

Online Supplementary Information

Microbial diversity in arctic freshwaters is structured by inoculation of microbes from soils.

Crump, B. C.¹, Amaral-Zettler, L. A.^{2,3}, and Kling, G. W.⁴

¹ University of Maryland Center for Environmental Science, Horn Point Laboratory, 2020 Horns Point Road, Cambridge, MD, 21613. bcrump@umces.edu

² Marine Biological Laboratory, Josephine Bay Paul Center, 7 MBL St., Woods Hole, MA, 02543. amaral@mbl.edu

³ Brown University, Department of Geological Sciences, Providence, RI, USA, 02912

⁴ University of Michigan, Department of Ecology and Evolutionary Biology, 830 North University, Ann Arbor, MI 48109. gwk@umich.edu

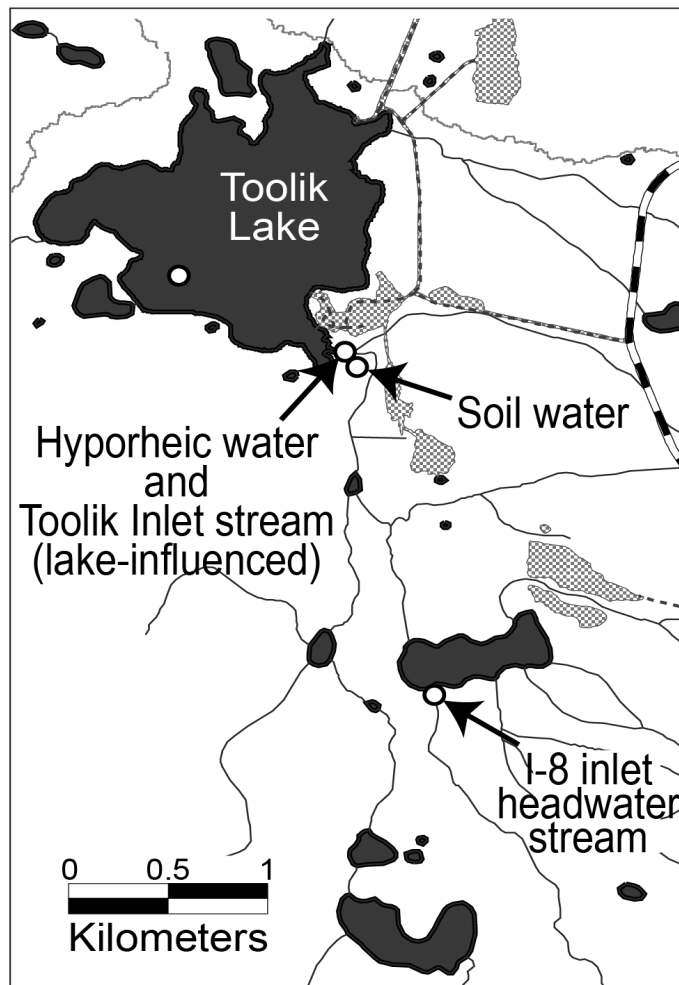


Figure S1. Map of sampling sites. Hatching indicates gravel pads of the Toolik Field Station, and areas of gravel excavation.

