Supplementary Materials for

Trace Element Patterns in Shells of Mussels (Bivalvia) Allow to Distinguish between Fresh- and Brackish-Water Coastal Environments

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Table S1. Elemental composition of freshwater bivalve shells (ppm, dry weight).

| Element | Detection Limit | Severnaya Dvina River | | | | Onega River | | | | | | Khalaktyrskoe Lake | | | | |
| | | Anodonta anatina | | Unio sp. | | Anodonta anatina | | | Unio sp. | | | Beringiana beringiana | | | | |
		1	2	1	2	1	2	3	1	2	3	1	2	3	4	5
Li	0.026	0.38	0.11	0.16	0.14	0.43	0.49	0.17	0.49	0.25	0.3	n.d	n.d	n.d	n.d	n.d
Na	11.2	2415	2670	2319	2471	2408	2246	2472	1938	1999	2080	2242	2037	2061	2238	2128
Mg	13.7	173	54.7	81	75.4	181	228	73.2	120	74.2	60.4	59.1	94.6	90.6	124	59.5
Al	7.93	580	157	130	148	518	651	116	385	190	148	58.3	119	109	215	105
P	20.7	323	81.9	321	81.6	71.8	90.6	54.1	124	126	76.3	126	133	135	251	106
S	26.7	465	198	278	176	171	341	159	257	249	187	551	446	526	547	318
K	20.3	246	51.8	55.4	58.4	184	219	42.2	126	56.2	52.8	n.d	n.d	n.d	22.1	n.d
Ca	65.7	392339	404725	385543	365543	392606	390740	399191	381631	385911	384704	421883	383635	385419	401699	394563
Ti	3.34	56.6	29.9	17.4	18.4	41.1	45.1	9.6	24	13.3	11.5	7.7	17.9	15.1	21	11.3
Mn	0.612	673	515	337	317	412	433	325	649	398	330	751	618	442	890	722
Fe	9.36	3088	469	2413	521	536	840	296	1725	1422	245	534	537	525	1396	284
Cu	0.717	3.2	2.6	2.2	1.9	3.3	4.2	3.1	4.5	3.8	2.2	8.5	9.2	8.8	10.5	9.1
Zn	1.28	4.5	0.25	4.5	2.7	6.5	12.1	11.4	12.3	10.7	8	7.5	7.8	9.5	9.1	5.7
Sr	0.048	815	734	720	622	363	376	370	436	388	374	287	254	256	284	236
Zr	0.024	2.5	1.13	0.65	0.43	2.17	2.83	0.74	1.3	0.97	0.96	0.51	0.6	0.61	0.68	0.57
Ba	0.070	69.4	39.5	51.3	24.8	27.1	31.6	25.5	35.3	28.2	21.7	14.8	14.7	12.1	21.2	14.4
La	0.012	1.1	0.25	0.6	0.25	0.39	0.38	0.1	0.49	0.29	0.11	n.d	0.026	0.026	0.032	0.019
Ce	0.021	2.3	0.5	1.1	0.4	0.74	0.8	0.2	1.1	0.67	0.17	n.d	0.03	0.03	0.063	n.d
Pr	0.004	0.26	0.08	0.12	0.07	0.1	0.09	0.02	0.11	0.08	0.03	0.005	0.006	0.008	0.009	n.d
Nd	0.009	1	0.23	0.47	0.18	0.34	0.35	0.08	0.44	0.28	0.08	0.018	0.032	0.037	0.06	0.025
Gd	0.006	0.17	0.04	0.1	0.03	0.06	0.06	0.01	0.07	0.04	0.02	0.008	0.017	0.01	0.02	0.011
Pb	0.064	0.64	0.43	0.45	0.35	0.23	0.4	0.13	0.87	0.65	0.13	0.14	0.23	0.2	0.27	0.16
U	0.005	0.053	0.017	0.017	0.009	0.02	0.03	n.d	0.027	0.019	0.007	n.d	n.d	n.d	n.d	n.d

n.d.—not determined.

Element	Detection Limit	Onega Bay *Mytilus edulis*					Dvina Bay *Mytilus edulis*				Avacha Bay *Mytilus trossulus*				
		1	2	3	4	5	1	2	3	4	1	2	3	4	5
Li	0.026	0.34	0.59	0.34	0.35	0.44	0.39	0.39	0.33	0.41	0.79	0.91	1.1	0.81	0.9
Na	11.2	3862	3227	2412	2927	3097	3510	3961	3082	3259	3568	3257	3660	3369	3755
Mg	13.7	1057	1342	1106	1499	1050	972	1178	872	1068	665	718	712	667	735
Al	7.93	37.4	65.9	11.4	45.4	21.6	60	29.8	31.2	16.8	n.d	n.d	n.d	n.d	n.d
P	20.7	129	156	152	155	174	184	161	143	130	148	161	153	153	220
S	26.7	1128	652	991	915	775	783	649	752	766	1038	1010	810	1248	945
K	20.3	41	46.1	n.d	42.9	40.3	63.5	29.3	24.2	n.d	25.6	n.d	n.d	22.3	27.3
Ca	65.7	436825	426232	421214	420768	410286	426901	416084	384750	398019	381521	361767	382948	374607	426009
Ti	3.34	n.d	6.2	n.d	3.7	n.d	4.6	n.d	n.d	n.d	n.d	n.d	n.d	n.d	n.d
Mn	0.612	52.6	14.8	35	83.9	22.3	190	59.5	339	25.7	9.3	13.8	15.9	9.4	12.7
Fe	9.36	84.4	62.6	77.6	251	48.6	576	286	386	98.1	67.3	48.9	46.2	74.4	20.6
Cu	0.717	n.d	1.33	1.13	n.d	1.41	1.45	1.11	0.94	n.d	1.9	2.2	2.6	1.9	1.11
Zn	1.28	13.9	12	12.7	22.8	18.9	20.5	20.6	16.5	11.6	14.5	9.8	17.1	16.9	11.8
Sr	0.048	1331	1369	1294	1295	1389	1643	1540	1683	1535	1298	1183	1099	1210	1270
Zr	0.024	n.d	0.65	0.41	0.47	0.45	0.61	0.47	0.59	n.d	0.57	0.55	0.01	0.58	n.d
Ba	0.070	5.1	4.5	3.2	4.5	4.8	13.3	10.2	14.4	10.7	2.9	3	2.3	2.4	2.8
La	0.012	0.59	0.38	0.3	0.3	0.3	0.15	0.09	0.13	0.078	0.038	0.032	0.023	0.033	0.026
Ce	0.021	0.57	0.38	0.33	0.35	0.34	0.22	0.101	0.22	0.063	n.d	n.d	n.d	n.d	n.d
Pr	0.004	0.008	0.01	0.012	0.018	0.006	0.034	0.011	0.031	0.012	0.006	0.002	0.014	0.002	0.022
Nd	0.009	0.048	0.062	0.051	0.068	0.038	0.1	0.056	0.105	0.039	0.021	0.014	n.d	0.019	n.d
Gd	0.006	0.007	0.01	0.011	0.013	0.01	0.02	0.016	0.023	0.014	0.009	n.d	n.d	0.007	n.d
Pb	0.064	0.095	0.13	0.096	0.11	0.17	0.14	0.11	0.11	0.09	0.14	0.14	0.17	0.19	0.18
U	0.005	0.015	0.011	0.02	0.012	n.d	0.01	n.d	0.018	n.d	0.031	0.044	0.008	0.071	0.024

n.d.—not determined.

