

# Supplementary Materials: Occurrence, Distribution and Toxins of Benthic Cyanobacteria in German Lakes

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**Table S1.** List of abbreviations of the lake names.

ID	lake
ALM	Lake Altmuehlsee
AQM	Aqua Park Moosburg
BHN	Burgheim Natural Pond
BIN	Quarry Pond Ingolstadt
BKW	Lake Bergknappweiher
DEC	Lake Dechsendorferweiher
DIT	Lake Dietlhofersee
EBS	Lake Ebingersee
EBW	Lake Ebenhauserweiher
EGG	Lake Egglbürgersee
EHS	Lake Ebertshausenersee
EIX	Reservoir Eixendorfersee
FRI	Lake Friedlsee
FRS	Lake Freudensee
GOS	Lake Ostersee
GUG	Lake Guggenbergersee
IGL	Lake Igelsbachsee
KBR	Lake Brombachsee
KLO	Lake Klostersee
KRU	Lake Russweiher
LSP	Reservoir Liebenstein
MAE	River Maedelelech
MAN	Reservoir Mandichosee
OIM	Reservoir Oberilzmühle
PEL	Lake Pelhamersee
PIL	Lake Pilsensee
ROD	Lake Rothdach
ROT	Lake Rottachsee
SIL	Lake Silbersee
SIM	Lake Simssee
SLI	Lake Schliersee
STM	Lake Stoibermühle
TAC	Lake Tachingensee
WAG	Lake Wagingersee

**Table S2.** Genus composition in the open water samples (in water bodies with benthic cyanobacteria findings). The dominant taxa are marked with an asterisk. The open water samples of BHN, STM and GOS were not sequenced.

	BHN **	STM **	PIL	SLI	DEC	DIT	GOS **	GUG	IGL	KBR	KLO	MAN
<i>Aliterella</i>			-	-	-	-		-	-	-	-	+
<i>Aphanizomenon</i>			+	-	+	+		-	-	+	+	+
<i>Calothrix</i>			-	-	+	-		-	-	-	-	-
<i>Cuspidothrix</i>			-	-	+	-		-	-	-	-	-
<i>Cyanobium</i>			+	+	+	+		+	+	+	+	+
<i>Dactylo-thamnos</i>			-	-	-	-		-	-	-	-	+
<i>Leptolyngbya</i>			-	-	-	-		-	-	-	-	+
<i>Limnoraphis</i>			+	-	-	-		-	-	-	-	-
<i>Microcystis</i>			-	+	-	+		+	+	+	+	-
<i>Planktothrix</i>			-	-	+	-		-	-	-	-	-
<i>Prochlorothrix</i>			-	+	-	-		-	-	-	-	-
<i>Pseudanabaena</i>			-	+	-	-		-	-	-	-	+
<i>Tychonema</i>			-	-	-	-		-	-	-	-	+
<i>Woronichinia</i>			-	-	-	-		-	-	+	-	-
Others			+	+	+	+		+	+	+	-	+
<b>Total number of genera</b>			<b>4</b>	<b>5</b>	<b>6</b>	<b>4</b>		<b>3</b>	<b>3</b>	<b>5</b>	<b>3</b>	<b>8</b>

\*dominant taxon.

\*\*the pelagic samples of BHN, STM and GOS were not sequenced.

**Table S3.** Results of the toxin measurements of all samples. MCs = sum of microcystin variants, ATXs = sum of anatoxin variants, SXT = saxitoxin, CYN = sum of cylindrospermopsin variants, n.d. = not detectable, “-” = not measured. MCs, ATXs and CYNs have been quantified with LC-MS/MS. SXT has been quantified using ELISA.

