APPENDIX 1

Hydrochemical parameter concentrations, statistical variability, and hydrodynamic topology of the lakes in the Zoloushka Cave (study period – February 20, 2020)

Parameter, component	Deviation	*Bukowina Lake* 2	*Basements Lake* 3	*Spelunca Lake* 3	*Siphon Lake* 3	*Venice Lake* 2	*Filipcovo Lake* 2	*Fragment Lake* 2	*Green Labyrinth Lake* 1	*Crocodile Lake* 2	*Four Lake* 2	*Arithmetic mean*
		No. 1	**No. 2**	**No. 3**	**No. 4**	**No. 5**	**No. 6**	**No. 7**	**No. 8**	**No. 9**	**No. 10**	
pH	-	7.93	7.81	7.48	7.71	7.79	7.54	7.51	7.56	7.51	7.64	7.65
	+/-	+ 0.28	+ 0.16	-0.17	+0.06	+0.14	-0.11	-0.14	-0.09	-0.14	-0.01	σ = 0.17
	%mean	+ 3.66%	+2.1%	-2.2%	+0.8%	+1.8%	-1.4%	-1.8%	-1.2%	-1.8%	-0.1%	
Eh	mV	237	242	242	231	238	242	242	241	243	242	240
	+/-	-3	+2	+2	-9	-2	+2	+2	+1	+3	+2	σ = 4
	%mean	-1.2%	+0.8%	+0.8%	-3.8%	-0.8%	+0.8%	+0.8%	+0.4%	+1.2%	+0.8%	
Total dissolved solids (TDS)	mg/l	2855.9	2512.9	2344.7	2171.4	2717.1	2640.5	2602.1	2979.0	2985.3	2654.6	2646.4
	+/-	+209.5	-133.5	-301.7	-475.0	+70.7	-5.9	-44.3	+332.6	+338.9	+8.2	σ = 247.2
	%mean	+7.9%	-5.0%	-11.4%	-17.9%	+2.7%	-0.2%	-1.7%	+12.6%	+12.8%	+0.3%	
Total hardness (TH)	mg $CaCO_3$/l	1739.5	1575.5	1484.6	1320.0	1415.2	1681.2	1686.7	1620.0	1584.4	1572.5	1568.0
	+/-	+171.5	+7.5	-83.4	-248.0	-152.8	+113.2	+118.7	+52.0	+16.4	+4.5	σ = 122.9
	%mean	+10.9%	+0.5%	-5.3%	-15.8%	-9.7%	+7.2%	+7.6%	+3.3%	+1.0%	+0.3%	
Carbonate hardness	mg $CaCO_3$/l	339.3	345.1	229.9	223.8	371.3	363.1	352.5	332.0	387.7	345.1	329.0
	+/-	+10.3	+16.1	-99.1	-105.2	+42.3	+34.1	+23.5	+3.0	+58.7	+16.1	σ = 53.4
	%mean	+3.1%	+4,9%	-30.1%	-32.0%	+12.9%	+10.4%	+7.1%	+0.9%	+17.8%	+4.9%	
Non-carbonate hardness	mval/l	28.0	24.61	25.09	21.93	20.88	26.36	26.29	25.76	23.93	24.55	24.74
	+/-	+3.26	-0.13	+0.35	-2.81	-3.86	+1.62	+1.55	+1.02	-0.81	-0.81	σ = 2.01
	%mean	+13.2%	-0.5%	+1.4%	-11.4%	-15.6%	+6.5%	+6.3%	+4.1%	-3.3%	-0.8%	
EC (25)	µS/cm	296	289	261	286	306	286	284	317	310	285	292
	+/-	+4	-3	-31	-6	+14	-6	-8	+25	+18	-7	σ = 15
	%mean	+1.4%	-1.0%	-10.6%	-2.1%	+4.8%	-2.1%	-2.7%	+8.6%	+6.2%	-3.4%	
H_2SiO_3	mg/l	21.58	15.34	16.38	14.43	24.70	18.15	17.77	16.16	22.93	18.63	18.61
	+/-	+2.97	-3.27	-2.23	-4.18	+6.09	-0.46	-0.84	-2.45	+4.32	+0.02	σ = 3.23
	%mean	+16.0%	-17.6%	-12.0%	-22.5%	+32.7%	-2.5%	-4.5%	-13.2%	+23.2%	+0.1%	
SiO_2	mg/l	16.60	11.80	12.60	11.10	19.00	13.96	13.67	12.43	17.64	14.33	14.13
	+/-	+2.47	-2.33	-1.53	-3.03	+4.87	-1.70	-0.46	-1.70	+3.51	+0.20	σ = 2.55
	%mean	+17.5%	-17.5%	-10.8%	-21.4%	+34.5%	-1.2%	-3.3%	-12.0%	+24.8%	+1.4%	
Cations:												
Na^+	mg/l	94.90	70.20	64.70	99.30	210.20	64.08	91.90	210.30	211.10	112.50	122.92
	+/-	-28.0	-52.7	-58.2	-23.6	+87.3	-58.8	-31.0	+87.4	+88.2	-10.4	σ = 59.22
	%mean	-22.8%	-42.9%	-47.4%	-19.2%	+71.0%	-47.9%	-25.2%	+71.1%	+71.8%	-8.5%	
K^+	mg/l	13.30	12.20	9.73	7.87	15.20	8.29	9.57	15.73	14.20	10.09	11.62
	+/-	+1.68	+0.58	-1.89	-3.75	+3.58	-3.33	-2.05	+4.11	+2.58	-1.53	σ = 2.73
	%mean	+14.5%	+5.0%	-16.3%	-32.3%	+30.8%	-28.7%	-17.6%	+35.4%	+22.2%	-13.2%	
Li^+	mg/l	0.116	0.099	0.081	0.082	0.154	0.074	0.089	0.175	0.163	0.108	0.114
	+/-	+0.002	-0.015	-0.033	-0.032	+0.040	-0.040	-0.025	+0.061	+0.049	-0.006	σ = 0.035
	%mean	+1.8%	-13.2%	-28.9%	-28.1%	+35.1%	-35.1%	-21.9%	+53.5%	+43.0%	-5.3%	

