Habitat severity characteristics structure soil communities at regional and local spatial scales along the Antarctica Peninsula

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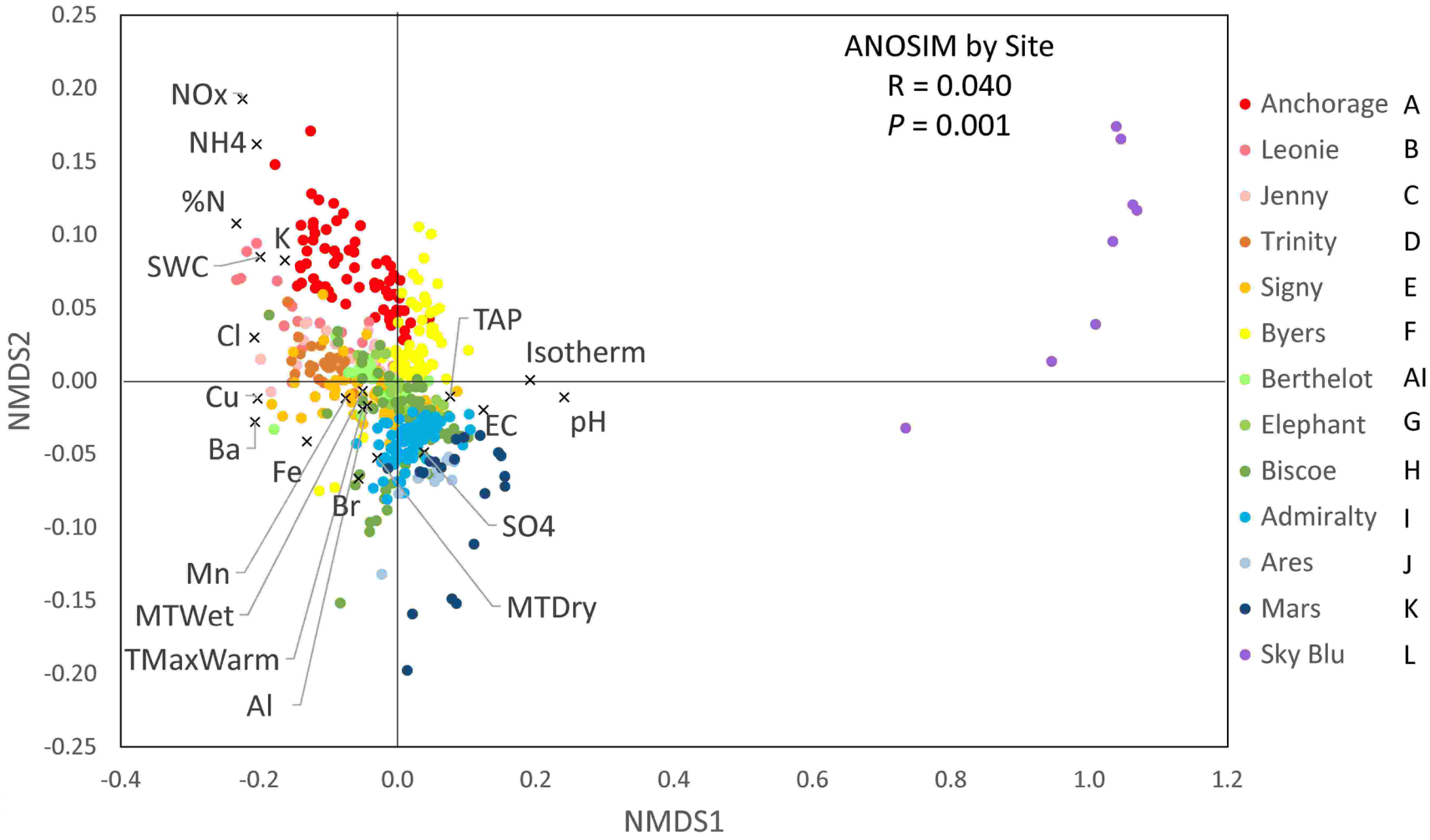
~~Appendix~~ S1. List of the thirteen sites sampled in the latitudinal transect from the South Orkney Islands to the southern Antarctic Peninsula, including the specific site name, geographic location (Island or Land, which for smaller islands is the same as the site name), latitude and longitude. Also listed is whether the site was a High- or Low-intensity sampling site.