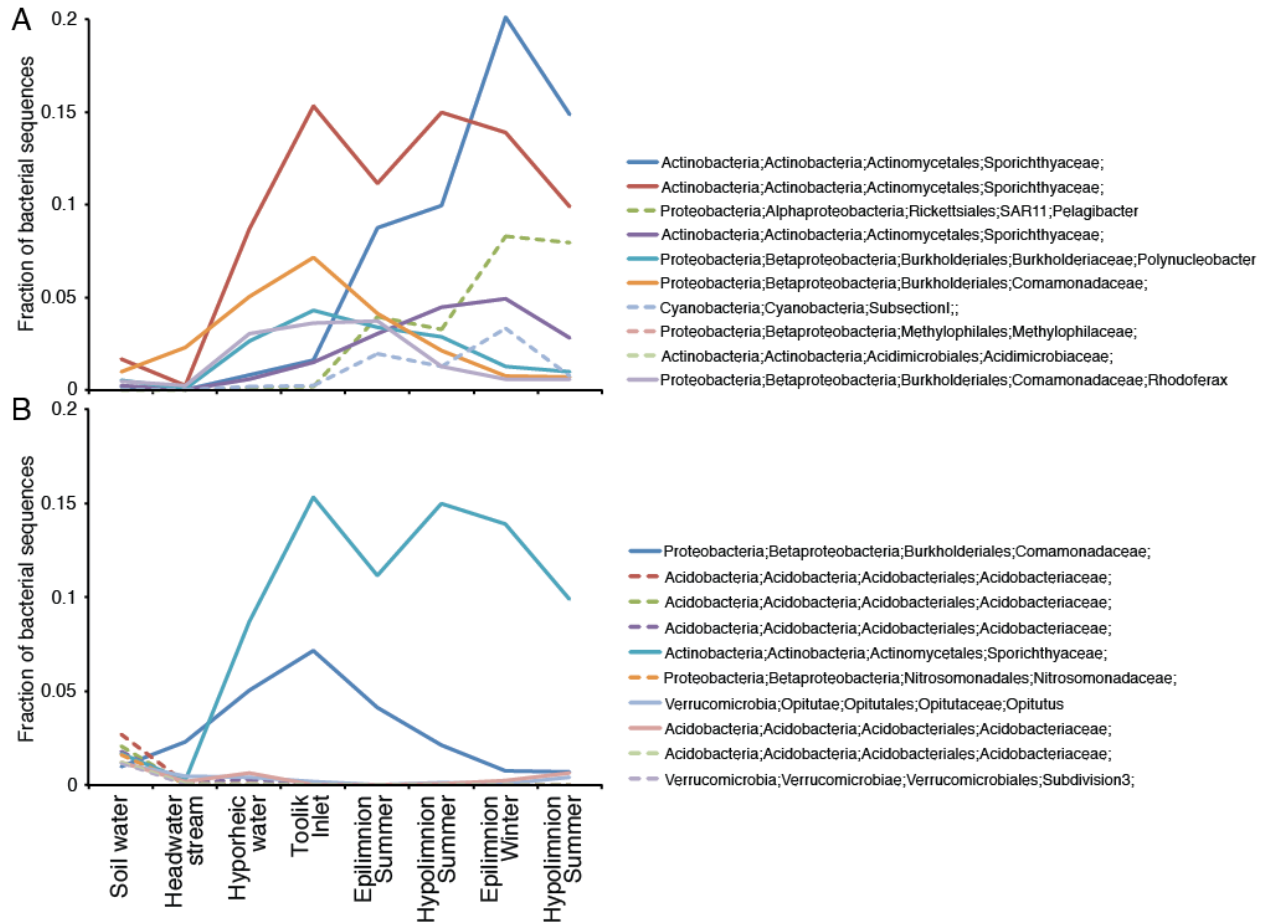


Figure S2. Relative abundance of bacterial sequences for the ten most abundant taxa in Toolik Lake (A), and in soil water and lake-less stream water (B). Taxa were selected by averaging the relative abundances of sequences in each taxon within the two sets of samples. Dashed lines in A indicate taxa that are rare in soil water and lake-less stream water. Dashed lines in B indicate taxa that are rare or absent in Toolik Lake. Rare taxa are represented by <0.1% of sequences in samples. Taxonomic identification for each taxa is based on comparisons to the SILVA-ARB database.

