSSW	0.10	0.01	0.17	0.016	31.17	1.92	0.18	72.58	33.83	2.14	0.22
028	1060 ^Δ	HSSW	0.13	0.02	0.42	0.030	31.05	1.98	0.16	72.37	34.52	2.00	0.02
A3	1070 ⁰	HSSW	0.24	0.04	0.18	0.029	30.74	1.89	0.04	74.27	34.21	2.01	0.11
A4	700 ⁰	HSSW			0.19	0.012	30.67	1.73	0.07	71.53	34.39	2.00	0.27
A25	944 ⁰	HSSW	0.40	0.08	0.32	0.037	31.75	1.90	0.11	69.07	34.70	2.19	0.29
A26	700 ⁰	HSSW	0.24	0.04	0.29	0.021	29.53	1.92	0.06	66.80	33.36	2.18	0.26
A58	888 ⁰	HSSW	0.37	0.07	0.21	0.057	29.98	2.11	0.11	75.06	34.26	2.22	0.11
		average	0.16	0.03	0.38	0.03	31.35	1.97	0.17	73.20	34.68	2.09	0.13
		st.dev.	0.10	0.02	0.20	0.02	0.56	0.07	0.08	2.59	0.61	0.07	0.08

Acronyms: WM = water mass; PGE = Prokaryotic Growth Efficiency; TDN = Total Dissolved Nitrogen; TDP = Total Dissolved Phosphorus; DOP =Dissolved Organic Phosphorus; n.d. = not determined

Supplementary Table 2: Computation of yearly DIC fixation rates in the three water masses (HSSW = High Salinity Shelf Water; CDW = Circumpolar Deep Water; AABW = Antarctic Bottom Water) and in the total Ross Sea (Sum of HSSW + CDW + AABW). Initial DIC fixation rates ($\text{nmol C L}^{-1} \text{d}^{-1}$) correspond to the mean value of all measurements in a specific Water Mass (WM) as per Supplementary Table 1. Water mass volumes are derived from the literature².

		HSSW	CDW	AABW		
DIC fixation rates	$\text{nmol C L}^{-1} \text{d}^{-1}$	1.30	0.41	0.58		
DIC fixation rates	$\text{nmol C km}^{-3} \text{d}^{-1}$	1.30E+12	4.13E+11	5.80E+11		
DIC fixation rates	$\mu\text{mol C km}^{-3} \text{d}^{-1}$	1.30E+09	4.13E+08	5.80E+08		
DIC fixation rates	$\text{mmol C km}^{-3} \text{d}^{-1}$	1.30E+06	4.13E+05	5.80E+05		
DIC fixation rates	$\text{mol C km}^{-3} \text{d}^{-1}$	1296.67	412.50	580.00		
DIC fixation rates	$\text{kmol C km}^{-3} \text{d}^{-1}$	1.30	0.41	0.58		
Water mass volumes	km^3	71580	173140	2470		
DIC fixation rates	$\text{kmol C d}^{-1} \text{ per WM}$	9.28E+04	7.14E+04	1.43E+03		
DIC fixation rates	$\text{Mmol C d}^{-1} \text{ per WM}$	92.82	71.42	1.43		
DIC fixation rates	$\text{Mmol C yr}^{-1} \text{ per WM}$	33877.62	26068.39	522.90		
DIC fixation rates	$\text{Gmol C yr}^{-1} \text{ per WM}$	33.88	26.07	0.52		
DIC fixation rates	$\text{Gg C yr}^{-1} \text{ per WM}$	406.53	312.82	6.27	→ TOTAL	725.63
DIC fixation rates	$\text{Tg C yr}^{-1} \text{ per WM}$	0.4065	0.3128	0.0063	→ TOTAL	0.7256

Supplementary Table 3: Results of the Kruskal-Wallis test highlighting differences between the relative abundance of the taxa SAR324 and SUP05 in High Salinity Shelf Water (HSSW), Antarctic Bottom Water (AABW) and Circumpolar Deep Water (CDW).

Multiple Comparisons z' values: Kruskal-Wallis test: H (2, N= 45) =17.86; p =0.0001

SAR324	HSSW	AABW	CDW
HSSW			
AABW	1.27		
CDW	4.22***	1.16	

Multiple Comparisons z' values; Kruskal-Wallis test: H (2, N= 45) =21.46; p < 10⁴

SUP05	HSSW	AABW	CDW
HSSW			
AABW	2.48*		
CDW	4.42***	0.09	

* = $p < 0.05$; *** = $p < 0.001$

Supplementary References

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