SUPPLEMENTARY MATERIAL

Causes of eutrophication in small water reservoirs in urban areas

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Table S1. Selected characteristic physico-chemical properties of the waters (minimum-maximum/average) of the ponds in the Botanical Garden of Maria Curie-Skłodowska University in Lublin in the 2022 and 2023 seasons

Parameter	Point								
	I	II	III	IV	I	II	III	IV	V – underground outflow
Sampling date	Mar–Jul 2022				Mar–Oct 2023				2023
Indices characterising the physical state, including thermal conditions									
Temperature (°C)	4.0–22.2/14.3	4.1–22.4/13.6	4.2–22.2/13.5	5.4–21.2/13.7	9.8–22.8/16.7	9.1–23.3/16.7	9.3–22.2/16.3	10.5–21.5/16.5	9.6–9.9/9.8
Turbidity (NTU)	9.9–19.0/13.9	9.1–14.2/12.0	9.0–16.8/11.9	10.2–12.0/ 11.2	14.8–24.1/ 19.4	14.0–18.5/ 15.4	9.2–14.6/12.4	13.3–15.0/14	n.d.
Suspended solids ($mg \cdot dm^{-3}$)	7.4–34.6/17.2	5.0–30.5/15.5	5.1–28.8/15.5	3.9–29.4/15.7	6.1–33.5/24.2	11.0–27.8/ 23.0	5.4–31.0/23.4	10.0–31.5/23.5	19.0–21.0/20.0
Transparency (m)	n.d.	n.d.	n.d.	n.d.	0.15–0.52/ 0.38	0.18–0.75/ 0.51	0.20–0.59/0.53	0.25–0.64/0.48	n.d.
Indices characterising acidification and salinity									
Reaction (pH)	7.58–8.36/8.00	7.20–7.88/7.47	7.60–8.27/7.95	7.30–8.19/ 7.82	7.52–8.49/ 8.04	7.56–8.68/ 8.12	7.60–8.42/7.98	7.37–8.67/7.92	7.09–7.33/7.21
Electrolytical conductivity ($\mu S \cdot cm^{-1}$)	627–759/676	577–741/634	575–746/640	584–711/629	562–1143/703	549–1215/699	564–1220/708	564–1229/707	819–889/854
Indices characterising oxygen conditions and organic pollutants									
Dissolved oxygen ($mg\ O_2 \cdot dm^{-3}$)	2.1–17.1/11.1	10.3–13.3/12.5	9.4–16.7/13.9	1.13–18.8/ 12.0	3.64–14.3/9.2	3.9–17.6/10.5	3.9–18.3/11.1	3.6–21.6/10.7	4.4–5.4/4.9
Oxygen (% saturation)	24.5–105.3/60.1	105.7–126.2/119.0	64.0–141.0/106.1	12.9–120/65.7	33.4–138/98.2	35.2–172/ 109.8	36.1–171.8/ 115.9	33.9–203.9/ 110.8	39.9–58/48.8
Biological oxygen demand ($mg\ O_2 \cdot dm^{-3}$)	4.6–8.5/6.8	3.6–8.0/5.6	3.5–7.5/5.6	3.6–7.6/5.6	2.2–8.9/6.6	3.5–7.7/6.5	1.9–11.0/6.8	3.4–8.3/6.4	6.3–14.4/10.3
Chemical oxygen demand measured in chrome ($mg\ O_2 \cdot dm^{-3}$)	7.5–15.6/11.2	6.3–18.6/11.4	6.5–17.4/11.3	6.2–18.2/11.8	7.3–19.4/15.1	10.4–17.2/ 14.8	6.1–24.4/15.5	9.3–18.2/14.6	13.–29.0/21.0
Chlorophyll “a” ($\mu g \cdot dm^{-3}$)	12.4–49.0/32.6	10.0–142.1/63.0	11.0–108.2/57.7	13.3–42.3/ 43.5	55.7–330.6/ 139.6	63.8–289/ 154.0	37.9–296.9/ 132.4	66.9–260.3/ 163.1	n.d.
Cyanobacteria ($\mu g \cdot dm^{-3}$)	0.2–2.7/1.1	0.3–6.5/2.1	0.2–6.0/3.2	0.1–6.0/2.0	2.1–13/8.5	7.5–18.8/11.6	3.9–15/8.6	6.0–15.2/11.3	n.d.

