Supplementary Information:

Archaeal amoA and ureC genes and their transcriptional activity in the Arctic Ocean
By
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Supplementary Table S1. Biophysicochemical characteristics Baffin Bay samples: A) Station 129; B) Station 123; C) Station 109.

Supplementary Methods used for Supplementary Table S1.

Legends:

SUPPLEMENTARY Figure S1. Regression of cDNA MG1 copies versus *amoA* copies from cDNA. Filled circles are data form Baffin Bay, open diamonds from the Amundsen Gulf winter samples and the crosses from the two T_0 samples used for the light experiment. Standard errors of triplicates were smaller than the size of the symbols.

SUPPLEMENTARY Figure S2. Principal component analysis (PCA) showing the relationship between environmental variables and transcript and gene copy numbers.

Supplementary Table S1. Biophysicochemical characteristics of the water sampled.

DO_2 : Dissolved oxygen concentration ; PAR : photosynthetically available radiation ; nitrate plus nitrite ; VLP : virus like particules ; nd : no data. A) Station 129; B) Station 123; C) Station 109.

A) Station 129

Depth (m)	10	22	35	80	120	160	300	500
Salinity	31.4	31.8	32.6	33.1	33.5	33.9	34.2	34.3
Temperature °C	0.2	0.4	0.8	-0.1	-0.9	-0.7	-0.4	-0.4
Density σ-theta	25.21	25.49	29.09	26.59	26.94	27.24	27.47	27.54
DO_2 µmol Kg^{-1}	356	355	337	324	305	288	279	280
PAR µmol m^{-2} sec^{-1}	0.006	0.002	0	0	0	0	0	0
Chlorophyll *a* µg L^{-1}	0.60	1.42	1.19	0.24	0.72	0.04	0.022	0
Ammonia µM	0.21	0.48	0.47	0.64	0.74	0.145	0.014	nd
Nitrite µM	0.05	0.07	0.09	0.11	0.13	0.11	0.06	0.09
Nitrate µM	nd	nd	2.73	4.19	8.64	11.68	12.53	11.93
Silicate µM	nd	nd	nd	nd	nd	nd	nd	nd
Phosphate µM	nd	nd	nd	nd	nd	nd	nd	nd
Virus (10^7 VLP mL^{-1})	1.21	2.47	2.43	0.46	1.58	0.45	0.44	0.32
Bacteria 10^5 cells mL^{-1}	3.55	4.32	3.41	2.73	2.36	2.21	1.79	1.96
Bacteria Grazers pgC L^{-1}	711.10	496.76	521.09	477.31	187.29	157.19	151.77	134.53
Protist Grazers pgC L^{-1}	799.8	454.2	703.7	4305.4	6037.0	4959.9	1824.5	989.2
Diatoms pgC L^{-1}	10278	20439	20379	4806.0	1806.0	1180.7	882.1	742.6

B) Station 123

Depth (m)	10	45	100	120	200	280	350	500
Salinity	32.1	32.5	33.4	33.5	33.9	34.1	34.2	34.3
Temperature °C	-0.59	-0.36	-0.69	-0.95	-0.29	0.23	-0.24	-0.36
Density σ-theta	25.21	25.49	26.09	26.59	26.94	27.24	27.47	27.54
DO_2 µmol Kg^{-1}	353	336	313	310	278	258	275	283
PAR µmol m^{-2} sec^{-1}	8.73	0.24	0.006	0.002	0.0	0.0	0.0	0.0
Chlorophyll *a* µg L^{-1}	0.65	0.42	0.14	0.72	0.70	0.49	0.23	0.15
Ammonia µM	0.20	1.01	0.06	0.004	0.003	nd	0.06	nd
Nitrite µM	0.08	0.10	0.15	0.14	0.12	0.06	0.06	0.07
Nitrate µM	2.96	4.87	8.85	10.43	13.96	15.34	13.87	13.6
Silicate µM	5.8	7.7	8.8	11.2	13.7	16.7	13.8	12.5
Phosphate µM	0.75	0.82	0.95	1.03	1.13	1.18	1.08	1.04
Virus 10^7 VLP mL^{-1}	0.83	1.29	1.35	0.71	0.62	0.67	0.49	0.25
Bacteria 10^5 cell mL^{-1}	2.92	2.92	3.02	2.21	1.85	1.52	1.64	1.97
Bacteria Grazers pgC L^{-1}	387.14	65.93	162.95	208.68	75.64	19.38	139.59	53.30
Protists Grazers pgC L^{-1}	1345.5	380.33	406.2	2307.4	1682. 5	1521.9	1476.2	1022.9
Diatoms pgC L^{-1}	4504.8	1892.5	1426.7	441.8	600.8	93.8	1088.9	169.0

