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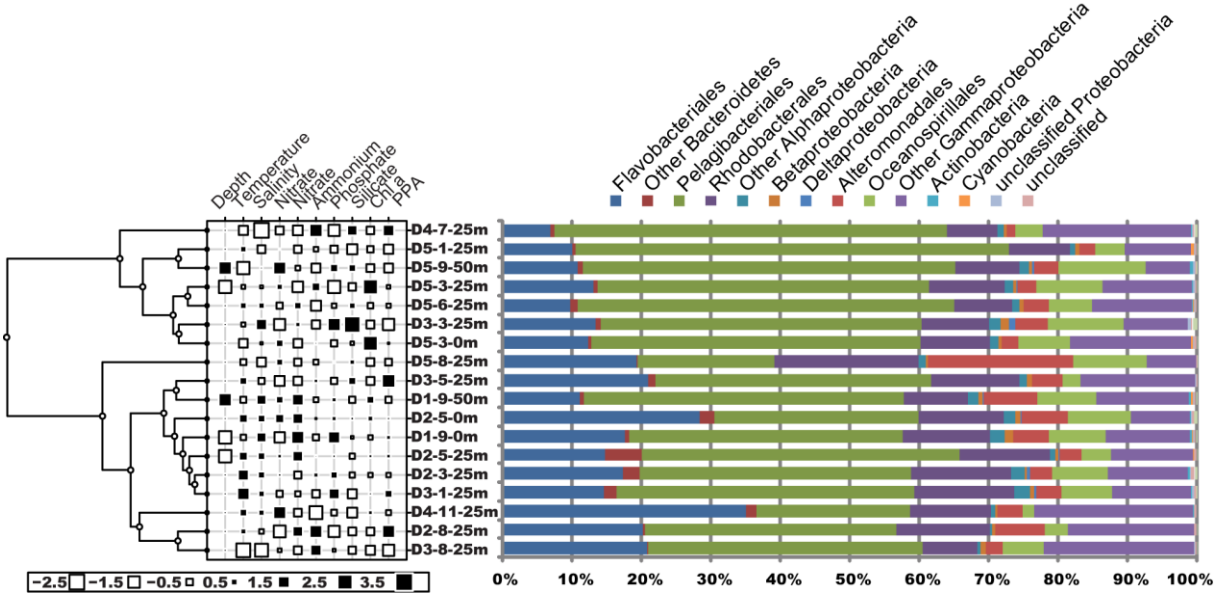
Abbreviations

ANOVA: analysis of variance; chl *a*: chlorophyll *a*; DCA: detrended correspondence analysis; MWM: mixed water mass; pRDA: partial redundancy analysis; RDA: redundancy analysis; SSWs: Scotia Summer Surface Water; SSWw: Weddell Summer Surface Water; WWs: Scotia Winter Water



Supplementary Fig. S1. Cluster analysis and bacterial composition of the northern tip of the Antarctic Peninsula summer surface waters. The cluster shows the similarity of investigated samples calculated based on operational taxonomic unit data using R language. Since the value of environment factor varied a lot, we made a heatmap with the normalized relative values to make them comparable.

Supplementary Table S1. Analyses result of DCA with 26 segments. The axes were rescaled with four iterations. The largest axis is highlighted in boldface.

	DCA1	DCA2	DCA3	DCA4
Eigenvalues	0.07587	0.03814	0.024995	0.027472
Decorana	values	0.07675	0.02576	0.008763
Axis	lengths	**1.00887**	0.68089	0.510494

Supplementary Table S2. Analyses result of RDA and pRDA. The variance proportion and their corresponding factors are highlighted in boldface. The variance explained by nutrients, chl *a* combined with temperature, salinity and depth is calculated as follows: 7.14% = 30.39%-13.18%.

RDA	Inertia	proportion	rank						
Total	1.494e+06	1.000e+00							
Constrained	4.538e+05	**3.039e-01**	**Environment factors (9)**						
Unconstrained	1.040e+06	6.961e-01	Bacterial community (8 orders)						
Inertia is variance									
Eigenvalues for constrained axes									
RDA1	RDA2	RDA3	RDA4	RDA5	RDA6	RDA7	RDA8	RDA9	
322309	69027	41595	11256	6889	1899	656	125	64	
Inertia proportion rank (pRDA 1)									
Total	1.494e+06	1.000e+00							
Conditional	3.132e+05	2.097e-01	6 (nutrients)						
Constrained	1.406e+05	**9.420e-02**	**3 (essential environment factor)**						
Unconstrained	1.040e+06	6.961e-01	8 (bacterial genera)						
Inertia proportion rank (pRDA 2)									
Total	1.494e+06	1.000e+00							
Conditional	2.473e+05	1.656e-01	3 (essential environment factor)						
Constrained	2.065e+05	**1.383e-01**	**6 (nitrite factor)**						
Unconstrained	1.040e+06	6.961e-01	8 (bacterial genera)						