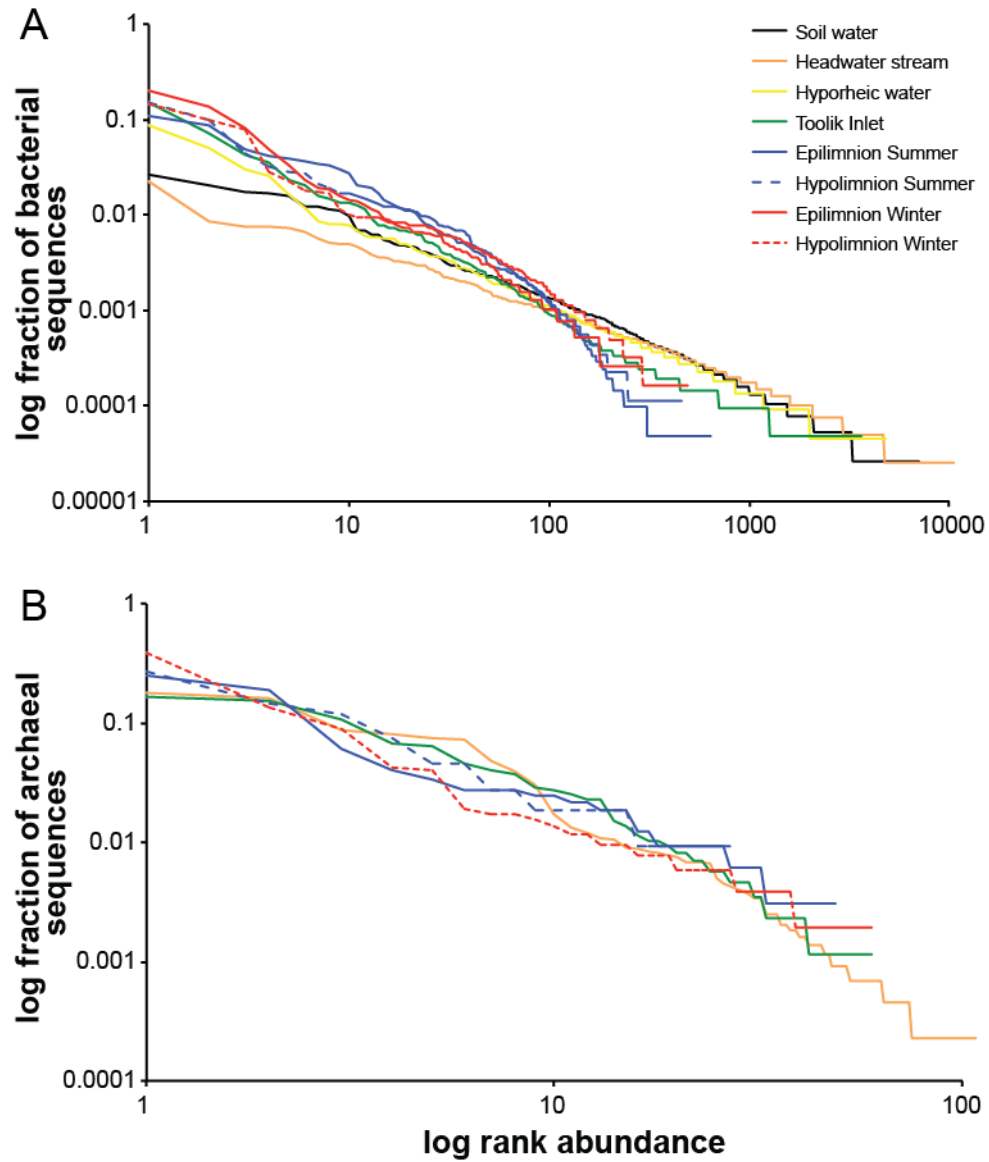


Figure S3. Rank abundance curves for (A) bacterial and (B) archaeal taxa for each site using pooled sequences from duplicate samples (when available, see Tables S1 & S2).

Table S1. Number of DNA sequences for each replicate (rep) sample for Bacteria (BAC), Archaea (ARC), and Eukarya (EUK), and the number of observed taxa (OTUs) determined based on 97% sequence similarity. Eukaryotic sequences classified as metazoa, metaphyta (Viridiplantae/Streptophyta, Rhodophyta), and Unknown ('Unknown Eukarya', 'environmental sample') were omitted.

