

DOI: 10.4081/aiol.2017.6350

SUPPLEMENTARY MATERIAL

Monitoring a newly re-born patient: water quality and cyanotoxin occurrence in a reconstructed shallow Mediterranean lake

Spyros Gkelis,^{1*} Manthos Panou,¹ Ioannis Chronis,¹ Sevasti-Kiriaki Zervou,² Christophoros Christophoridis,² Korina Manolidi,² Chrysoula Ntislidou,¹ Theodoros M. Triantis,² Triantafyllos Kaloudis,³ Anastasia Hiskia,² Ifigenia Kagalou,⁴ Maria Lazaridou¹

¹School of Biology, Aristotle University of Thessaloniki, 541 24 Thessaloniki, Greece

²Institute of Nanoscience and Nanotechnology, NCSR “Demokritos”, Athens, Greece

³Water Quality Department, Athens Water Supply and Sewerage Company, Athens, Greece

⁴Management Body of Ecodevelopment Area of Karla, Mavrovouni, Kefalovriso, Velestino, Stefanovikio 37500, Greece

***Corresponding author:** sgkelis@bio.auth.gr

Supplementary Table 1. Method Limit of Detection (LOD) and Method Limit of Quantification (LOQ) for each cyanotoxin analysed in this study using (LC-MS/MS).

($\mu\text{g L}^{-1}$)	CYN	Anatoxin-a	[D-Asp3] MC-RR	MC- RR	NOD	MC- YR	MC- HtyR	[D-Asp3] MC-LR	MC- LR	MC- HilR	MC- WR	MC- LA	MC- LY	MC- LW	MC- LF	STX	Neo- STX
LOD	0.018	0.016	0.042	0.018	0.036	0.088	0.13	0.072	0.086	0.124	0.11	0.058	0.122	0.088	0.106	0.060	0.100
LOQ	0.054	0.048	0.126	0.054	0.108	0.264	0.39	0.216	0.258	0.372	0.33	0.174	0.366	0.264	0.318	0.180	0.300

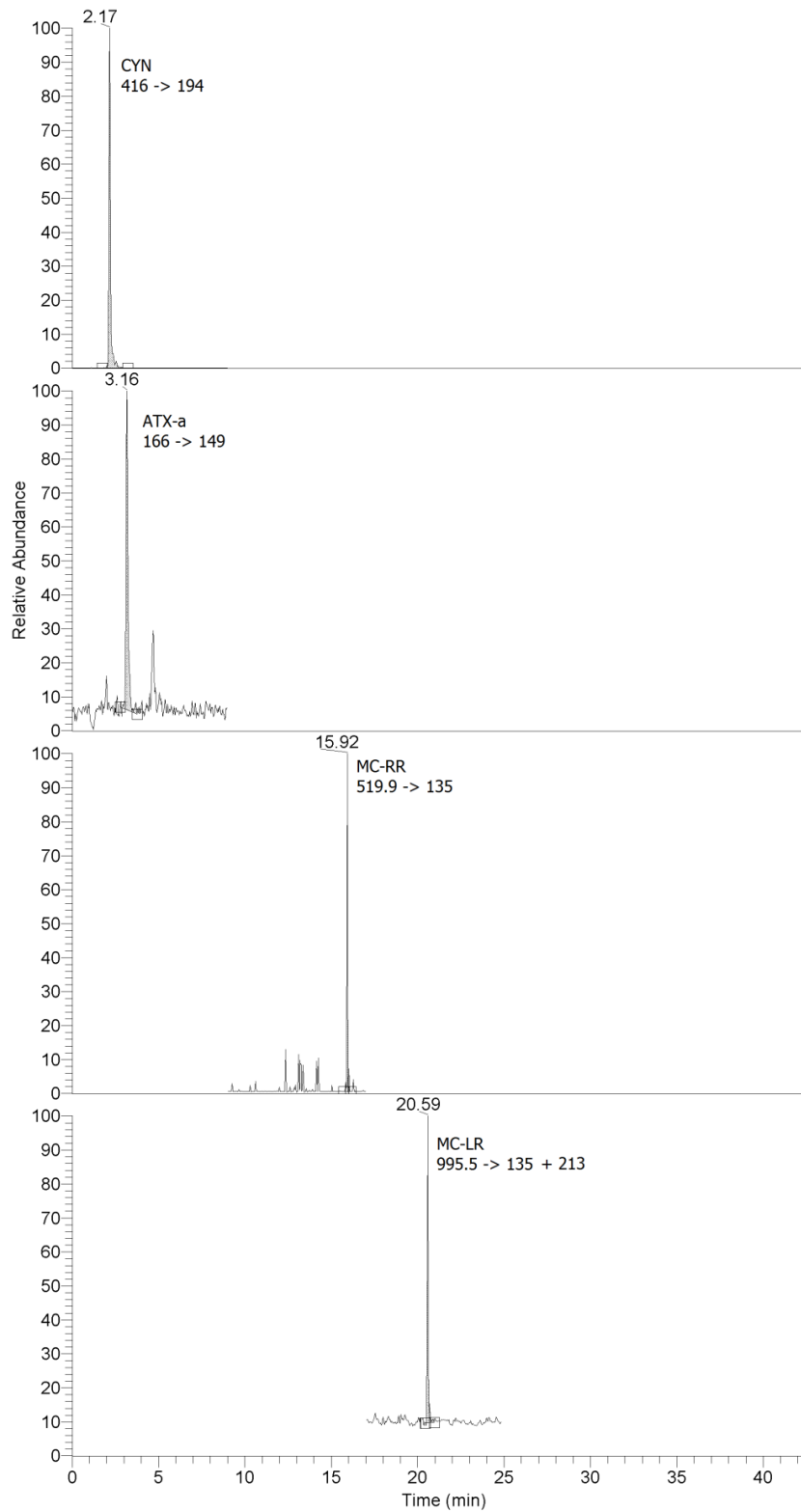
Supplementary Table 2. Spearman's correlation coefficients (first line: r; second line: p) between environmental variables, cyanotoxins (ELISA, intracellular), and dominant phytoplankton species (% of total) biomass in the water samples collected from Lake Karla and Kalamaki Reservoir.