Site name	Location	Lat (°S)	Long (°W)	Intensity	Parent material
Signy	Signy Is	60°42.40'	45°35.55'	H	Quartz-mica schist (Allen *et al.* 1967)
Elephant	Elephant Is	61°13.25'	55°08.38'	L	Schists (Schmitz *et al.* 2022)
Admiralty Bay	King George Is	62°11.01'	58°26.56'	H	Tholeiite basalt (Birkenmajer 1980)
Byers Peninsula	Livingston Is	62°40.40'	61°06.46'	H	Basalt (Moura *et al.* 2012)
Trinity	Trinity Is	63°53.72'	60°53.49'	L	Not documented
Biscoe Point	Anvers Is	64°48.62'	63°46.71'	H	Gabbro and adamellite (ASPA-139 2014)
Berthelot	Berthelot Is	65°19.69'	64°09.60'	L	Gabbro (ASPA-108 2018)
Anchorage	Anchorage Is	67°36.18'	68°12.35'	H	Granodiorite (Riley *et al.* 2011, Black *et al.* 2016)
Léonie	Léonie Is	67°36.07'	68°21.01'	L	Gabbro (Riley *et al.* 2011)
Jenny	Jenny Is	67°43.47'	68°24.17'	L	Gabbro (Riley *et al.* 2011)
Ares Oasis	Alexander Is	71°50.67'	68°13.55'	L	Sandstone and mudstone (Bell 1973)
Mars Oasis	Alexander Is	71°52.56'	68°15.58'	L	Sandstone and mudstone (Bell 1973)
Sky Blu	Ellsworth Land	74°49.82'	71°33.04'	L	Granodiorite (Rowley *et al.* 1988)

~~Appendix S2~~. NMDS ordination of soil habitat severity using the subset of soil physicochemical and climate parameters deemed to be non-collinear by VIF (following the protocol of Ball *et al.* (2022)), yielding a stress of 0.103. The NMDS creates a composite "map" of these site differences, demonstrating how sites varied along a gradient of overall habitat severity, ranging from more favorable conditions of warmer temperatures with moderate precipitation and high-nutrient but low-pH soils (upper left quadrant), to sites that were either wetter or drier, often cooler, and low in nutrients (lower right quadrant). Chemical and climate vectors are represented by ×'s.



~~Appendix S3~~. Resulting *P*-values from linear regressions between biotic metrics (microbial diversity and arthropod abundance) and latitude and climate factors at a regional scale (All sites).

	Latitude	MAT	MDR	Isotherm	TSeason	TMaxWarm	TMinCold	**TAR**	**MTWet**	MTDry	**MTWarm**	MTCold	TAP	**PWetMo**	**PDryMo**	**PSeason**	**PWet**	**PDry**	**PWarm**	**PCold**
Bacteria Chao1	0.241	0.011	0.386	0.314	0.064	0.010	0.034	0.155	0.010	0.394	0.009	0.016	0.283	0.123	0.121	0.042	0.197	0.169	0.135	0.706
Bacteria Shannon	0.429	0.006	0.288	0.763	0.246	<0.001	0.020	0.218	0.018	0.009	<0.001	0.013	0.427	0.384	0.520	0.154	0.377	0.492	0.556	0.542
Fungi Chao1	0.007	0.043	0.270	0.818	0.014	0.784	0.064	0.099	0.108	0.998	0.178	0.033	0.119	0.104	0.004	<0.001	0.117	0.009	0.002	0.583
Fungi Shannon	0.058	0.176	0.352	0.968	0.105	0.989	0.194	0.209	0.053	0.633	0.385	0.157	0.403	0.364	0.027	0.006	0.393	0.096	0.023	0.922
Mite abundance	0.165	0.013	0.020	0.985	0.003	0.260	0.005	0.004	0.064	0.333	0.056	0.007	0.009	0.003	0.050	0.043	0.008	0.020	0.033	0.047
Springtail abundance	0.141	0.291	0.861	0.234	0.366	0.197	0.414	0.709	0.333	0.817	0.329	0.318	0.447	0.307	0.223	0.189	0.347	0.361	0.267	0.694
Midge abundance	0.162	0.559	0.496	0.852	0.459	0.812	0.480	0.384	0.349	0.671	0.651	0.521	0.683	0.748	0.780	0.254	0.941	0.683	0.544	0.541