Ca^{2+}	mg/l	589.8	551.9	528.5	466.3	483.9	592.1	590.5	532.5	549.6	545.0	543.0
	+/-	+46.8	+8.9	-14.5	-76.7	-59.1	+49.1	+47.5	-10.5	+6.6	+2.0	σ = 40.8
	%mean	+8.6%	+1.6%	-2.7%	-14.1%	-10.9%	+9.0%	+8.7%	-1.9%	+1.2%	+0.4%	
Mg^{2+}	mg/l	65.10	48.24	40.34	38.06	50.50	49.56	51.86	70.82	51.80	51.70	51.80
	+/-	+13.3	-3.56	-11.46	-13.74	-1.3	-2.24	+0.06	+19.02	0.00	-0.10	σ = 9.37
	%mean	+25.7%	-6.9%	-22.1%	-26.5%	-2.5%	-4.3%	+0.1%	+36.7%	0.0%	-0.2%	
Ba^{2+}	mg/l	0.018	0.025	0.018	0.009	0.007	0.021	0.021	0.019	0.016	0.022	0.018
	+/-	0.000	+0.007	0.000	-0.009	-0.011	+0.003	+0.003	+0.001	-0.002	+0.004	σ = 0.005
	%mean	0.0%	+38.9%	0.0%	-50.0%	-61.1%	+16.7%	+16.7%	+5.6%	-11.1%	+22.2%	
Sr^{2+}	mg/l	9.750	8.040	7.900	7.070	8.700	8.057	8.326	8.583	9.600	8.287	8.431
	+/-	+1.319	-0.391	-0.531	-1.361	+0.269	-0.374	-0.105	+0.152	+1.169	-0.144	σ = 0.752
	%mean	+15.7%	-4.6%	-6.3%	-16.1%	+3.2%	-4.4%	-1.2%	+1.8%	+13.9%	-1.7%	
Mn^{2+}	mg/l	0.003	0.003	0.002	0.002	0.002	0.002	0.005	0.002	0.001	0.004	0.003
	+/-	0.000	0.000	-0.001	-0.001	-0.001	-0.001	+0.002	-0.001	-0.002	+0001	σ = 0.001
	%mean	0.0%	0.0%	-33.3%	-33.3%	-33.3%	-33.3%	+66.7%	-33.3%	-66.7%	+33.3%	
Cu^{2+}	mg/l	0.00180	0.00150	0.00100	0.00120	0.00150	0.00800	0.00076	0.00130	0.00110	0.00090	0.0019
	+/-	-0.0001	-0.0004	-0.0009	-0.0007	-0.0004	+0.0061	-0.0011	-0.0006	-0.0008	-0.0010	σ = 0.00205
	%mean	-5.3%	-21.7%	-47.4%	-36.8%	-21.1%	+321.1%	-60.0%	-31.6%	-42.1%	-52.6%	
Ni^{2+}	mg/l	0.0012	0.0070	0.0050	0.0056	0.0044	0.0055	0.0045	0.0043	0.0043	0.0045	0.0046
	+/-	-0.0034	+0.0024	+0.0004	+0.0010	-0.0002	+0.0009	-0.0001	-0.0003	-0.0003	-0.0001	σ = 0.0010
	%mean	-73.9%	+52.2%	+8.7%	+21.7%	-4.3%	+19.6%	-2.2%	-6.5%	-6.5%	-2.2%	
Co^{2+}	mg/l	0.0012	0.0013	0.0013	0.0012	0.0010	0.0013	0.0012	0.0010	0.0010	0.0011	0.0012
	+/-	0.0000	+0.0001	+0.0001	0.0000	-0.0002	+0.0001	0.0000	-0.0002	-0.0002	-0.0001	σ = 0.0001
	%mean	0.0%	+8.3%	+8.3%	0.0%	-16.7%	+8.3%	0.0%	-16.7%	-16.7%	-8.3%	
Cr^{3+}	mg/l	0.0026	0.0029	0.0039	0.0016	0.0011	0.0022	0.0017	0.0010	0.0010	0.0009	0.0019
	+/-	+0.0007	+0.0010	+0.0020	-0.0003	-0.0008	+0.0003	-0.0002	-0.0009	-0.0009	-0.0010	σ = 0.0010
	%mean	+36.8%	+52.6%	+105.3%	-15.8%	-42.1%	+15.8%	-10.5%	-47.4%	-47.4%	-52.6%	
Mo^{6+}	mg/l	0.0054	0.0047	0.0033	0.0034	0.0018	0.0021	0.0016	0.0064	0.0030	0.0029	0.0035
	+/-	+0.0019	+0.0012	-0.0002	-0.0001	-0.0017	-0.0014	-0.0019	+0.0029	-0.0005	-0.0006	σ = 0.0015
	%mean	+54.3%	+34.3%	-5.7%	-2.9%	-48.6%	-40.0%	-54.3%	+82.9%	-14.3%	-17.1%	
Total cations	mg/l	773.1	690.8	651.3	618.7	768.7	722.2	752.3	838.3	836.5	727.7	
Anions:												
Cl^-	mg/l	67.0	42.4	28.9	23.3	15.8	78.0	63.0	25.0	14.00	16.00	37.3
	+/-	+29.7	+5.1	-8.4	-14.0	-21.5	+40.7	+25.7	-12.3	-23.3	-21.3	σ = 22.56
	%mean	+79.6%	+13.7%	-22.5%	-37.5%	-57.6%	+109.1%	+68.9%	-33.0%	-62.5%	-57.1%	
SO_4^{2-}	mg/l	1537.5	1334.5	1350.8	1239.6	1451.6	1357.3	1335.7	1685.5	1634.9	1466.0	1439.3
	+/-	+98.2	-104.8	-88.5	-199.7	+12.3	-82.0	-103.6	+246.2	+195.6	+26.7	σ = 136.2
	%mean	+6.8%	-7.3%	-6.1%	-13.9%	+0.9%	-5.7%	-7.2%	+17.1%	+13.6%	+1.9%	
HCO_3^{2-}	mg/l	414.0	421.0	280.5	273.0	453.0	443.0	430.0	405.0	473.0	421.0	401.4
	+/-	+12.6	+19.6	-120.9	-128.4	+51.6	+41.6	+28.6	+3.6	+71.6	+19.6	σ = 65.1
	%mean	+3.1%	+4.9%	-30.1%	-32.0%	+12.9%	+10.4%	+7.1%	+1.2%	+17.8%	+4.9%	
NO_3^-	mg/l	41.0	7.1	15.1	0.6	1.6	19.6	0.9	5.8	< 0.6	2.6	9.5
	+/-	+31.5	-2.4	+5.6	-8.9	-7.9	+10.1	-8.6	-3.7	-9.2	-6.9	σ = 12.2
	%mean	+331.6%	-25.3%	+58.9%	-93.7%	-83.2%	+106.3%	-90.5%	-38.9%	-96.8%	-72.6%	