	T	pH	DO	SRP	DIN	NO ₃	NO ₂	NH ₄	TP	EC	Trans.	Tur	Biomass	MCs	CYN	SXT	Aph.sp	D.spp.	D.smit.	An.ele.	C.rac.	L.red.	M.aer.	M.flaq.	Monor.	Nitsc.	Planktoth.	Desm.	Selen.	Sphaer.	Tetr.
T	.464**	.215	.449**	-.582**	.408**	.238	-.185	.384*	-.296	-.159	.269	.162	.474**	.439*	.293	.150	.009	.145	.182	.162	-.422**	.431**	-.076	-.136	-.493**	-.158	-.230	.038	.083	-.533**	
pH	.002	.162	.002	.000	.006	.124	.229	.010	.051	.304	.077	.294	.006	.012	.104	.331	.952	.346	.238	.295	.004	.003	.623	.379	.001	.305	.133	.809	.594	.000	
DO	.464**	.347*	-.001	-.274	.778**	.683**	.027	.032	.105	-.598**	.611**	-.438**	.022	-.099	-.072	-.006	-.530**	.348*	-.120	-.208	-.066	.320*	.035	-.169	-.062	.063	.207	.294	-.404**	-.364*	
SRP	.002	.021	.993	.072	.000	.000	.863	.836	.498	.000	.000	.003	.906	.591	.696	.969	.000	.021	.439	.175	.671	.034	.819	.272	.690	.685	.178	.053	.007	.015	
DIN	.215	.347*	.127	.076	.332*	.143	-.221	.007	.285	-.322*	.113	-.375*	-.184	-.088	-.062	-.150	-.382*	.049	-.187	-.156	-.012	.015	-.002	.184	.023	.003	.431**	.280	-.149	-.072	
NO ₃	.162	.021	.411	.622	.028	.361	.150	.962	.061	.033	.465	.012	.313	.632	.735	.331	.010	.754	.224	.311	.941	.921	.987	.231	.884	.983	.004	.065	.336	.641	
NO ₂	.449**	-.001	.127	-.305*	.051	-.124	-.454**	.900**	-.007	.025	-.074	-.045	.331	.483**	.314	-.150	-.275	.061	-.077	-.088	-.346*	.162	.083	.413**	-.202	.071	-.054	-.115	-.144	-.096	
TP	.002	.993	.411	.044	.744	.427	.002	.000	.962	.871	.634	.771	.064	.005	.080	.330	.070	.694	.618	.572	.021	.292	.591	.005	.188	.645	.729	.458	.352	.537	
EC	-.582**	-.274	.076	-.305*	.485	.211	.307	.073	.024	.065	.431	.844	.156	.061	.742	.670	.724	.205	.336	.835	.089	.002	.457	.789	.074	.869	.085	.806	.585	.003	
Trans.	.408**	.778**	.332*	.051	-.108	.665**	-.045	.059	.098	-.359*	.723**	-.360*	.156	.034	-.069	.036	-.530**	.250	-.098	-.122	-.184	.192	.048	-.135	.095	-.013	.362*	.051	-.361*	-.420**	
Tur	.006	.000	.028	.744	.485	.000	.770	.704	.526	.017	.000	.016	.394	.854	.707	.816	.000	.102	.527	.431	.232	.211	.755	.381	.538	.933	.016	.740	.016	.005	
Biomass	.238	.683**	.143	-.124	-.194	.665**	-.289	-.012	-.064	-.368*	.834**	-.456**	-.156	-.158	-.060	.138	-.429**	.368*	-.130	-.125	-.121	.072	-.125	-.405**	.204	-.015	.177	.107	-.461**	-.363*	
MCs	.124	.000	.361	.427	.211	.000	.060	.940	.683	.015	.000	.002	.394	.388	.745	.376	.004	.015	.405	.425	.440	.648	.424	.007	.188	.922	.257	.493	.002	.017	
CYN	-.185	.027	-.221	-.454**	.157	-.045	-.289	-.419**	.237	-.213	-.315*	.103	-.071	-.332	-.112	.054	.254	-.047	.104	.052	.331*	-.010	.275	-.059	-.056	.011	-.034	-.065	.125	.008	
SXT	.229	.863	.150	.002	.307	.770	.060	.005	.122	.166	.038	.504	.701	.063	.542	.728	.096	.762	.503	.739	.028	.951	.071	.703	.720	.942	.828	.677	.420	.960	
Aph.sp	.384*	.032	.007	.900**	-.273	.059	-.012	-.419**	-.067	-.004	.076	-.084	.371*	.466**	.324	-.102	-.264	.137	-.031	-.071	-.345*	.237	.048	.312*	-.055	.112	-.099	-.053	-.247	-.145	
D.spp.	.010	.836	.962	.000	.073	.704	.940	.005	.667	.978	.625	.586	.037	.007	.070	.509	.083	.374	.840	.645	.022	.122	.759	.039	.723	.469	.523	.733	.106	.348	
D.smit.	-.296	.105	.285	-.007	.340*	.098	-.064	.237	-.067	-.122	-.143	-.350*	-.321	-.291	-.070	-.222	-.311*	-.055	-.149	-.591**	.406**	-.106	.196	.279	.233	.406**	.422**	.181	-.357*	.298*	