lake	sampling date	habitat	MCs [µg/L]	ATXs [µg/L]	SXT [µg/L]	CYN [µg/L]
ALM	2021-07-21	planktic	n.d.	0.0	0.0	n.d.
ALM	2021-08-18	planktic	n.d.	0	-	n.d.
ALM	2021-09-22	planktic	n.d.	0	-	n.d.
ALM	2021-10-28	planktic	n.d.	0	-	n.d.
ALM	2021-12-08	planktic	n.d.	0	-	n.d.
ALM	2022-01-19	planktic	n.d.	0	-	n.d.
ALM	2022-03-23	planktic	n.d.	-	-	n.d.
AQM	2021-12-15	planktic	181	n.d.	0.0	n.d.
AQM	2022-01-17	planktic	4	n.d.	-	n.d.
AQM	2022-03-28	planktic	5	n.d.	n.d.	n.d.
KBR	2021-07-21	benthic	8	0	n.d.	n.d.
KBR	2021-07-21	planktic	1	0	n.d.	n.d.
KBR	2021-08-18	planktic	n.d.	0	-	n.d.
KBR	2021-09-22	planktic	0.0	0	-	n.d.
KBR	2021-10-28	planktic	0.0	0	-	n.d.
KBR	2021-12-08	planktic	n.d.	0	-	n.d.
KBR	2022-01-19	planktic	n.d.	0	-	n.d.
KBR	2022-03-23	benthic	n.d.	0.1	-	n.d.
KBR	2022-03-23	planktic	n.d.	0	-	n.d.
BHN	2021-09-14	benthic	2	2	-	n.d.
BHN	2021-09-14	planktic	0.3	0	n.d.	n.d.
DEC	2021-08-17	planktic	0.0	1	0.1	n.d.
DEC	2021-09-21	benthic	n.d.	0.3	0.6	n.d.
DEC	2021-09-21	planktic	n.d.	0.4	0.4	n.d.
DEC	2021-10-27	planktic	n.d.	0.2	0.1	n.d.
DEC	2021-12-07	planktic	n.d.	0	0.0	n.d.
DEC	2022-01-18	planktic	n.d.	0	0.0	n.d.
DEC	2022-03-22	benthic	0.4	0	0.0	n.d.

DEC	2022-03-22	planktic	n.d.	0	0.0	n.d.
DEC	2022-07-20	benthic	n.d.	0.2	0.1	n.d.
DEC	2022-07-20	planktic	n.d.	0.4	0.1	n.d.
DIT	2021-08-04	planktic	n.d.	0	n.d.	n.d.
DIT	2021-09-06	benthic	3	12	0.0	n.d.
DIT	2021-09-06	planktic	n.d.	0	n.d.	n.d.
DIT	2021-09-28	benthic	n.d.	0.5	n.d.	n.d.
DIT	2021-09-28	planktic	n.d.	0	0.03	n.d.
DIT	2021-11-24	benthic	n.d.	0.4	-	n.d.
DIT	2021-11-24	planktic	n.d.	0	-	n.d.
DIT	2021-12-15	benthic	n.d.	0.4	-	n.d.
DIT	2021-12-15	planktic	n.d.	0	-	n.d.
DIT	2022-01-12	benthic	n.d.	20	-	n.d.
DIT	2022-01-12	planktic	n.d.	0	-	n.d.
DIT	2022-02-08	benthic	n.d.	0.3	-	n.d.
DIT	2022-02-08	planktic	n.d.	0	-	n.d.
DIT	2022-03-24	planktic	n.d.	0	-	n.d.
DIT	2022-06-21	benthic	n.d.	0.1	n.d.	n.d.
DIT	2022-06-21	planktic	n.d.	0.0	0.0	n.d.
EBW	2021-06-29	planktic	n.d.	0	n.d.	n.d.
EBW	2021-08-26	planktic	n.d.	0	-	n.d.
EBW	2021-09-14	benthic	0.7	0.2	-	n.d.
EBW	2021-09-14	planktic	n.d.	0	-	n.d.
EBW	2021-11-23	planktic	n.d.	0	-	n.d.
EBW	2022-01-11	planktic	n.d.	0	-	n.d.
EBW	2022-02-08	planktic	n.d.	0	-	n.d.
EBW	2022-03-21	planktic	n.d.	0	-	n.d.
EBS	2021-07-20	planktic	45	0	n.d.	n.d.
EBS	2021-08-17	benthic	0.4	0	n.d.	n.d.
EBS	2021-08-17	planktic	0.2	0	n.d.	n.d.
EBS	2021-09-21	benthic	8	0	n.d.	n.d.
EBS	2021-09-21	planktic	0.4	0	0.1	n.d.
EBS	2021-10-27	planktic	0.0	0	n.d.	n.d.
EBS	2021-12-07	planktic	1.5	0	-	n.d.
EBS	2022-01-18	planktic	n.d.	0	n.d.	n.d.
EBS	2022-03-22	planktic	n.d.	0	0.0	n.d.
EGG	2021-06-22	benthic	n.d.	0	0.03	n.d.
EGG	2021-06-22	planktic	n.d.	0	0.03	n.d.
EGG	2021-08-04	planktic	6.1	0	n.d.	n.d.
EGG	2021-09-06	planktic	1.4	0	n.d.	n.d.
EGG	2021-09-29	planktic	16.7	0	n.d.	n.d.
EGG	2021-11-24	planktic	0.0	0	n.d.	n.d.
EGG	2022-01-12	planktic	n.d.	0	n.d.	n.d.
EGG	2022-02-22	planktic	n.d.	0	-	n.d.
EGG	2022-03-24	planktic	n.d.	0	0.0	n.d.
EIX	2021-09-17	planktic	17780	0	-	n.d.
GOS	2021-11-03	benthic	0.4	81	0	n.d.
GOS	2021-11-03	benthic	0.3	9	0.0	n.d.
GOS	2021-11-03	planktic	n.d.	n.d.	n.d.	n.d.
GUG	2021-07-13	benthic	n.d.	0	0.0	n.d.
GUG	2021-07-13	planktic	n.d.	0.1	0.0	n.d.
GUG	2021-08-25	benthic	1.3	0	-	n.d.
GUG	2021-08-25	planktic	0.6	0	-	n.d.
GUG	2021-09-14	planktic	0.3	0	-	n.d.
GUG	2021-10-13	planktic	0.8	0	-	n.d.
GUG	2021-11-23	planktic	1.5	0	-	n.d.