C) Station 109

Depth (m)	25	40	80	90	110	195	210	400
Salinity	32.5	33.0	33.4	33.5	33.6	34.0	34.0	34.3
Temperature °C	0.6	-1.1	-0.8	-0.9	-0.9	-0.6	-0.6	-0.4
Density σ-theta	26.05	26.52	26.86	26.92	27.01	27.30	27.35	27.55
DO_2 µmol Kg^{-1}	328	334	322	316	306	284	284	274
PAR µmol m^{-2} sec^{-1}	3.21	0.64	0.031	0.015	0.004	0	0	0
Chlorophyll *a* µg L^{-1}	1.30	0.02	0.44	0.08	0.02	0.02	0.02	0.03
Ammonia µM	0.39	0.34	0.78	0.48	0.19	nd	nd	0.13
Nitrite µM	0.12	0.15	0.17	0.17	0.14	0.12	0.11	0.12
Nitrate µM	2.33	7.39	7.51	8.01	9.94	13.26	12.87	13.32
Silicate µM	4.1	10.9	6.2	8.3	8.8	14.6	14.1	14.8
Phosphate µM	0.51	0.96	0.85	0.89	0.92	1.06	1.04	0.99
Virus 10^7 VLP mL^{-1}	2.43	1.39	1.89	0.86	0.81	0.49	0.37	0.29
Bacteria 10^5 cells mL^{-1}	2.82	2.17	2.78	3.36	2.26	1.82	1.65	1.81
Bacteria Grazers pgC L^{-1}	563.28	171.15	236.36	216.11	84.14	72.68	46.87	80.81
Protists Grazers pgC L^{-1}	627.9	638.2	1039.5	1814.0	1325.8	2382.7	1264.2	976.9
Diatoms	24157	1003	1569	1564	107.6	442.3	191.2	322.8

Supplementary methods used in Table S1:

Nanoplankton (ca. 2-20 μm) concentrations were estimated using epifluorescence microscopy after staining with 4'6-diamino-2-phenylindole (DAPI) (Invitrogen, Burlington, ON, CAN) (Porter and Feig, 1980). Stained preparations were examined using an Olympus 1X71 (Olympus, Markham, ON, CAN) microscope at 1000X under both blue and UV excitation to visualize chlorophyll fluorescence of chloroplasts and DAPI stained nuclear DNA. Small flagellates were classified by size (1-3 μm, 3-6 μm, 6-10 μm) and diatoms, dinoflagellates and ciliates were enumerated separately (Thaler and Lovejoy 2012). Cell sizes were estimated using a calibrated grid and ocular micrometer. Biovolume values were determined for each category from approximate geometric shape (Hillebrand 2004). Bacterial grazers were considered to belong to the smaller size categories <) 6 microns irrespective of chlorophyll content, whereas protist grazers were dinoflagellates, ciliates and other protists > 6 microns. Virus concentrations were estimated after staining with SYBR Gold (Molecular Probes) (Noble and Fuhrman 1998). All microscopic counts were carried out using an Olympus 1X71 microscope at 1000X under blue excitation. Samples for flow cytometry (FCM) were fixed with buffered formalin for 1 h in the dark then flash frozen in Liquid Nitrogen and stored at -80 C until processing at the Bedford Institute of Oceanography where bacterial (prokaryote) concentrations were determined (Li et al 2009)

Additional References for methods used in the supplementary tables:

Hillebrand H (2004). Strength, slope and variability of marine latitudinal gradients. *Marine Ecology-Progress Series* **273:** 251-267.

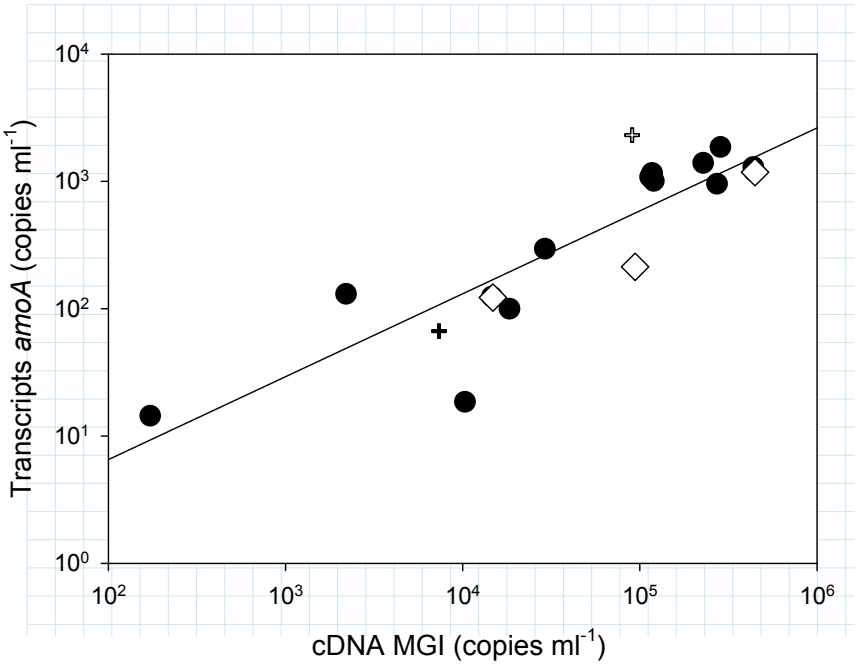
Li HR, Yu Y, Luo W, Zeng YX, Chen B (2009). Bacterial diversity in surface sediments from the Pacific Arctic Ocean. *Extremophiles* **13:** 233-246.