An.ele.	.051	.498	.061	.962	.024	.526	.683	.122	.667	.431	.355	.020	.074	.106	.702	.147	.040	.724	.336	.000	.006	.493	.201	.066	.127	.006	.004	.239	.017	.049	
C.rac.	-.159	-.598**	-.322*	.025	.281	-.359*	-.368*	-.213	-.004	-.122	-.255	.558**	.168	.231	.065	.079	.446**	-.257	.158	.163	.014	-.074	-.037	-.037	.012	-.172	-.133	-.166	.384*	.210	
L.red.	.304	.000	.033	.871	.065	.017	.015	.166	.978	.431	.095	.000	.357	.202	.724	.609	.002	.092	.305	.289	.928	.635	.809	.811	.938	.264	.389	.282	.010	.170	
M.aer.	.269	.611**	.113	-.074	-.122	.723**	.834**	-.315*	.076	-.143	-.255	-.360*	.035	.027	-.031	.234	-.345*	.263	-.173	-.040	-.211	.134	-.160	-.373*	.104	.019	.246	.075	-.412**	-.356*	
M.flaq.	.077	.000	.465	.634	.431	.000	.000	.038	.625	.355	.095	.016	.847	.885	.864	.126	.022	.084	.262	.798	.170	.385	.301	.013	.502	.903	.108	.629	.005	.018	
Monor.	.162	-.438**	-.375*	-.045	.031	-.360*	-.456**	.103	-.084	-.350*	.558**	-.360*	.536**	.422*	.339	.132	.665**	-.246	.536**	.568**	-.220	-.071	-.044	-.087	-.337*	-.286	-.429**	-.296	.758**	-.094	
Nitsc.	.294	.003	.012	.771	.844	.016	.002	.504	.586	.020	.000	.016	.002	.016	.058	.393	.000	.108	.000	.000	.152	.646	.778	.574	.025	.060	.004	.051	.000	.544	
Planktoth.	.474**	.022	-.184	.331	-.257	.156	-.156	-.071	.371*	-.321	.168	.035	.536**	.620**	.246	.049	.158	-.057	.586**	.403*	-.375*	.122	.058	.052	-.555**	-.096	-.108	-.118	.296	-.173	
Desm.	.006	.906	.313	.064	.156	.394	.394	.701	.037	.074	.357	.847	.002	.000	.174	.792	.387	.759	.000	.022	.035	.506	.752	.776	.001	.600	.558	.519	.100	.343	
Selen.	.439*	-.099	-.088	.483**	-.335	.034	-.158	-.332	.466**	-.291	.231	.027	.422*	.620**	.550**	.254	.086	.160	.291	.339	-.535**	.145	.142	.336	-.255	-.322	-.267	-.122	.282	-.377*	
Sphaer.	.012	.591	.632	.005	.061	.854	.388	.063	.007	.106	.202	.885	.016	.000	.001	.161	.640	.383	.106	.057	.002	.429	.438	.060	.159	.072	.139	.507	.117	.033	
Tetr.	.293	-.072	-.062	.314	-.061	-.069	-.060	-.112	.324	-.070	.065	-.031	.339	.246	.550**	.380*	.292	.098	.418*	.133	-.295	-.191	-.159	.036	-.080	-.263	-.354*	-.265	.387*	-.243	
	.104	.696	.735	.080	.742	.707	.745	.542	.070	.702	.724	.864	.058	.174	.001	.032	.104	.594	.017	.467	.101	.295	.386	.845	.663	.147	.047	.142	.029	.181	
	.150	-.006	-.150	-.150	-.066	.036	.138	.054	-.102	-.222	.079	.234	.132	.049	.254	.380*	.201	-.048	.102	.225	-.198	-.112	-.033	-.102	-.042	-.102	-.200	-.141	.157	-.189	
	.331	.969	.331	.330	.670	.816	.376	.728	.509	.147	.609	.126	.393	.792	.161	.032	.191	.756	.509	.143	.197	.471	.830	.511	.786	.509	.194	.361	.307	.220	
	.009	-.530**	-.382*	-.275	.055	-.530**	-.429**	.254	-.264	-.311*	.446**	-.345*	.665**	.158	.086	.292	.201	-.200	.333*	.467**	-.051	-.225	-.138	-.269	-.313*	-.273	-.433**	-.193	.707**	.005	
	.952	.000	.010	.070	.724	.000	.004	.096	.083	.040	.002	.022	.000	.387	.640	.104	.191	.192	.027	.001	.740	.142	.370	.078	.039	.073	.003	.209	.000	.975	
	.145	.348*	.049	.061	-.195	.250	.368*	-.047	.137	-.055	-.257	.263	-.246	-.057	.160	.098	-.048	-.200	-.046	-.013	-.277	.023	.293	-.001	-.160	-.395**	-.268	.046	-.241	-.390**	
	.346	.021	.754	.694	.205	.102	.015	.762	.374	.724	.092	.084	.759	.383	.594	.756	.192	.768	.933	.068	.881	.054	.994	.298	.008	.079	.769	.115	.009		