GUG	2022-01-11	planktic	n.d.	0	-	n.d.
GUG	2022-03-21	benthic	n.d.	0	-	n.d.
GUG	2022-03-21	planktic	n.d.	0	-	n.d.
IGL	2021-08-18	planktic	n.d.	0	-	n.d.
IGL	2021-09-22	benthic	0.0	0	-	n.d.
IGL	2021-09-22	planktic	n.d.	0	-	n.d.
IGL	2021-10-28	planktic	n.d.	0	-	n.d.
IGL	2021-12-08	benthic	6.6	4	-	n.d.
IGL	2021-12-08	planktic	n.d.	0	-	n.d.
IGL	2022-01-19	planktic	n.d.	0	-	n.d.
IGL	2022-03-23	planktic	n.d.	0	-	n.d.
IGL	2022-07-21	planktic	n.d.	0.1	0.0	n.d.
KLO	2021-06-22	benthic	n.d.	0	0.0	n.d.
KLO	2021-06-22	planktic	n.d.	0	0.0	n.d.
KLO	2021-08-04	planktic	n.d.	0	n.d.	n.d.
KLO	2021-09-06	planktic	n.d.	0	0.0	n.d.
KLO	2021-09-29	benthic	0.5	0	0.0	n.d.
KLO	2021-09-29	planktic	n.d.	0	n.d.	n.d.
KLO	2021-11-24	planktic	n.d.	0	n.d.	n.d.
KLO	2021-12-15	planktic	n.d.	0	-	n.d.
KLO	2022-01-12	planktic	n.d.	0	-	n.d.
KLO	2022-02-22	benthic	0.2	0	n.d.	n.d.
KLO	2022-02-22	planktic	n.d.	0	n.d.	n.d.
KLO	2022-03-24	planktic	n.d.	0	0.0	n.d.
MAN	2021-06-30	benthic	n.d.	0.1	n.d.	n.d.
MAN	2021-06-30	planktic	n.d.	0.0	n.d.	n.d.
MAN	2021-07-27	planktic	n.d.	2	n.d.	n.d.
MAN	2021-09-07	benthic	n.d.	407	-	n.d.
MAN	2021-09-07	planktic	n.d.	4	-	n.d.
MAN	2021-09-28	benthic	n.d.	119	-	n.d.
MAN	2021-09-28	planktic	n.d.	0	-	n.d.
MAN	2021-11-23	benthic	n.d.	2	-	n.d.
MAN	2021-11-23	planktic	n.d.	0	-	n.d.
MAN	2021-12-15	benthic	n.d.	0.1	-	n.d.
MAN	2021-12-15	planktic	n.d.	0	-	n.d.
MAN	2022-01-11	benthic	n.d.	0	-	n.d.
MAN	2022-01-11	planktic	n.d.	0	-	n.d.
MAN	2022-02-08	benthic	n.d.	0	-	n.d.
MAN	2022-02-08	planktic	n.d.	0	-	n.d.
MAN	2022-03-21	benthic	n.d.	0	-	n.d.
MAN	2022-03-21	planktic	n.d.	0	-	n.d.
MAN	2021-07-27	benthic (a)	2	44971	n.d.	n.d.
MAN	2021-07-27	benthic (b)	n.d.	469	-	n.d.
PEL	2021-08-12	planktic	101	n.d.	n.d.	n.d.
STM	2021-08-26	benthic	n.d.	2	0.0	n.d.
STM	2021-08-26	planktic	n.d.	0	n.d.	n.d.