		Bottom Sediments, ppm								Fresh Water, ppb					Marine Water, ppb		
Element	Detection Limit	Dvina Bay	Onega Bay	Avacha Bay	Severnaya Dvina River	Onega River	Khalaktyrskoye Lake	Element	Detection limit	Severnaya Dvina River	Onega River	Khalaktyrskoye Lake	Element	Detection Limit	Dvina Bay	Onega Bay	Avacha Bay
Na	52	7402	21369	30670	6505	16147	23349	Na	10	9567	4617	12640	Na	149	4785387	5476652	8815829
Mg	42	1715	3090	23842	1636	11035	26640	Mg	6.86	9977	11763	6122	Mg	274	572375	632628	1012034
Al	42	19116	44734	91139	21052	48106	88014	Al	0.82	155	15.0	11.7	Al	35.3	74.9	139	17.7
P	13	131	216	995	114	457	709	P	12.7	39.3	6.3	22.4	P	529	n.d.	n.d.	n.d.
S	10	403	132	475	63	466	611	S	13.4	17766	9470	2914	S	534	381696	457269	740505
K	25	8116	13981	9286	8893	16112	5234	K	10	1064	693	2050	K	160	162874	183643	310544
Ca	43	4561	10966	50006	4436	19987	58978	Ca	10	47842	38255	17303	Ca	203	187318	217142	342192
Ti	1.8	983	746	4475	790	2002	5076	Ti	0.51	n.d.	n.d.	n.d.	Ti	20.3	n.d.	n.d.	n.d.
Mn	4.7	135	150	1067	127	307	1260	Mn	0.1	168	6.9	1.8	Mn	2.5	104	37.8	3.2
Fe	35	5756	7583	55368	5800	19207	59763	Fe	5.44	592	56.2	78.0	Fe	218	n.d.	n.d.	n.d.
Li	0.043	4.1	4.6	11	5.6	13	9.3	Li	0.007	3.9	6.6	0.9	Li	0.27	84.4	96.2	159
Be	0.031	0.36	0.82	0.76	0.51	0.99	0.60	Be	0.007	n.d.	n.d.	n.d.	Be	0.3	n.d.	n.d.	n.d.
Sc	0.058	2.3	3.2	21.2	1.8	6.9	34.4	Sc	0.1	n.d.	n.d.	n.d.	Sc	3.05	n.d.	n.d.	n.d.
V	0.75	0.4	8.9	170	11.9	40.2	225	V	0.11	1.3	0.52	1.57	V	4.59	n.d.	n.d.	n.d.
Cr	0.68	16.6	37.1	41.1	15	47.5	59.9	Cr	0.62	n.d.	n.d.	n.d.	Cr	24.7	n.d.	n.d.	n.d.
Co	0.21	2.5	3.3	14.9	2.6	8.0	26.1	Co	0.12	n.d.	n.d.	n.d.	Co	4.71	n.d.	n.d.	n.d.
Ni	0.75	4.6	8.3	18.4	7.7	17.9	23.0	Ni	0.5	n.d.	n.d.	n.d.	Ni	8.58	n.d.	n.d.	n.d.
Cu	0.8	3.0	1.7	64.8	2.37	8.5	55.8	Cu	0.5	n.d.	n.d.	n.d.	Cu	10.3	n.d.	n.d.	n.d.
Zn	0.78	13.0	13.8	113	18	51.3	150	Zn	0.5	3.1	2.4	0.96	Zn	11.4	n.d.	n.d.	n.d.
Ga	0.024	3.5	8.3	14.9	4.2	9.0	18.0	Ga	0.04	n.d.	n.d.	n.d.	Ga	1.58	n.d.	n.d.	n.d.
As	0.064	0.71	0.032	4.60	1.21	0.82	2.31	As	0.1	1.5	0.56	0.40	As	2.23	n.d.	n.d.	n.d.
Rb	0.043	22.2	38.5	15.8	26.8	53.3	11.0	Rb	0.02	1.3	1.0	2.0	Rb	0.23	55.3	63.5	102
Sr	0.048	106	214	371	104	177	357	Sr	0.1	549	205	66	Sr	1.22	3538	4104	6879
Y	0.049	4.5	6.4	19.5	4.6	11.0	19.1	Y	0.005	0.42	0.030	0.007	Y	0.1	n.d.	n.d.	n.d.
Zr	0.024	32.6	60.1	81.6	27.4	114.9	78.1	Zr	0.007	0.29	0.093	0.015	Zr	0.3	n.d.	n.d.	n.d.
Nb	0.016	3.5	3.1	2.2	2.5	6.6	1.6	Nb	0.005	n.d.	n.d.	n.d.	Nb	0.21	n.d.	n.d.	n.d.
Mo	0.058	0.09	0.12	0.77	0.14	0.24	0.87	Mo	0.02	0.53	0.25	0.31	Mo	0.4	4.5	6.3	11.2
Ag	0.027	0.013	0.013	0.047	0.049	0.062	0.105	Ag	0.005	n.d.	n.d.	n.d.	Ag	0.11	n.d.	n.d.	n.d.
Sn	0.074	0.12	0.33	0.75	0.15	0.59	0.91	Sn	0.02	n.d.	n.d.	n.d.	Sn	0.33	n.d.	n.d.	n.d.
Sb	0.033	0.13	0.06	0.45	0.14	0.22	0.44	Sb	0.006	0.038	0.038	0.104	Sb	0.25	n.d.	n.d.	n.d.
Cs	0.012	0.27	0.29	0.66	0.43	1.0	0.54	Cs	0.001	0.009	0.001	0.011	Cs	0.02	0.12	0.14	0.25
Ba	0.07	273	489	406	334	417	250	Ba	0.1	49.9	22.6	6.2	Ba	0.76	n.d.	n.d.	n.d.
La	0.012	4.6	4.04	6.80	6.10	12.2	4.43	La	0.001	0.65	0.027	0.002	La	0.05	n.d.	n.d.	n.d.
Ce	0.02	10.1	8.2	15.5	12.1	26.6	11.1	Ce	0.001	1.5	0.049	0.004	Ce	0.05	n.d.	n.d.	n.d.
Pr	0.004	1.2	1.0	2.2	1.39	3.1	1.7	Pr	0.001	0.17	0.008	0.001	Pr	0.009	n.d.	n.d.	n.d.
Nd	0.034	4.7	4.2	10.6	5.29	12.1	7.8	Nd	0.001	0.70	0.034	0.004	Nd	0.03	n.d.	n.d.	n.d.
Sm	0.008	0.93	0.95	3.0	1.03	2.5	2.4	Sm	0.001	0.14	0.009	0.001	Sm	0.02	n.d.	n.d.	n.d.
Eu	0.007	0.26	0.30	0.93	0.29	0.58	0.92	Eu	0.001	n.d.	n.d.	n.d.	Eu	0.02	n.d.	n.d.	n.d.
Gd	0.003	0.764	0.875	2.9	0.939	2.1	2.8	Gd	0.001	0.13	0.006	0.003	Gd	0.03	n.d.	n.d.	n.d.