BO_3^{3-}	mg/l	1.00	1.00	1.00	1.00	1.00	1.63	2.00	3.18	3.21	2.18	1.72
	+/- %mean	-0.72 -41.9%	-0.72 -41.9%	-0.72 -41.9%	-0.72 -41.9%	-0.72 -41.9%	-0.09 -5.2%	+0.28 +16.3%	+1.46 +84.9%	+1.49 +86.6%	+0.46 +26.7%	σ = 0.85
Total anions	mg/l	2060.3	1806.0	1676.3	1537.5	1923.0	1898.9	1830.6	2122.3	2123.5	1906.6	
Total analysis	mg/l	2833.5	2496.8	2327.6	2156.2	2691.7	2621.1	2582.9	2960.4	2960.0	2634.3	2626.4
	+/- %mean	+209.1 +7.9%	-127.6 -4.9%	-296.8 -11.4%	-468.2 -17.9%	+67.3 +2.5%	-3.3 -0.2%	-41.5 -1.7%	+336.0 +12.7%	+335.6 +12.7%	+9.9 +0.3%	σ = 241.6
Analytical error	%	-2.34	-1.35	-1.30	0.17	-0.14	-1.67	2.00	-0.48	-0.92	-1.54	-0.76
	+/- %mean	-1.58	-0.59	-0.54	+0.93	+0.62	-0.91	+2.76	+0.28	-0.16	-0.78	σ = 1.16
Hydroche-mical type	Type*	SO_4-Ca	SO_4-Ca	SO_4-Ca	SO_4-Ca	SO_4-Ca-Na	SO_4-Ca	SO_4-Ca	SO_4-Ca-Na	SO_4-Ca-Na	SO_4-Ca	

(1 – hanging ('relic') lakes, 2 – lakes well-connected to the aquifer; 3 – and lakes with poor connection to the aquifer; No. x – number of sample)