Supplementary Table 2. (continue)

	T	pH	DO	SRP	DIN	NO ₃	NO ₂	NH ₄	TP	EC	Trans.	Tur	Biomass	MCs	CYN	SXT	Aph.sp	D.spp	D.smit	An.elen	C.raci	L.red	M.aer	M.flaq	Mono	Nitsc	Planktoth.	Desm.	Selen	Sphaer	Tetr
An.elen.	.182	-.120	-.187	-.077	-.149	-.098	-.130	.104	-.031	-.149	.158	-.173	.536**	.586**	.291	.418*	.102	.333*	-.046		.390**	-.090	-.151	-.090	-.111	-.268	-.023	-.236	-.206	.500**	-.155
	.238	.439	.224	.618	.336	.527	.405	.503	.840	.336	.305	.262	.000	.000	.106	.017	.509	.027	.768		.009	.562	.328	.563	.471	.078	.882	.122	.180	.001	.314
C.rac.	.162	-.208	-.156	-.088	-.032	-.122	-.125	.052	-.071	-.591**	.163	-.040	.568**	.403*	.339	.133	.225	.467**	-.013	.390**		-.480**	-.315*	.000	-.150	-.348*	-.490**	-.267	-.177	.614**	-.233
	.295	.175	.311	.572	.835	.431	.425	.739	.645	.000	.289	.798	.000	.022	.057	.467	.143	.001	.933	.009		.001	.037	.999	.331	.021	.001	.080	.249	.000	.128
L.red.	-.422**	-.066	-.012	-.346*	.259	-.184	-.121	.331*	-.345*	.406**	.014	-.211	-.220	-.375*	-.535**	-.295	-.198	-.051	-.277	-.090	-.480**		.095	-.185	-.167	.351*	.450**	.350*	.095	-.184	.610**
	.004	.671	.941	.021	.089	.232	.440	.028	.022	.006	.928	.170	.152	.035	.002	.101	.197	.740	.068	.562	.001		.540	.228	.279	.019	.002	.020	.541	.232	.000
M.aer.	.431**	.320*	.015	.162	-.463**	.192	.072	-.010	.237	-.106	-.074	.134	-.071	.122	.145	-.191	-.112	-.225	.023	-.151	-.315*	.095		.131	-.037	-.039	.175	-.073	.206	-.280	-.162
	.003	.034	.921	.292	.002	.211	.648	.951	.122	.493	.635	.385	.646	.506	.429	.295	.471	.142	.881	.328	.037	.540		.396	.809	.799	.256	.639	.181	.066	.293
M.flaq.	-.076	.035	-.002	.083	-.115	.048	-.125	.275	.048	.196	-.037	-.160	-.044	.058	.142	-.159	-.033	-.138	.293	-.090	.000	-.185	.131		.415**	-.177	-.199	-.188	.292	-.167	-.154
	.623	.819	.987	.591	.457	.755	.424	.071	.759	.201	.809	.301	.778	.752	.438	.386	.830	.370	.054	.563	.999	.228	.396		.005	.250	.195	.221	.055	.280	.318
Monor.	-.136	-.169	.184	.413**	-.042	-.135	-.405**	-.059	.312*	.279	-.037	-.373*	-.087	.052	.336	.036	-.102	-.269	-.001	-.111	-.150	-.167	-.037	.415**		.025	.092	.026	.041	-.139	-.053