Tb	0.007	0.12	0.16	0.52	0.12	0.34	0.50	Tb	0.001	n.d.	n.d.	n.d.	Tb	0.008	n.d.	n.d.	n.d.
Dy	0.007	0.66	0.98	2.97	0.80	1.81	2.90	Dy	0.001	0.089	0.004	0.001	Dy	0.01	n.d.	n.d.	n.d.
Ho	0.007	0.13	0.20	0.61	0.15	0.37	0.63	Ho	0.001	n.d.	n.d.	n.d.	Ho	0.008	n.d.	n.d.	n.d.
Er	0.004	0.41	0.64	1.8	0.39	1.1	2.0	Er	0.001	0.042	0.003	0.002	Er	0.008	n.d.	n.d.	n.d.
Tm	0.005	0.061	0.099	0.27	0.061	0.16	0.28	Tm	0.001	n.d.	n.d.	n.d.	Tm	0.007	n.d.	n.d.	n.d.
Yb	0.008	0.50	0.77	2.1	0.45	1.2	2.2	Yb	0.001	0.032	0.003	0.003	Yb	0.02	n.d.	n.d.	n.d.
Lu	0.004	0.068	0.10	0.28	0.064	0.16	0.30	Lu	0.001	n.d.	n.d.	n.d.	Lu	0.01	n.d.	n.d.	n.d.
Hf	0.013	0.73	1.5	2.1	0.64	2.6	1.9	Hf	0.001	n.d.	n.d.	n.d.	Hf	0.05	n.d.	n.d.	n.d.
Ta	0.011	0.15	0.15	0.15	0.16	0.36	0.16	Ta	0.003	n.d.	n.d.	n.d.	Ta	0.11	n.d.	n.d.	n.d.
W	0.023	0.18	0.12	0.33	0.16	0.31	0.32	W	0.003	0.008	0.021	0.023	W	0.14	n.d.	n.d.	n.d.
Tl	0.005	0.094	0.14	0.077	0.14	0.21	0.067	Tl	0.002	0.003	0.001	0.001	Tl	0.07	n.d.	n.d.	n.d.
Pb	0.075	5.1	7.8	12.6	6.1	11.8	61.2	Pb	0.02	0.379	0.010	0.032	Pb	0.49	n.d.	n.d.	n.d.
Bi	0.01	0.012	0.005	0.069	0.030	0.054	0.090	Bi	0.001	n.d.	n.d.	n.d.	Bi	0.04	n.d.	n.d.	n.d.
Th	0.007	0.65	0.64	1.2	1.0	3.0	0.72	Th	0.001	0.035	0.004	0.001	Th	0.02	n.d.	n.d.	n.d.
U	0.006	0.24	0.27	0.52	0.33	0.79	0.32	U	0.001	0.407	0.355	0.029	U	0.03	1.31	1.74	2.93
B	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	B	0.69	23.1	23.0	32.4	B	30.6	2128	2502	4040
Si	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	Si	16.7	2094	1180	2439	Si	668	n.d.	n.d.	n.d.
Br	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	Br	20	33.5	27.9	38.6	Br	371	31355	38049	63331
Re	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	Re	0.001	0.0009	0.0005	0.0013	Re	0.008	n.d.	n.d.	n.d.

n.d.—not determined.

Table S4. Ca-normalized distribution coefficients between mussels' shells and water.

Sample	Li	Na	Mg	Al	S	K	Mn	Sr	U
AHol1	0.0121	0.0308	0.00212	0.46	0.00319	0.02814	0.49	0.181	0.0160
AHol2	0.0033	0.0330	0.00065	0.12	0.00132	0.00576	0.36	0.158	0.0049
UHol1	0.0050	0.0301	0.00101	0.10	0.00194	0.00646	0.25	0.163	0.0051
UHol2	0.0048	0.0338	0.00099	0.12	0.00129	0.00718	0.25	0.148	0.0030
OAP 1	0.0063	0.0508	0.00150	3.36	0.00176	0.02593	5.81	0.172	0.0056
OAP 2	0.0072	0.0476	0.00190	4.24	0.00352	0.03087	6.15	0.179	0.0082
OAP 3	0.0025	0.0513	0.00060	0.74	0.00161	0.00583	4.51	0.173	0.0007
OUP 1	0.0075	0.0421	0.00102	2.56	0.00272	0.01819	9.43	0.213	0.0077
OUP 2	0.0038	0.0429	0.00063	1.25	0.00260	0.00803	5.71	0.187	0.0053
OUP 3	0.0045	0.0448	0.00051	0.98	0.00197	0.00757	4.76	0.181	0.0020
AVA 1	0.0045	0.0004	0.00059	0.20	0.00126	0.00007	2.56	0.169	0.0095
AVA 2	0.0054	0.0003	0.00067	0.21	0.00129	0.00003	4.02	0.163	0.0143
AVA 3	0.0062	0.0004	0.00063	0.20	0.00098	0.00003	4.37	0.143	0.0025
AVA 4	0.0046	0.0003	0.00060	0.21	0.00154	0.00007	2.64	0.161	0.0221
AVA 5	0.0045	0.0003	0.00058	0.18	0.00102	0.00007	3.15	0.148	0.0066
O 1	0.0018	0.0004	0.00083	0.13	0.00123	0.00011	0.69	0.161	0.0043
O 2	0.0031	0.0003	0.00108	0.24	0.00073	0.00013	0.20	0.170	0.0032
O 3	0.0018	0.0002	0.00090	0.04	0.00112	0.00003	0.48	0.163	0.0060
O 4	0.0019	0.0003	0.00122	0.17	0.00103	0.00012	1.15	0.163	0.0034
O 5	0.0024	0.0003	0.00088	0.08	0.00090	0.00012	0.31	0.179	0.0008
J 1	0.0020	0.0003	0.00074	0.35	0.00090	0.00017	0.80	0.204	0.0033
J 2	0.0021	0.0004	0.00093	0.18	0.00077	0.00008	0.26	0.196	0.0009
J 3	0.0019	0.0003	0.00074	0.20	0.00096	0.00007	1.59	0.232	0.0069
J 4	0.0023	0.0003	0.00088	0.11	0.00094	0.00003	0.12	0.204	0.0009
KHL2	0.0006	0.0073	0.00040	0.20	0.00776	0.00020	17.36	0.178	0.0036
KHL3	0.0007	0.0073	0.00070	0.46	0.00690	0.00022	15.73	0.174	0.0040
KHL5	0.0007	0.0073	0.00066	0.42	0.00810	0.00022	11.19	0.174	0.0040
KHL6	0.0006	0.0076	0.00088	0.79	0.00808	0.00047	21.62	0.186	0.0038
KHL8	0.0007	0.0074	0.00043	0.39	0.00478	0.00022	17.85	0.157	0.0039