~~Appendix S4~~. Resulting R^2 values from linear mixed effects model testing the relationship between biotic metrics (microbial diversity and arthropod abundance) and soil properties at the regional scale (All sites), as well as the linear models testing the same relationships at each of the five 'high intensity' sites. The *P*-values for each relationship are listed in Appendix S5.

	pH	SWC	EC	% LOI	Total % C	Total %N	NO_2+NO_3-N	NH_4-N	P	K	Ca	Mg	Mn	SO_4^{2-}	Cl	Al	Fe	Na
Bacteria Chao1																		
All sites	0.013	0.031	0.002	0.030	0.048	0.019	<0.001	<0.001	0.009	0.002	0.003	0.002	0.009	0.001	0.013	0.013	0.006	0.009
Anchorage	<0.001	0.007	0.003	<0.001	0.006	0.006	0.001	<0.001	0.001	0.005	0.001	0.002	0.001	0.002	0.038	0.008	0.012	<0.001
Signy	0.109	0.022	<0.001	0.074	0.081	0.071	0.024	0.023	0.044	0.013	0.032	0.004	0.010	<0.001	<0.001	0.044	0.019	0.001
Byers	<0.001	0.124	0.001	0.110	0.178	0.092	0.044	0.121	0.139	0.019	<0.001	<0.001	0.003	0.004	0.048	0.144	0.110	0.094
Biscoe	0.166	0.097	0.007	0.090	0.088	0.069	0.074	0.034	0.057	0.033	0.020	0.013	0.107	0.020	0.037	0.030	0.049	0.070
Admiralty	0.022	0.292	0.053	0.202	0.211	0.134	0.035	0.018	0.185	0.275	0.217	0.153	0.136	0.211	0.163	0.254	0.173	0.480
Bacteria Shannon																		
All sites	0.016	0.007	0.001	0.005	0.008	0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	0.008	<0.001	0.003	0.011	0.004	0.006
Anchorage	0.013	0.018	0.029	0.003	0.006	0.006	0.009	0.008	<0.001	<0.001	0.003	0.006	0.005	<0.001	0.009	0.001	<0.001	<0.001
Signy	0.131	0.127	0.010	0.163	0.179	0.136	0.005	0.021	0.154	0.130	0.116	0.060	0.007	0.033	0.058	0.138	0.142	0.072
Byers	0.108	0.074	<0.001	<0.001	<0.001	0.017	<0.001	0.011	<0.001	0.047	0.029	0.011	0.115	0.046	0.085	0.004	0.037	0.003
Biscoe	<0.001	0.005	<0.001	<0.001	0.005	0.014	0.015	0.030	0.066	0.010	0.003	0.003	0.008	0.032	<0.001	0.002	0.001	0.017
Admiralty	0.020	0.238	0.047	0.069	0.186	0.097	0.058	0.013	0.086	0.112	0.102	0.056	0.085	0.144	0.093	0.123	0.061	0.300
Fungi Chao1																		
All sites	0.001	0.010	0.002	0.017	0.020	0.012	0.014	0.007	0.006	0.006	0.027	0.002	<0.001	<0.001	0.026	0.013	0.021	0.021
Anchorage	0.160	0.122	0.006	0.090	0.064	0.024	0.065	0.062	0.115	0.184	0.039	0.017	0.107	0.124	0.127	0.002	0.027	0.179
Signy	0.059	0.171	0.007	0.216	0.142	0.193	0.126	0.244	0.211	0.120	0.008	0.054	0.031	<0.001	0.041	0.002	0.194	0.087