	.379	.272	.231	.005	.789	.381	.007	.703	.039	.066	.811	.013	.574	.776	.060	.845	.511	.078	.994	.471	.331	.279	.809	.005		.874	.553	.868	.789	.368	.733
Nitsc.	-.493**	-.062	.023	-.202	.272	.095	.204	-.056	-.055	.233	.012	.104	-.337*	-.555**	-.255	-.080	-.042	-.313*	-.160	-.268	-.348*	.351*	-.039	-.177	.025		.263	.342*	-.155	-.327*	.074
	.001	.690	.884	.188	.074	.538	.188	.720	.723	.127	.938	.502	.025	.001	.159	.663	.786	.039	.298	.078	.021	.019	.799	.250	.874		.084	.023	.316	.030	.631
Planktoth.	-.158	.063	.003	.071	.026	-.013	-.015	.011	.112	.406**	-.172	.019	-.286	-.096	-.322	-.263	-.102	-.273	-.395**	-.023	-.490**	.450**	.175	-.199	.092	.263		.415**	.057	-.489**	.350*
	.305	.685	.983	.645	.869	.933	.922	.942	.469	.006	.264	.903	.060	.600	.072	.147	.509	.073	.008	.882	.001	.002	.256	.195	.553	.084		.005	.711	.001	.020
Scen.	-.230	.207	.431**	-.054	.263	.362*	.177	-.034	-.099	.422**	-.133	.246	-.429**	-.108	-.267	-.354*	-.200	-.433**	-.268	-.236	-.267	.350*	-.073	-.188	.026	.342*	.415**		-.123	-.371*	.272
	.133	.178	.004	.729	.085	.016	.257	.828	.523	.004	.389	.108	.004	.558	.139	.047	.194	.003	.079	.122	.080	.020	.639	.221	.868	.023	.005		.426	.013	.074
Sel.	.038	.294	.280	-.115	.038	.051	.107	-.065	-.053	.181	-.166	.075	-.296	-.118	-.122	-.265	-.141	-.193	.046	-.206	-.177	.095	.206	.292	.041	-.155	.057	-.123		-.263	.069
	.809	.053	.065	.458	.806	.740	.493	.677	.733	.239	.282	.629	.051	.519	.507	.142	.361	.209	.769	.180	.249	.541	.181	.055	.789	.316	.711	.426		.085	.658
Sphaer.	.083	-.404**	-.149	-.144	.085	-.361*	-.461**	.125	-.247	-.357*	.384*	-.412**	.758**	.296	.282	.387*	.157	.707**	-.241	.500**	.614**	-.184	-.280	-.167	-.139	-.327*	-.489**	-.371*	-.263		-.071
	.594	.007	.336	.352	.585	.016	.002	.420	.106	.017	.010	.005	.000	.100	.117	.029	.307	.000	.115	.001	.000	.232	.066	.280	.368	.030	.001	.013	.085		.648
Tetr.	-.533**	-.364*	-.072	-.096	.443**	-.420**	-.363*	.008	-.145	.298*	.210	-.356*	-.094	-.173	-.377*	-.243	-.189	.005	-.390**	-.155	-.233	.610**	-.162	-.154	-.053	.074	.350*	.272	.069	-.071	
	.000	.015	.641	.537	.003	.005	.017	.960	.348	.049	.170	.018	.544	.343	.033	.181	.220	.975	.009	.314	.128	.000	.293	.318	.733	.631	.020	.074	.658	.648	