Table S5. Comparison of normalized concentration of Na, Mn, Ba, Mg, and Sr in marine and freshwater environments (✔ - $p < 0.01$, ✔* - $p < 0.05$, × - $p > 0.05$).

Factor	Na	Mn	Ba	Mg	Sr
Marine, Ca-normalized					
Locality	✔*	✔*	✔	✔	✔*
Species	✔*	✔	✔	✔	×
Freshwater, Ca-normalized					
Locality	✔*	✔*	✔	×	✔
Species	×	✔*	✔	×	✔*
Marine, Al-normalized					
Locality	✔*	×	✔	✔*	✔*
Species	✔	×	✔	✔	✔
Freshwater, Al-normalized					
Locality	×	✔	×	✔*	×
Species	×	✔	×	✔*	×

Table S6. Correlations between Ca-normalized concentrations of Li, Na, S and U in mussels' shells, water, and sediment (n = 6). Significant correlations are marked by an asterisk.

Element in Shell	Element in Water $R_{Spearman}$ (Probability)	Element in Sediment $R_{Spearman}$ (Probability)
Li/Ca	0.943 ($p < 0.01$)*	- 0.086 ($p > 0.05$)
Na/Ca	0.829 ($p < 0.05$)*	0.371 ($p > 0.05$)
S/Ca	0.829 ($p < 0.01$)*	- 0.543 ($p > 0.05$)
U/Ca	0.257 ($p > 0.05$)	0.829 ($p < 0.01$)*

Table S7. Relationships of Ca-normalized trace element concentrations in mussels' shells with "species" factor, determined using GLM (relationships are significant at p < 0.05, marked by an asterisk).

Element	Freshwater Species		Marine Species	
	R^2	*p*-Value	R^2	*p*-Value
Li	0.507	0.006*	0.884	0.001*
Na	0.292	0.050	0.301	0.025*
Mg	0.156	0.143	0.602	0.001*
S	0.523	0.005*	0.372	0.012*
La	0.295	0.049*	0.401	0.009*
Ce	0.285	0.053	0.546	0.002*
Nd	0.257	0.067	0.541	0.002*
Pb	0.206	0.099	0.590	0.001*
U	0.324	0.038*	0.403	0.009*

Table S8. Relationships of Ca-normalized trace element concentrations in mussels' shells with "locality" factor, determined using GLM (relationships are significant at p < 0.01). Statistically significant relationships are marked by an asterisk.

Element	Factor			
	Freshwater Locality		Marine Locality	
	R^2	*p*-Value	R^2	*p*-Value
Li	0.652	0.001*	0.874	0.001*
S	0.541	0.004*	0.381	0.028
Mn	0.327	0.037	0.306	0.054
Cu	0.935	0.001*	0.492	0.010
Sr	0.962	0.001*	0.727	0.001*
Ba	0.590	0.002*	0.908	0.001*
Nd	0.357	0.028	0.620	0.002*
Gd	0.305	0.045	0.718	0.001*
Pb	0.144	0.156	0.556	0.005*

Table S9. GLM for Al-normalized concentration of trace elements in freshwater mussels' shells, Factor: Locality (relationships are significant at p < 0.01).

Element	R^2	p-Value
Li	0.696	< 0.001
S	0.503	< 0.006
Ti	0.575	< 0.002
Mn	0.478	< 0.008
Cu	0.732	< 0.001
Ce	0.576	< 0.002
Nd	0.543	< 0.004
U	0.583	< 0.002

Table S10. GLM for Al-normalized concentration of trace elements in marine mussels' shells, Factor: Locality (relationships are significant at p < 0.01).

Element	R^2	p-Value
Li	0.965	< 0.001
Na	0.903	< 0.001
Mg	0.926	< 0.001
S	0.665	< 0.001
K	0.952	< 0.001
Mn	0.511	< 0.008
Fe	0.865	< 0.001
Cu	0.876	< 0.001
Zn	0.948	< 0.001
Sr	0.784	< 0.001
Ba	0.343	< 0.040
Pr	0.977	< 0.001

Table S11. Relationships of distribution coefficients ($K_{d\ Shell/Water}$) of elements between mussels' shells and water with factor "locality" determined using GLM (relationships are significant at p < 0.01).

Distribution Coefficient	R²	*p*-Value
K_d Li	0.551	0.001
K_d S	0.894	0.001
K_d Mn	0.910	0.001
K_d Sr	0.616	0.001

Table S12. Relationships of element distribution coefficients ($K_{d\ Shell/Water}$) with species factor determined using GLM (relationships are significant at p < 0.01).

Distribution Coefficient	R²	*p*-Value
K_d Na	0.937	0.001
K_d Mg	0.321	0.009
K_d Al	0.252	0.026
K_d S	0.895	0.001
K_d Mn	0.827	0.001
K_d U	0.243	0.029

Table S13. Spearman correlation coefficients between content of calcite, aragonite, vaterite and Ca-normalized element concentrations in bivalve shells. One asterisk indicates a significant correlation at p < 0.05, two asterisks indicate a significant correlation at p < 0.01. A dash indicates no statistically significant correlation.

Mineral	Mg	Sr	Mn	Fe	Na	Zn	Ba	Ce	Pr	Nd	Gd	Pb
Calcite	0.73**	0.74**	0.84**	-0.73**	0.80**	0.62**	-0.79**	-	-	0.46*	-0.59**	-0.57**
Aragonite	-0.76**	-0.76**	0.77**	0.69**	-0.83**	0.53**	0.75**	-	-	0.45*	0.54**	0.54**
Vaterite	-0.71**	-0.70**	0.76**	0.75**	-0.68**	0.76**	0.81**	0.43*	0.38*	0.58*	0.68**	0.61**

Table S14. Spearman correlation cefficients between content of calcite, aragonite, vaterite and Al-normalized element concentrations. One asterisk indicates a significant correlation at p < 0.05, two asterisks indicate a significant correlation at p < 0.01. A dash indicates no statistically significant correlation.