Supplementary Table S3. Results of Spearman's rho (ρ_s). Significant correlations at $p < 0.05$ (two-tailed) are in boldface and at $p < 0.01$ (two-tailed) are underlined. Table continues next page.

		T	S	Nitrite	Nitrate	Ammonium	Phosphate	Silicate	Chl *a*	*Sulfito-bacter*	*Octadeca-bacter*	*Pelagi-bacter*	*Marino-bacter*	SUP05	*Altero-monas*	HTCC2207	*Glaciecola*	Candidatus *Portiera*	*Alcanivora x*	*Ulvibacter*	*Polari-bacter*
Sulfito-bacter	ρ_s	.141	.315	.235	.455	**-.513**	.362	0.000	.055	1.000	**-.522**	-.189	.852	-.021	.767	-.337	.383	.102	.728	-.346	-.234
	Sig.	.576	.203	.348	.058	.029	.140	1.000	.829		.026	.453	.000	.935	.000	.172	.116	.686	.001	.159	.349
	N	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Octa-deca-bacter	ρ_s	.430	.191	.095	-.342	.160	-.003	-.077	.428	**-.522**	1.000	.249	**-.578**	.426	**-.521**	.201	-.896	.321	-.418	.227	-.146
	Sig.	.075	.448	.707	.165	.526	.990	.760	.077	.026		.320	.012	.078	.027	.423	.000	.194	.084	.364	.565
	N	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Pelagi-bacter	ρ_s	-.115	.051	.316	-.189	**-.470**	-.065	-.277	.166	-.189	.249	1.000	-.231	**.477**	-.053	-.284	-.199	**.500**	-.285	-.017	-.761
	Sig.	.651	.842	.201	.453	.049	.797	.266	.510	.453	.320		.356	.045	.835	.254	.428	.035	.252	.948	.000
	N	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Mari-no-bacter	ρ_s	.006	.383	.083	.649	-.389	.431	-.048	.051	.852	**-.578**	-.231	1.000	.026	.911	-.177	.392	.168	.864	-.303	-.089
	Sig.	.980	.117	.742	.004	.110	.074	.850	.841	.000	.012	.356		.920	.000	.483	.107	.505	.000	.221	.724
	N	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
SUP05	ρ_s	-.032	.335	.126	-.044	-.191	.352	.013	.105	-.021	.426	**.477**	.026	1.000	-.028	.214	**-.497**	.718	-.029	-.088	-.297
	Sig.	.900	.175	.618	.861	.448	.152	.959	.679	.935	.078	.045	.920		.911	.394	.036	.001	.908	.727	.231
	N	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
	ρ_s	-.033	.283	.252	**.543**	-.395	.313	-.074	.130	.767	**-.521**	-.053	.911	-.028	1.000	-.371	.414	.202	.712	-.260	-.194