Byers	0.264	0.029	0.002	0.062	0.161	0.002	0.434	0.304	0.055	0.060	0.147	0.199	0.115	0.001	0.001	0.148	0.115	0.084
Biscoe	0.003	0.058	0.001	0.066	0.062	0.053	0.021	0.043	0.120	0.065	0.119	0.107	0.066	0.028	0.094	0.038	0.041	0.110
Admiralty	0.230	0.002	0.020	0.179	<0.001	0.030	0.090	0.003	0.035	0.004	0.056	0.035	0.005	0.011	0.012	0.031	0.013	0.041
Fungi Shannon																		
All sites	0.004	0.005	0.017	0.023	0.038	0.024	0.004	<0.001	0.006	<0.001	0.005	0.002	0.028	<0.001	0.006	0.058	0.052	<0.001
Anchorage	<0.001	0.312	0.158	0.117	0.089	0.282	0.351	0.256	0.006	0.005	0.118	0.232	0.041	0.282	0.300	0.126	0.024	0.091
Signy	0.069	0.135	0.012	0.183	0.171	0.194	0.005	0.163	0.210	0.006	0.042	0.029	0.060	0.006	0.015	0.027	0.002	0.025
Byers	0.183	0.096	0.018	0.009	0.038	0.202	0.019	0.011	0.069	0.025	0.089	0.031	0.096	0.012	0.006	0.028	0.008	0.099
Biscoe	0.028	0.185	0.108	0.163	0.179	0.187	0.008	0.004	0.119	0.052	0.023	0.018	0.173	0.007	0.011	0.189	0.181	0.089
Admiralty	0.257	0.103	0.144	0.224	0.096	0.011	0.094	0.046	0.008	<0.001	0.012	0.018	<0.001	0.006	0.012	0.004	<0.001	0.003
Mite abundance																		
All sites	0.034	0.008	<0.001	0.039	0.039	0.053	0.002	0.001	0.040	0.019	<0.001	<0.001	<0.001	<0.001	0.022	0.022	0.007	0.024
Anchorage	0.011	0.021	0.004	0.080	0.042	0.097	0.053	<0.001	0.062	0.128	0.006	<0.001	<0.001	0.016	0.002	0.011	0.009	0.023
Signy	0.035	0.066	0.051	0.128	0.128	0.131	0.007	0.003	0.090	0.113	0.075	0.091	0.003	0.059	0.076	0.018	0.008	0.090
Byers	<0.001	<0.001	0.013	0.189	0.092	<0.001	0.072	0.066	0.095	0.014	0.002	0.012	<0.001	<0.001	<0.001	0.023	0.111	0.003
Biscoe	0.066	0.022	0.050	0.023	0.033	0.027	0.002	<0.001	0.059	<0.001	0.002	0.005	0.052	0.003	0.026	0.028	0.051	0.009
Admiralty	<0.001	0.062	0.027	0.048	0.033	0.003	0.084	<0.001	0.035	0.008	0.046	0.019	0.090	0.064	0.128	0.086	0.045	0.096
Springtail abundance																		
All sites	0.018	0.036	<0.001	0.076	0.090	0.058	0.008	0.027	0.028	0.015	<0.001	<0.001	0.002	<0.001	0.018	0.001	<0.001	0.020
Anchorage	<0.001	0.165	0.024	0.220	0.225	0.039	0.045	0.004	0.015	0.019	0.003	0.013	0.015	0.012	0.285	0.015	0.004	0.064
Signy	0.010	0.061	0.059	0.082	0.079	0.057	0.301	0.496	0.192	0.048	0.020	0.025	<0.001	0.024	0.023	0.052	0.022	0.027
Byers	<0.001	0.063	0.003	0.026	0.042	0.006	0.083	0.090	0.024	<0.001	0.031	0.050	0.031	0.014	<0.001	0.044	0.022	0.001