Mineral	Mg	Sr	Fe	Na	Zn	Ba	La	Ce	Pr	Nd	Gd	Pb
Calcite	0.82**	0.81**	0.40*	0.79**	0.79**	0.58**	0.75**	0.38*	0.59**	0.55**	0.65**	0.73**
Aragonite	-0.81**	-0.80**	-0.43*	-0.80**	-0.75**	-0.58**	-0.78**	-0.43*	-0.61**	-0.59**	-0.72**	-0.71**
Vaterite	-0.84**	-0.79**	-	-0.82**	-0.85**	-0.55**	-0.64**	-	-0.46	-0.44*	-0.58**	-0.70**
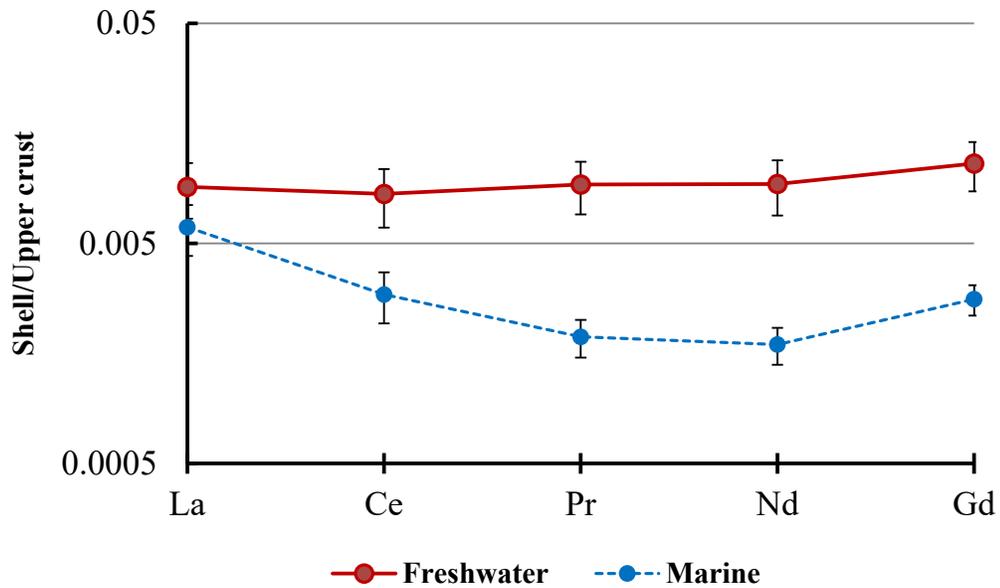
Figure S1. Upper crust-normalized REE pattern of the average values in the bivalve mollusks' shells.
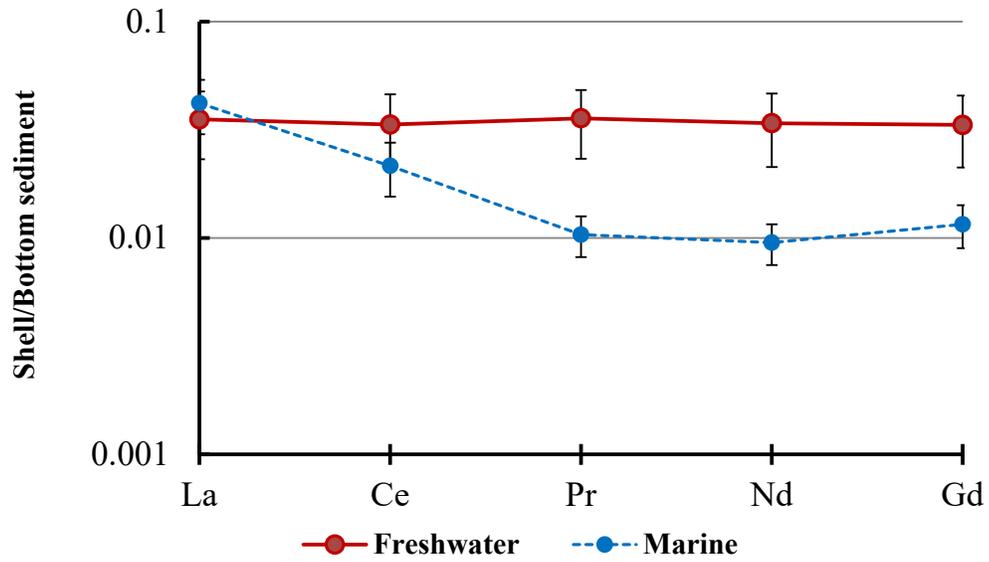
Figure S2. Bottom sediment-normalized REE pattern of the average values in the bivalve mollusks' shells.
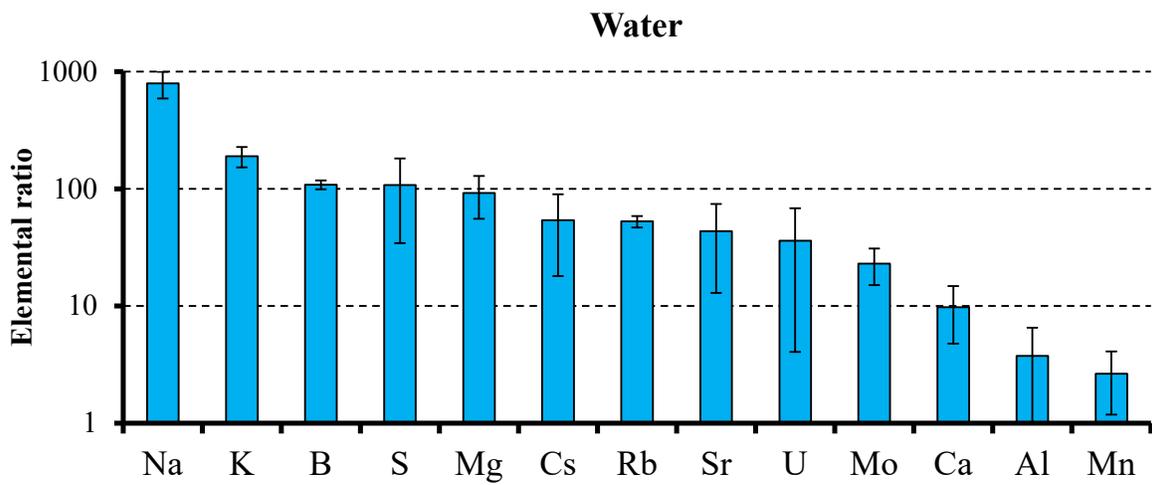
Figure S3. Mean ratio of trace elements concentrations in marine to fresh water localities. Error bars indicate s.e.m.
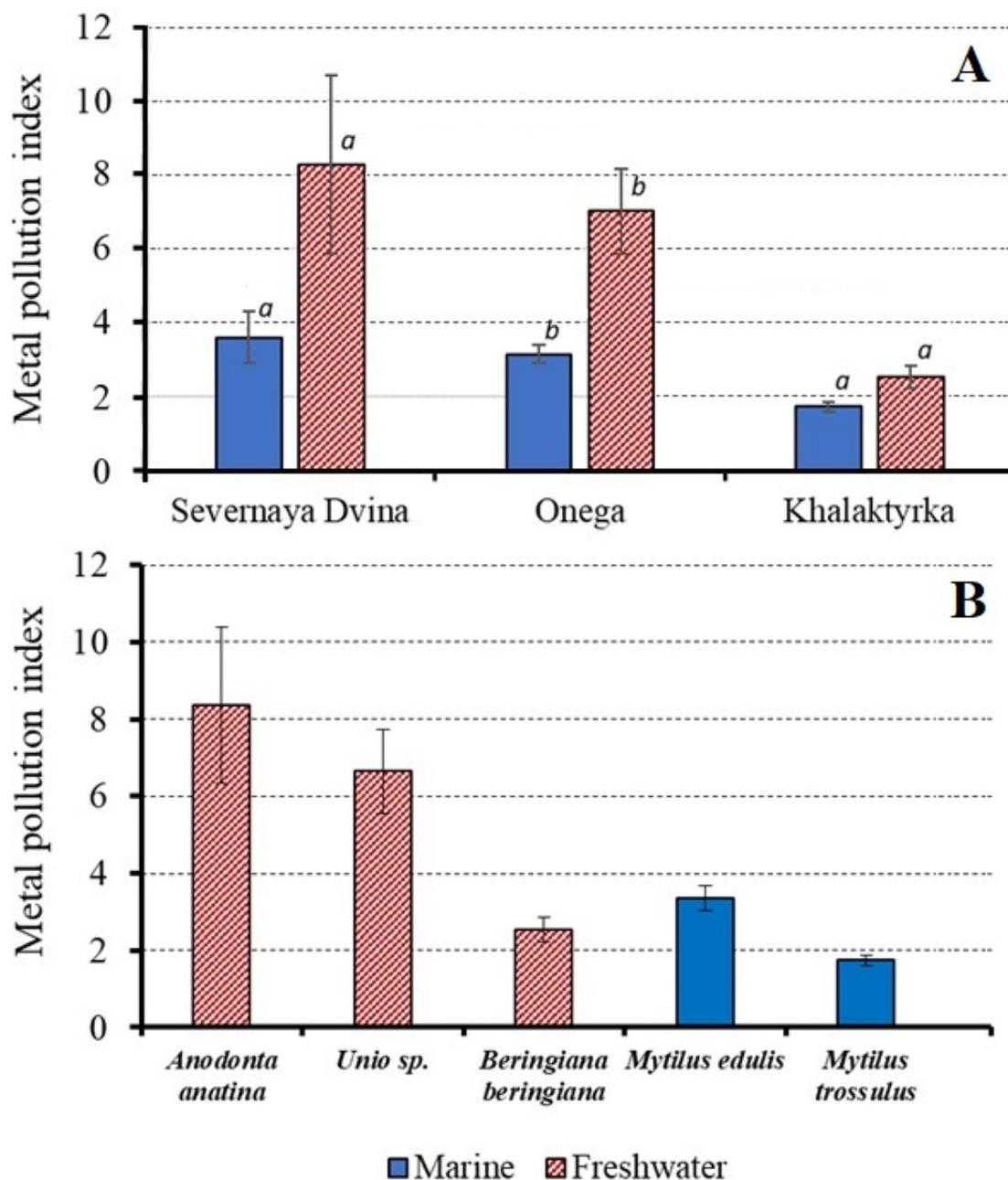