Altero-monas	Sig.	.896	.256	.313	.020	.105	.206	.770	.607	.000	.027	.835	.000	.911		.130	.088	.421	.001	.297	.441
	N	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
HTCC -2207	ρ_s	.067	.148	**-.549**	.238	.356	.065	.326	-.186	-.337	.201	-.284	-.177	.214	-.371	1.000	-.269	.229	-.037	.388	.422
	Sig.	.791	.559	.018	.341	.147	.797	.186	.460	.172	.423	.254	.483	.394	.130		.281	.360	.884	.111	.081
	N	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Glacie -cola	ρ_s	**-.469**	-.423	-.110	.137	-.039	-.172	.154	**-.485**	.383	-.896	-.199	.392	**-.497**	.414	-.269	1.000	**-.485**	.240	-.295	.162
	Sig.	.050	.081	.665	.588	.878	.495	.540	.041	.116	.000	.428	.107	.036	.088	.281		.041	.338	.234	.520
	N	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Candi-datus *Porti-era*	ρ_s	.037	.631	.311	.287	-.466	.413	.128	.405	.102	.321	**.500**	.168	.718	.202	.229	**-.485**	1.000	.105	.351	**-.536**
	Sig.	.884	.005	.209	.248	.051	.089	.612	.095	.686	.194	.035	.505	.001	.421	.360	.041		.677	.153	.022
	N	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Alcani -vorax	ρ_s	.017	**.502**	-.059	.717	-.357	**.567**	-.025	.060	.728	-.418	-.285	.864	-.029	.712	-.037	.240	.105	1.000	-.374	-.085
	Sig.	.948	.034	.816	.001	.146	.014	.922	.812	.001	.084	.252	.000	.908	.001	.884	.338	.677		.127	.738
	N	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Ulvi-bacter	ρ_s	-.006	.076	-.049	-.133	.196	-.294	.193	.322	-.346	.227	-.017	-.303	-.088	-.260	.388	-.295	.351	-.374	1.000	.025
	Sig.	.981	.763	.848	.598	.435	.237	.443	.192	.159	.364	.948	.221	.727	.297	.111	.234	.153	.127		.922
	N	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Polari-bacter	ρ_s	-.075	-.434	-.462	-.154	.765	-.271	.118	-.289	-.234	-.146	-.761	-.089	-.297	-.194	.422	.162	**-.536**	-.085	.025	1.000
	Sig.	.766	.072	.054	.542	.000	.277	.642	.244	.349	.565	.000	.724	.231	.441	.081	.520	.022	.738	.922	
	N	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18

Supplementary Table S4. ANOVA analysis of nutrients and chl *a* among different water masses and at different depths. Significant correlations at $p < 0.01$ (two-tailed) are underlined. Table continues next page.

Station	Depth	Temperature (°C)	Salinity (psu)	Nitrite (µmol/L)	Nitrate (µmol/L)	Ammonium (µmol/L)	Phosphate (µmol/L)	Silicate (µmol/L)	Chl *a* (µg/L)
D1-9 (WWs)	2 m	-0.13	34.43	0.12	53.03	1.06	2.27	71.61	0.51
D1-9 (WWs)	50 m	-0.18	34.43	0.25	49.54	1.12	1.96	69.77	1.03
D2-3 (SSWs)	25 m	0.95	34.30	0.22	29.82	1.33	2.03	70.44	0.51
D2-5 (SSWs)	2 m	0.63	34.32	0.22	46.94	1.25	1.92	70.44	0.74
D2-5 (SSWs)	25 m	0.62	34.32	0.27	47.53	1.22	1.96	72.68	0.85
D2-8 (MWM)	25 m	0.33	34.11	0.10	47.14	1.91	1.55	68.51	0.23
D3-1 (SSWs)	25 m	1.16	34.27	0.18	32.39	0.97	2.20	67.42	0.71
D3-3 (WWs)	25 m	-0.04	34.50	0.11	38.16	0.93	2.34	87.10	0.21
D3-5 (SSWs)	25 m	0.49	34.06	0.13	27.45	1.30	1.783	75.41	0.20
D3-8 (SSWw)	25 m	-1.30	33.70	0.20	28.66	1.76	1.87	68.88	0.08
D4-7 (SSWs)	25 m	0.48	34.27	0.34	28.84	0.50	1.80	66.54	0.79
D4-11 (SSWw)	25 m	-0.52	33.58	0.16	25.04	1.97	1.55	77.94	0.25
D5-1 (MWM)	25 m	0.37	34.00	0.21	29.17	1.13	1.74	66.25	0.36
D5-3 (WWs)	2 m	-0.02	34.14	0.24	23.20	1.53	1.48	68.80	2.14
D5-3 (WWs)	25 m	-0.46	34.15	0.25	27.26	1.25	1.78	71.31	2.11
D5-6 (MWM)	25 m	0.39	34.27	0.18	40.95	0.78	1.83	74.33	0.43
D5-8 (WWs)	25 m	-0.18	33.95	0.24	29.65	1.12	1.90	73.65	0.22

D5-9 (MWM)	50 m	-1.02	34.19	0.34	33.06	0.88	2.06	75.02	0.22
F[a]		1.330	1.102	1.882	1.275	0.365	0.268	0.196	1.224
Sig.[a]		0.294	0.358	0.186	0.308	0.700	0.768	0.824	0.322
F[b]		10.025	9.308	0.228	0.598	2.907	0.844	0.478	1.971
Sig.[b]		0.001	0.001	0.876	0.627	0.072	0.492	0.703	0.165

[a] Results of ANOVA were calculated based on three depths: 2 m, 25 m, 50 m. [b] Results of ANOVA were calculated based on the different water mass.