Biscoe	0.084	0.024	0.033	0.036	0.040	0.040	0.007	0.015	0.067	0.002	0.030	0.001	0.027	0.002	0.005	0.036	0.052	<0.001
Admiralty	0.012	<0.001	0.011	0.006	0.004	0.001	0.011	0.027	0.008	0.012	0.005	0.001	0.002	0.037	0.004	<0.001	<0.001	0.010
Midge abundance																		
All sites	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001
Anchorage	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Signy	0.002	0.008	0.011	0.005	0.007	0.008	0.004	<0.001	0.011	0.005	0.008	0.007	<0.001	0.005	0.007	0.001	0.006	0.009
Byers	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Biscoe	<0.001	<0.001	0.011	0.002	0.003	0.004	<0.001	0.002	0.003	<0.001	0.002	0.003	<0.001	0.001	0.001	0.004	0.007	<0.001
Admiralty	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

~~Appendix S5~~. Resulting *P*-values from linear regressions between biotic metrics (microbial diversity and arthropod abundance) and soil properties both at the regional scale (All sites) and at each of the five 'high intensity' sites.

	pH	SWC	EC	% LOI	Total % C	Total %N	NO_2+NO_3-N	NH_4-N	P	K	Ca	Mg	Mn	SO_4^{2-}	Cl	Al	Fe	Na
Bacteria Chao1																		
All sites	0.054	0.001	0.278	0.003	<0.001	0.028	0.617	0.796	0.090	0.321	0.254	0.357	0.039	0.410	0.015	0.015	0.086	0.052
Anchorage	0.837	0.505	0.652	0.914	0.538	0.559	0.790	0.922	0.797	0.598	0.805	0.741	0.802	0.753	0.128	0.499	0.401	0.897
Signy	0.006	0.230	0.983	0.025	0.018	0.028	0.209	0.214	0.088	0.358	0.142	0.610	0.412	0.814	0.926	0.087	0.259	0.780
Byers	0.942	0.003	0.789	0.005	<0.001	0.011	0.083	0.003	0.002	0.250	0.861	0.845	0.671	0.617	0.067	0.001	0.005	0.010
Biscoe	0.001	0.015	0.514	0.019	0.020	0.041	0.035	0.158	0.063	0.163	0.282	0.387	0.010	0.282	0.139	0.184	0.085	0.040
Admiralty	0.246	<0.001	0.067	<0.001	<0.001	0.003	0.136	0.289	<0.001	<0.001	<0.001	0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001
Bacteria Shannon																		
All sites	0.008	0.055	0.344	0.132	0.074	0.492	0.808	0.466	0.583	0.235	0.937	0.811	0.011	0.850	0.118	0.005	0.057	0.046
Anchorage	0.386	0.294	0.184	0.668	0.554	0.566	0.463	0.491	0.997	0.968	0.651	0.540	0.601	0.808	0.463	0.807	0.996	0.906
Signy	0.002	0.003	0.411	<0.001	<0.001	0.002	0.506	0.244	0.001	0.003	0.005	0.045	0.490	0.138	0.048	0.002	0.002	0.026
Byers	0.006	0.023	0.796	0.890	0.875	0.276	0.857	0.384	0.899	0.071	0.159	0.382	0.004	0.074	0.014	0.584	0.113	0.650
Biscoe	0.858	0.593	0.963	0.948	0.579	0.356	0.351	0.187	0.046	0.452	0.666	0.687	0.483	0.167	0.970	0.732	0.770	0.322
Admiralty	0.268	<0.001	0.087	0.036	<0.001	0.013	0.056	0.376	0.019	0.007	0.010	0.060	0.020	0.002	0.015	0.005	0.049	<0.001
Fungi Chao1																		
All sites	0.774	0.435	0.720	0.321	0.289	0.427	0.321	0.493	0.550	0.540	0.195	0.719	0.803	0.826	0.161	0.328	0.203	0.242
Anchorage	0.326	0.396	0.859	0.470	0.545	0.716	0.541	0.553	0.411	0.289	0.640	0.756	0.429	0.392	0.386	0.909	0.699	0.297
Signy	0.470	0.206	0.800	0.150	0.253	0.176	0.284	0.122	0.156	0.296	0.793	0.490	0.606	0.965	0.550	0.898	0.175	0.378
Byers	0.050	0.546	0.891	0.372	0.139	0.871	0.008	0.033	0.398	0.379	0.158	0.096	0.217	0.891	0.895	0.157	0.217	0.295