Figure S4. (**A**) - Mean values of the metal (Li, Na, Mg, Al, P, K, Ti, Mn, Fe, Cu, Zn, Sr, Zr, Ba, La, Ce, Pr, Nd, Gd, Pb, and U) pollution index for studied samples of marine (n = 4-5) and freshwater mussels (n = 4-6). Significant differences are shown by letters (a – no significant differences ($p > 0.05$), b – differences are significant at $p < 0.05$); (**B**) - Mean values of the metal (Li, Na, Mg, Al, P, K, Ti, Mn, Fe, Cu, Zn, Sr, Zr, Ba, La, Ce, Pr, Nd, Gd, Pb, and U) pollution index for studied species of marine (n = 5-9) and freshwater mussels (n = 5).
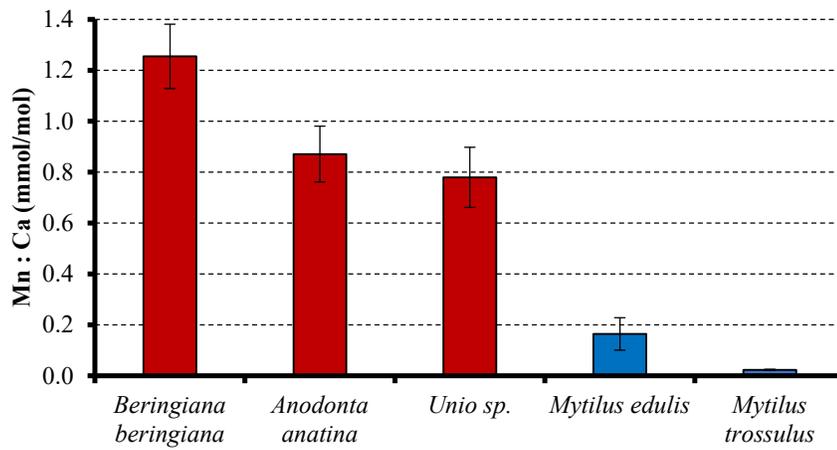
Figure S5. Comparison of Mn : Ca-ratio (mmol/mol) in shells of studied species of bivalve mollusks (n = 5 to 9). The differences between Mn : Ca-ratio values among samples are significant at p < 0.00001). Error bars indicate s.e.m.
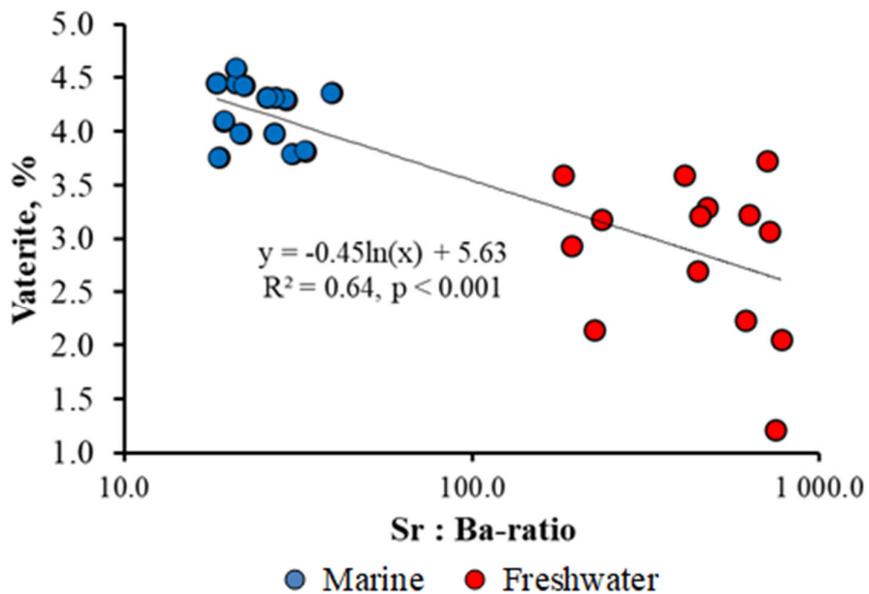