Supplementary Table S5. MIMS file with the metadata information corresponding to the samples taken off the north tip of Antarctic Peninsula. Table continues next page.

*sample_name	sample_title	bioproject_accession	*organism	*collection_date	*depth	*env_biome	*env_feature	*env_material	*geo_loc_name	*lat_lon
SC6	D1-9-2m	PRJNA299749	Bacteria	2012/1/17	2 m	water	Antactic Ocean	water	Southern Ocean: north tip of Antarctic Peninsula	62.7485° S, 55.9919° W
SC9	D1-9-50m	PRJNA299749	Bacteria	2012/1/17	50 m	water	Antactic Ocean	water	Southern Ocean: north tip of Antarctic Peninsula	62.7485° S, 55.9919° W
SC12	D2-3-25m	PRJNA299749	Bacteria	2012/1/23	25 m	water	Antactic Ocean	water	Southern Ocean: north tip of Antarctic Peninsula	60.8014° S 54.6810° W
SC18	D2-5-25m	PRJNA299749	Bacteria	2012/1/23	25 m	water	Antactic Ocean	water	Southern Ocean: north tip of Antarctic Peninsula	61.5893° S 54.1472° W
SC20	D2-5-2m	PRJNA299749	Bacteria	2012/1/23	2 m	water	Antactic Ocean	water	Southern Ocean: north tip of Antarctic Peninsula	61.5893° S 54.1472° W
SC22	D2-8-25m	PRJNA299749	Bacteria	2012/1/20	25 m	water	Antactic Ocean	water	Southern Ocean: north tip of Antarctic Peninsula	62.5703° S 52.7339° W
SC25	D3-1-25m	PRJNA299749	Bacteria	2012/1/24	25 m	water	Antactic Ocean	water	Southern Ocean: north tip of Antarctic Peninsula	60.1002° S 51.1523° W
SC28	D3-3-25m	PRJNA299749	Bacteria	2012/1/24	25 m	water	Antactic Ocean	water	Southern Ocean: north tip of Antarctic Peninsula	61.1574° S 50.7602° W
SC31	D3-5-25m	PRJNA299749	Bacteria	2012/1/25	25 m	water	Antactic Ocean	water	Southern Ocean: north tip of Antarctic Peninsula	62.2324° S 50.3602° W
SC36	D3-8-25m	PRJNA299749	Bacteria	2012/1/26	25 m	water	Antactic Ocean	water	Southern Ocean: north tip of Antarctic Peninsula	63.1462° S 49.9578° W
SC38	D4-11-25m	PRJNA299749	Bacteria	2012/1/26	25 m	water	Antactic Ocean	water	Southern Ocean: north tip of Antarctic Peninsula	62.9753° S 47.1607° W

SC40	D4-7-25m	PRJNA299749	Bacteria	2012/1/27	25 m	water	Antactic Ocean	water	Southern Ocean: north tip of Antarctic Peninsula	61.7980° S 47.1782° W
SC42	D5-1-25m	PRJNA299749	Bacteria	2012/1/28	25 m	water	Antactic Ocean	water	Southern Ocean: north tip of Antarctic Peninsula	60.3169° S 44.6967° W
SC46	D5-3-25m	PRJNA299749	Bacteria	2011/12/30	25 m	water	Antactic Ocean	water	Southern Ocean: north tip of Antarctic Peninsula	60.9177° S 44.7053° W
SC47	D5-3-2m	PRJNA299749	Bacteria	2011/12/30	2 m	water	Antactic Ocean	water	Southern Ocean: north tip of Antarctic Peninsula	60.9177° S 44.7053° W
SC52	D5-6-25m	PRJNA299749	Bacteria	2012/1/29	25 m	water	Antactic Ocean	water	Southern Ocean: north tip of Antarctic Peninsula	61.7899° S 44.6832° W
SC56	D5-8-25m	PRJNA299749	Bacteria	2012/1/29	25 m	water	Antactic Ocean	water	Southern Ocean: north tip of Antarctic Peninsula	62.3877° S 44.6905° W
SC58	D5-9-50m	PRJNA299749	Bacteria	2012/1/29	50 m	water	Antactic Ocean	water	Southern Ocean: north tip of Antarctic Peninsula	62.7007° S 44.6892° W

*Fields are mandatory.