Biscoe	0.817	0.336	0.887	0.303	0.320	0.358	0.568	0.410	0.159	0.309	0.161	0.185	0.303	0.505	0.215	0.438	0.422	0.180
Admiralty	0.083	0.867	0.631	0.131	0.978	0.572	0.297	0.844	0.519	0.831	0.415	0.521	0.808	0.716	0.711	0.549	0.693	0.485
Fungi Shannon																		
All sites	0.600	0.543	0.190	0.197	0.111	0.222	0.536	0.834	0.534	0.910	0.543	0.682	0.092	0.810	0.424	0.009	0.014	0.958
Anchorage	0.952	0.150	0.329	0.407	0.472	0.176	0.122	0.201	0.857	0.870	0.406	0.227	0.629	0.175	0.160	0.389	0.715	0.468
Signy	0.434	0.266	0.747	0.189	0.206	0.175	0.831	0.217	0.157	0.823	0.548	0.617	0.468	0.818	0.718	0.630	0.894	0.640
Byers	0.112	0.261	0.631	0.736	0.484	0.093	0.628	0.710	0.344	0.573	0.280	0.533	0.260	0.693	0.781	0.551	0.754	0.254
Biscoe	0.510	0.075	0.182	0.096	0.080	0.073	0.717	0.815	0.162	0.362	0.550	0.597	0.086	0.738	0.675	0.072	0.078	0.230
Admiralty	0.064	0.264	0.181	0.087	0.280	0.738	0.287	0.461	0.762	0.949	0.711	0.645	0.971	0.791	0.709	0.834	0.935	0.864
Mite abundance																		
All sites	0.001	0.091	0.577	<0.001	0.001	<0.001	0.315	0.416	<0.001	0.003	0.681	0.696	0.639	0.757	0.002	0.002	0.068	0.002
Anchorage	0.413	0.252	0.610	0.022	0.103	0.012	0.066	0.989	0.045	0.004	0.545	0.837	0.897	0.318	0.724	0.402	0.442	0.232
Signy	0.122	0.032	0.059	0.002	0.002	0.002	0.491	0.660	0.012	0.004	0.021	0.011	0.659	0.043	0.021	0.270	0.450	0.012
Byers	0.996	0.819	0.355	<0.001	0.011	0.897	0.025	0.032	0.009	0.335	0.722	0.358	0.971	0.905	0.916	0.213	0.005	0.652
Biscoe	0.032	0.219	0.064	0.205	0.130	0.174	0.745	0.830	0.043	0.909	0.703	0.549	0.057	0.680	0.182	0.165	0.059	0.431
Admiralty	0.860	0.037	0.177	0.069	0.135	0.632	0.015	0.810	0.121	0.457	0.075	0.258	0.012	0.034	0.002	0.014	0.077	0.009
Springtail abundance																		
All sites	0.031	<0.001	0.698	<0.001	<0.001	<0.001	0.061	<0.001	0.002	0.009	0.954	0.990	0.383	0.919	0.004	0.467	0.609	0.004
Anchorage	0.996	0.003	0.275	<0.001	<0.001	0.159	0.133	0.644	0.382	0.325	0.692	0.427	0.382	0.431	<0.001	0.391	0.658	0.071
Signy	0.414	0.040	0.044	0.016	0.018	0.048	<0.001	<0.001	<0.001	0.067	0.244	0.190	0.933	0.205	0.208	0.057	0.223	0.175
Byers	0.847	0.036	0.672	0.185	0.088	0.535	0.016	0.012	0.199	0.876	0.147	0.063	0.145	0.336	0.901	0.083	0.222	0.780
Biscoe	0.015	0.203	0.132	0.117	0.097	0.095	0.490	0.319	0.031	0.704	0.151	0.787	0.171	0.743	0.554	0.118	0.057	0.914

Admiralty	0.368	0.995	0.394	0.532	0.615	0.784	0.382	0.175	0.461	0.377	0.564	0.766	0.714	0.111	0.610	0.942	0.895	0.405
Midge abundance																		
All sites	0.683	0.673	0.736	0.646	0.594	0.490	0.980	0.857	0.706	0.738	0.924	0.939	0.980	0.771	0.625	0.791	0.457	0.792
Anchorage	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Signy	0.728	0.463	0.398	0.559	0.493	0.473	0.599	0.938	0.395	0.546	0.469	0.485	0.869	0.577	0.479	0.750	0.511	0.430
Byers	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Biscoe	0.946	0.860	0.385	0.738	0.645	0.622	0.884	0.695	0.660	0.811	0.733	0.681	0.796	0.780	0.784	0.582	0.502	0.903
Admiralty	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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