Figure S6. Regression relationship between Sr : Ba – ratio in freshwater (red circles) and marine (blue circles) mussels' shells and percentage of vaterite.
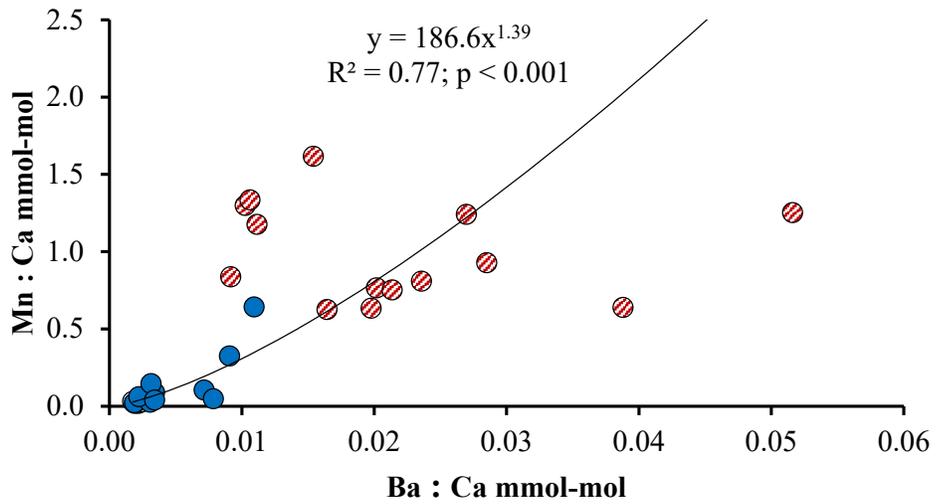
Figure S7. Regression relationships between Ba : Ca-ratio and Mn : Ca-ratio in bivalve shells samples. Blue circles, marine mussels (N = 15); hatched circles, freshwater mussels (N = 14).
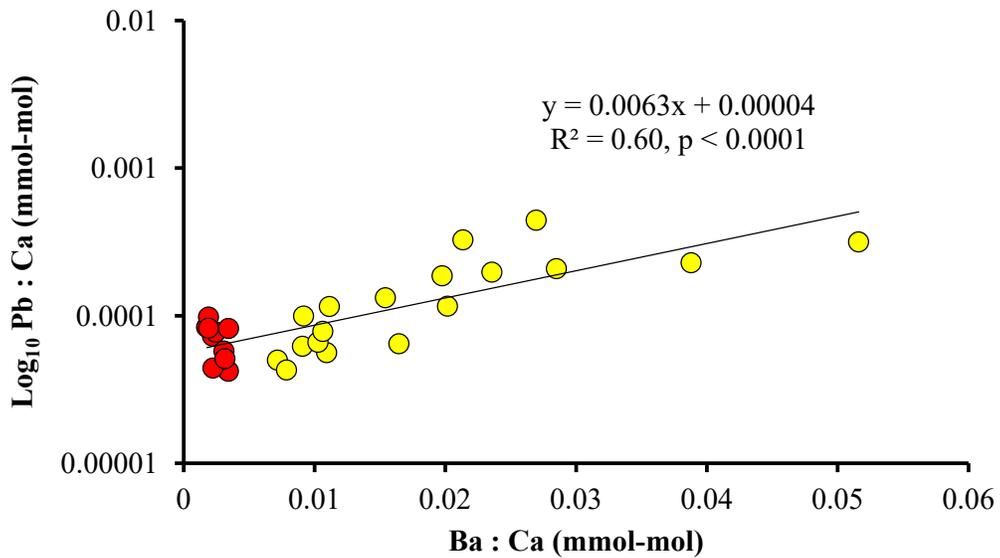
Figure S8. The power relationships between Ba : Ca-ratio and Pb : Ca-ratio in bivalve shells samples. Yellow labels show samples from biotopes with silt sediment and red labels show samples from biotopes with dominant sandy deposits.
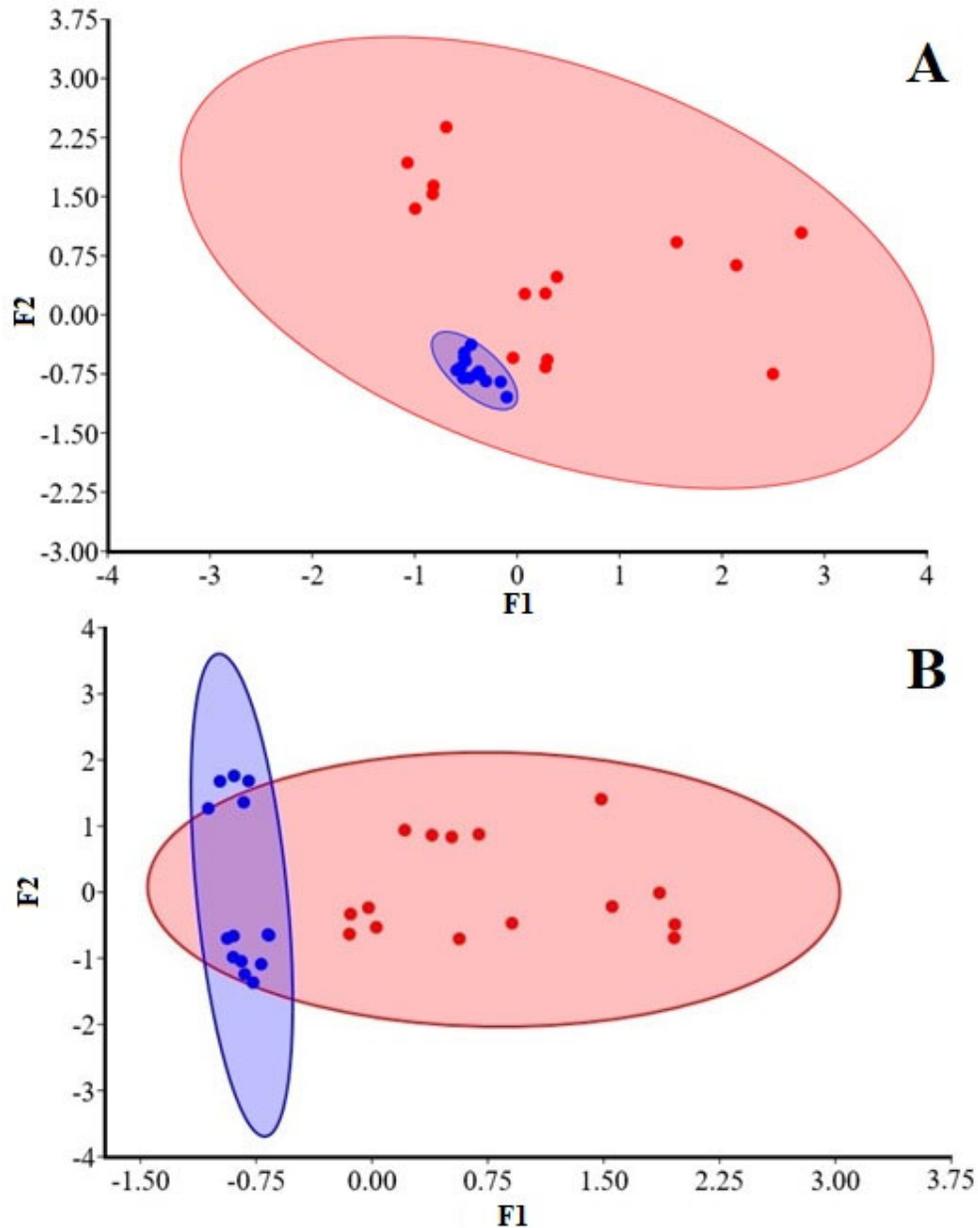
Figure S9. (A) - PCA factorial graph F1 × F2 for $K_{d\ \text{Shell/Water}}$. The samples are shown by markers: blue ones present marine samples; red ones present freshwater samples. Ellipses indicate 95 % confidence