DO, dissolved oxygen; SRP, soluble reactive phosphorus; NO₃, nitrate nitrogen; NO₂, nitrite nitrogen; NH₄, ammonia nitrogen; TP, total phosphorus; EC, conductivity; Trans., transparency; Tur., turbidity; Biomass, total phytoplankton biomass; MCs, microcystins; CYN, cylindrospermopsin; SXT, saxitoxin; Aph.sp., *Aphanizomenon* sp.; D.spp., *Dolichospermum* spp.; D.smit., *Dolichospermum (Anabaena)* cf. *smithii*; An.elen., *Anabaenopsis elenkinii*; C.rac., *Cylindrospermopsis raciborskii*; L.red., *Limnothrix redekei*; M.aer., *Microcystis aeruginosa*; M.flaq., *Microcystis flos-aquae*; Monor., *Monoraphidium* sp.; Nitsc., *Nitzschia acicularis* and *Nitzschia closterium*; Planktoth., *Planktothrix* cf. *agardhii*; Desm., *Desmodesmus communis*; Selen., *Selenastrum* sp.; Sphaer., *Sphaerospermopsis aphanizomenoides*; Tetr., *Tetrastrum komarekii*; **Correlation is significant at the 0.01 level (2-tailed); *Correlation is significant at the 0.05 level (2-tailed).



Supplementary Figure 1. MRM chromatogram of quantification ions for detected cyanotoxins (Sample KK 26-7-2013).