continue Tab. S1

Parameter	Point								
	I	II	III	IV	I	II	III	IV	V – underground outflow
Indices characterising nutrient conditions									
Ammonium (mg $NH_4^+ \cdot dm^{-3}$)	<0.01–0.53/0.15	<0.01–1.63/0.42	<0.01–1.86/0.50	<0.01–1.4/0.38	<0.01–0.17/0.05	<0.01–0.37/0.09	<0.01–0.36/0.12	<0.01–0.53/0.20	<0.01
Nitrates (mg $NO_3^- \cdot dm^{-3}$)	6.19–9.16/7.34	4.50–9.73/7.27	4.56–10.26/7.66	4.89–10.29/7.50	3.20–13.70/7.90	0.92–18.22/6.88	2.53–19.81/9.1	1.72–16.40/8.33	34.9–53.2/42.4
Nitrites (mg $NO_2^- \cdot dm^{-3}$)	0.01–0.15/0.09	0.01–0.14/0.06	0.01–0.15/0.06	0.01–0.14/0.06	<0.01–0.3/0.13	<0.01–0.18//0.10	0.01–0.25/0.13	0.02–0.15/0.11	<0.01
Mineral nitrogen (mg $N \cdot dm^{-3}$)	1.49–2.11/1.80	1.11–3.27/1.99	1.18–3.76/2.13	1.25–3.18/2.00	0.76–3.28/1.86	0.21–4.30/1.65	0.61–4.48/2.18	0.46–3.97/2.07	7.9–12.02/9.96
Total nitrogen (mg $N \cdot dm^{-3}$)	2.71–3.71/3.06	2.80–3.98/3.30	2.42–6.60/3.80	2.06–4.25/3.15	2.62–5.29/3.75	2.80–5.79/3.85	2.87–6.06/4.30	2.76–6.33/4.37	9.0–13.33/11.9
Orthophosphates (mg $PO_4^{3-} \cdot dm^{-3}$)	0.21–0.53/0.34	0.13–0.30/0.21	0.24–0.44/0.35	0.11–0.71/0.36	0.09–0.57/0.42	0.08–0.49/0.33	0.05–0.36/0.28	0.06–0.44/0.30	0.52–0.70/0.62
P_{min} (mg $P \cdot dm^{-3}$)	0.07–0.17/0.11	0.04–0.10/0.07	0.08–0.15/0.11	0.04–0.23/0.12	0.03–0.19/0.14	0.03–0.16/0.11	0.02–0.12/0.09	0.02–0.15/0.10	0.17–0.21/0.19
Total phosphorus (mg $P \cdot dm^{-3}$)	0.12–0.25/0.20	0.14–0.21/0.18	0.12–0.35/0.22	0.15–0.42/0.22	0.24–0.34/0.28	0.16–0.28/0.22	0.17–0.29/0.21	0.19–0.25/0.22	0.18–0.21/0.20
Physico-chemical indices									
Silica (µg $Si \cdot dm^{-3}$)	7,811–12,533/9,647	6,833–12,520/9,201	6,673–12,750/9,192	5,581–13,500/9,216	n.d.	n.d.	n.d.	n.d.	n.d.
Iron (µg $Fe \cdot dm^{-3}$)	3.83–7.28/9.19	3.68–23.77/11.78	5.30–2.30/8.33	1.93–17.09/8.47	n.d.	n.d.	n.d.	n.d.	n.d.

Explanations: n.d. = no data.
Source: own study.

Table S2. Correlation (Pearson correlation coefficient) between the studied indicators of water quality in the ponds of the Botanical Garden of Maria Curie-Skłodowska University in Lublin

Indicator	Temperature	Turbidity	Suspended solids	Reaction	Electrolytical conductivity	Dissolved oxygen	Chlorophyll "a"	Cyanobacteria	Mineral nitrogen	Total nitrogen	Mineral phosphorus	Total phosphorus	Silica	Iron	Abundance	Biomass
Temperature	1.000															
Turbidity	0.317	1.000														
Suspended solids	0.938***	0.118	1.000													
Reaction	–0.403	0.316	–0.546*	1.000												
Electrolytical conductivity	–0.828***	–0.355	–0.738*	0.289	1.000											
Dissolved oxygen	–0.760***	0.031	–0.788***	0.633**	0.407	1.000										
Chlorophyll "a"	0.764***	0.231	0.833***	–0.468	–0.767***	–0.369	1.000									
Cyanobacteria	0.663**	–0.023	0.777***	–0.350	–0.661**	–0.436	0.786***	1.000								
Mineral nitrogen	0.290	–0.258	0.531*	–0.499*	–0.058	–0.410	0.492	0.570*	1.000							
Total nitrogen	0.388	0.041	0.509*	–0.374	–0.350	–0.257	0.586*	0.546*	0.776***	1.000						
Mineral phosphorus	0.455	–0.046	0.515*	–0.166	–0.162	–0.720**	0.110	0.441	0.374	0.105	1.000					
Total phosphorus	0.735**	0.049	0.780***	–0.418	–0.604*	–0.761***	0.507*	0.745***	0.558*	0.620*	0.718**	1.000				
Silica	0.479	–0.244	0.661**	–0.592*	–0.082	–0.737**	0.412	0.527*	0.871***	0.551*	0.642**	0.663**	1.000			
Iron	–0.428	0.360	–0.575*	0.275	0.129	0.583*	–0.280	–0.490	–0.507*	–0.129	–0.715**	–0.502*	–0.707**	1.000		
Abundance	0.658**	0.281	0.712**	–0.338	–0.704**	–0.275	0.881***	0.647**	0.492	0.669**	0.095	0.486	0.303	–0.161	1.000	
Biomass	0.269	0.628**	0.132	0.162	–0.567*	0.210	0.414	0.106	–0.311	0.039	–0.255	–0.052	–0.487	0.406	0.617*	1.000

Explanations: *$p \leq 0.05$, **$p \leq 0.01$, ***$p \leq 0.001$, abundance = abundance of phytoplankton, biomass = phytoplankton biomass.
Source: own study.