interval. **(B)** - PCA factorial graph F1 × F2 for $K_{d\ \text{Shell/Sediment}}$. The samples are shown by markers: blue ones present marine samples; red ones present freshwater samples. Ellipses indicate 95 % confidence interval.
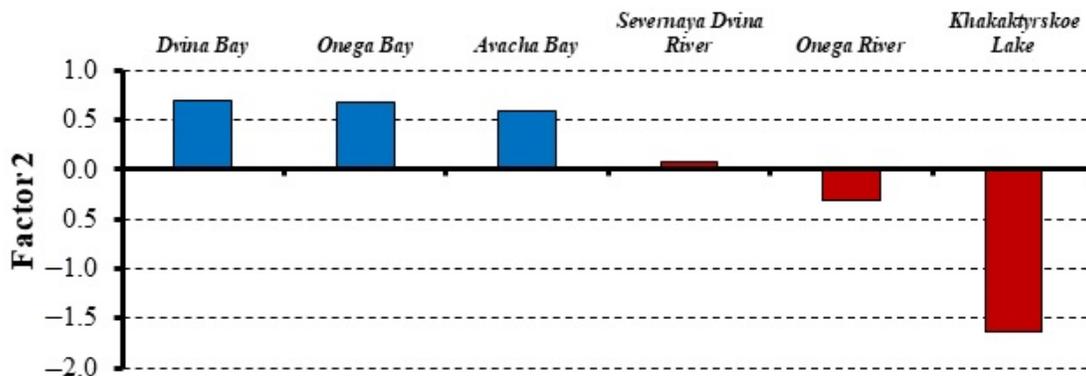
Figure S10. Median values of Factor 2 for studied samples of mussels from marine (blue columns) and freshwater (red columns) localities.
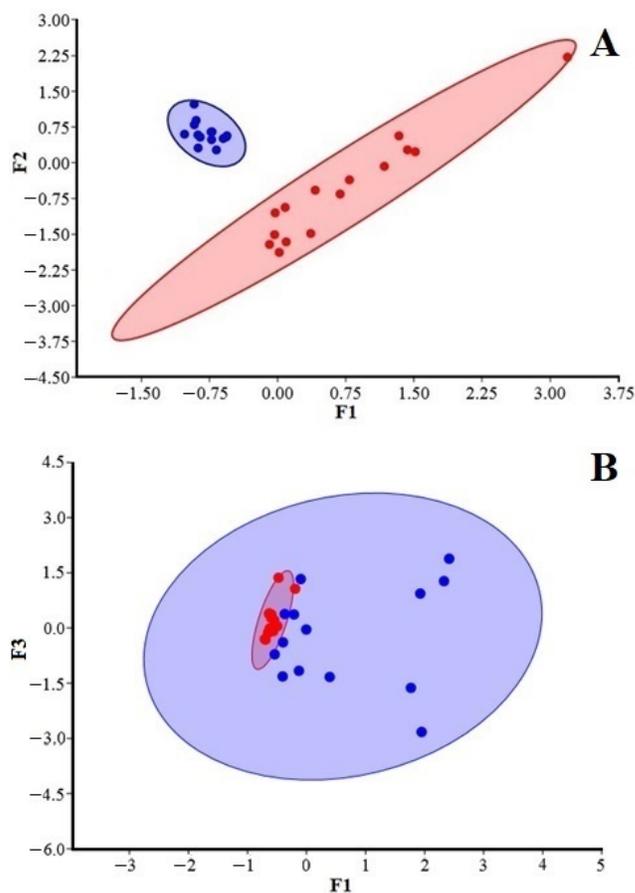

Figure S11. (**A**) Normed PCA factorial graph F1 × F2 of marine (blue circles) and freshwater (red circles) samples. Ellipses indicate 95 % confidence interval; (**B**) PCA factorial graph F1 × F3 of Al-normalized concebtration of trace elements in freshwater and marine samples. The samples are shown by markers: blue ones present marine samples; red ones present freshwater samples. Ellipses indicate 95 % confidence interval.