Noble RT, Fuhrman JA (1998). Use of SYBR Green I for rapid epifluorescence counts of marine viruses and bacteria. *Aquatic Microbial Ecology* **14:** 113-118.

Porter KG, Feig YS (1980) The use of DAPI for identifying and counting aquatic microflora. *Limnol Oceanogr* 25: 943-948.

Thaler M, Lovejoy C (2012). Distribution and Diversity of a Protist Predator Cryothecomonas (Cercozoa) in Arctic Marine Waters. *Journal of Eukaryotic Microbiology* **59:** 291-299.

Supplementary Figure S1



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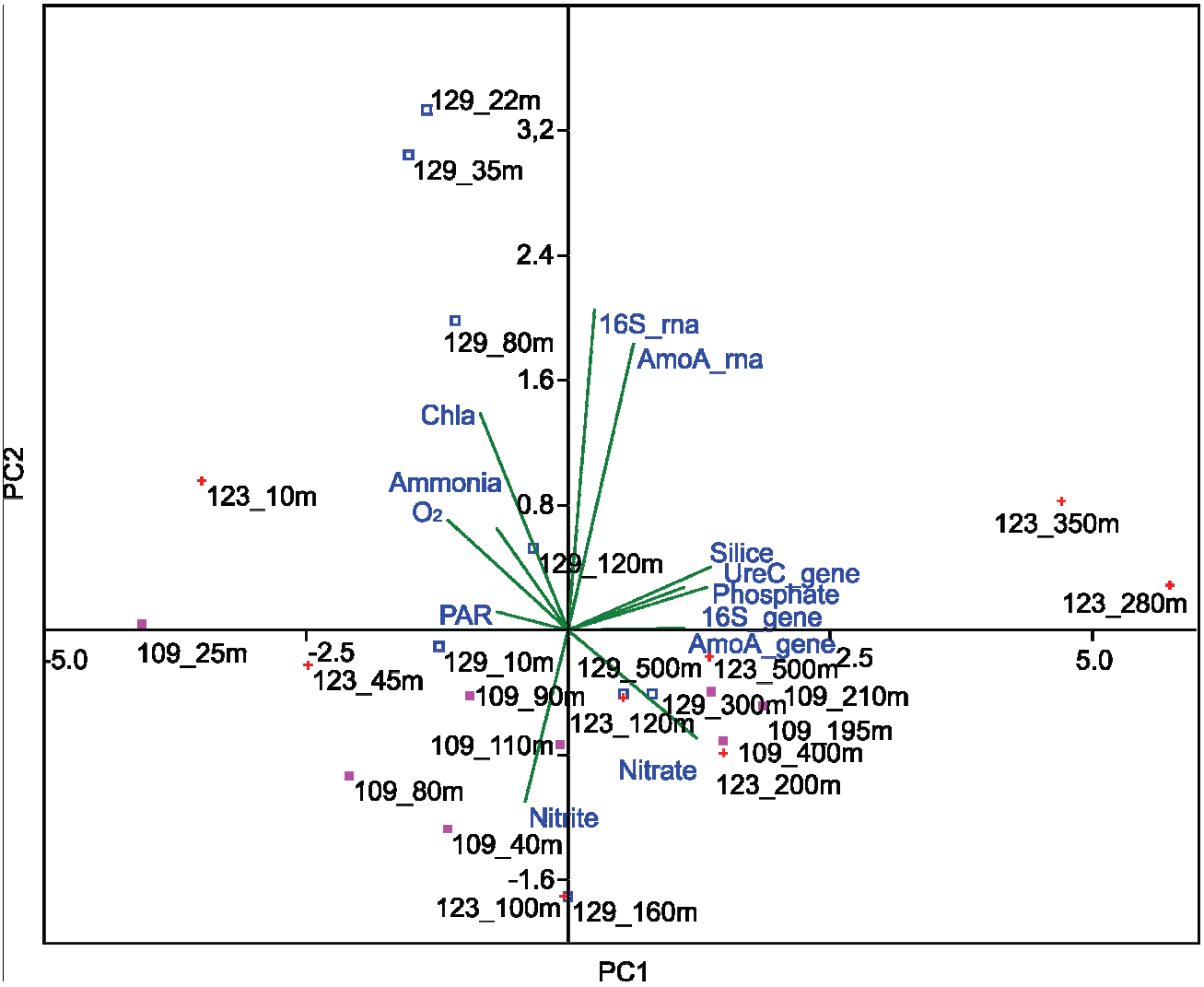
Supplementary Figure S2



SUPPLEMENTARY Figure S2. Principal component analysis (PCA) showing the relationship between environmental variables and transcript and gene copy numbers.