Environment	rep	BAC Reads	BAC OTUs	ARC Reads	ARC OTUs	EUK Reads	EUK OTUs
Soil Water	A	17747	4685	1491	54	223	85
	B	20275	4110	2422	60	*	*
Headwater stream (I-8 inlet)	A	304	252	2156	78	3678	688
	B	39280	10512	2217	80	2772	588
Hyporheic water (Toolik inlet)	A	19443	4621	*	*	*	*
	B	2476	999	*	*	*	*
Stream water (Toolik inlet)	A	1770	555	520	53	12752	661
	B	19071	3493	346	34	4402	342
Toolik epilimnion (summer)	A	18322	607	117	29	*	*
	B	2312	217	208	35	1206	118
Toolik hypolimnion (summer)	A	3823	304	58	23	8470	213
	B	5005	358	50	10	7973	203
Toolik epilimnion (winter)	A	1862	214	*	*	2524	184
	B	1986	227	297	36	3291	166
Toolik hypolimnion (winter)	A	2773	341	221	42	6170	162
	B	3406	402	1491	54	9264	169

* Failed to PCR amplify

Table S2. Number of DNA sequences (reads) and observed OTUs (Obs. OTUs) for each pooled sample for Bacteria, Archaea, and Eukarya. Alpha diversity was estimated (Est. OTUs) by CatchAll for Bacteria and Archaea, and by Chao2 for Eukarya, given the data in Table S1. The Chao1, Shannon diversity index, and Shannon evenness are also included. Bacterial and archaeal sequences from epilimnion and hypolimnion samples were pooled by season (summer, winter) for Toolik Lake. For CatchAll, estimates and 95% upper and lower confidence bounds with Bonferroni corrections (U-CB and L-CB) are presented for the full data sets (Full, all reads), and for reduced data sets randomly resampled to equal sample size (*Reduced*).

GROUP Environment	Full # Reads	Full Obs. OTUs	Full Est. OTUs	Full U-CB Bonf.	Full L-CB Bonf.	Chao1	Shannon	Shannon evenness	Reduced # Reads	Reduced Obs. OTUs	Reduced Est. OTUs	Reduced U-CB Bonf.	Reduced L-CB Bonf.	Reduced Chao1	Reduced Shannon	Reduced Shannon evenness
BACTERIA:																
Soil water	38022	7113	26018	42370	17270	13195	7.28	0.82	10027	3256	11409	15449	8720	7641	7.00	0.87
Headwater stream	39584	10568	35555	42315	30243	20137	8.17	0.88	10027	4582	20769	25156	17319	11232	7.78	0.92
Hyporheic water	21919	4928	17617	21057	14919	10105	6.68	0.79	10027	2953	13095	17060	10252	6808	6.49	0.81
Toolik Inlet	20841	3697	16907	21858	13334	9036	5.55	0.68	10027	2234	15914	29180	9190	6569	5.43	0.70
Toolik Lake summer	29462	873	4119	6721	2699	2081	4.35	0.64	10027	487	1308	1814	1026	1077	4.33	0.70
Toolik Lake winter	10027	563	2548	6672	1242	1095	4.28	0.68	10027	563	2548	6537	1258	1095	4.28	0.68
ARCHAEA:																
Soil water	3913	77	131	230	101	100	1.90	0.44	433	32	51	88	42	62	1.69	0.49
Headwater stream	4373	108	172	262	142	155	2.97	0.63	433	52	76	112	68	121	2.89	0.73
Toolik Inlet	866	60	96	172	73	77	3.01	0.74	433	47	82	184	57	64	2.95	0.77
Toolik Lake summer	433	60	117	357	72	75	2.99	0.73	433	60	117	357	72	75	2.99	0.73
Toolik Lake winter	518	60	93	138	76	79	2.59	0.63	433	58	96	148	76	85	2.58	0.64
EUKARYA:																
Headwater stream	6450	951	1252	1299	1212				2524	865	1140	1185	1102			
Toolik Inlet	17154	746	979	1020	944				2524	427	543	571	520			
Toolik hypolimnion (summer)	16443	281	321	335	310				2524	177	200	211	193			
Toolik epilimnion (winter)	5815	233	262	274	253				2524	224	251	263	243			
Toolik hypolimnion (winter)	15434	221	249	261	241				2524	160	181	191	174			