

# Supplementary Material

## Shotgun Metagenomic Sequencing to Assess Cyanobacterial Community Composition following Coagulation of Cyanobacterial Blooms

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**Table S1.** Removal effectiveness (%) of taxonomic cell counts of individual cyanobacterial genus after 48 hours (Mean±Standard deviation) in Missisquoi Bay (MB) and Petit Lac St. François (PLSF). Adapted from the author of [1].

Event	Treat	Total cell counts	<i>Aphanizomenon</i>	<i>Aphanocapsa</i>	<i>Aphanothece</i>	<i>Chroococcus</i>	<i>Coelosphaerium</i>	<i>Dolichospermum</i>	<i>Merismopedia</i>	<i>Microcystis</i>	<i>Pseudanabaena</i>
MB September 10-12, 2018	20 mgFe/L	99.96±0.04	97.84±3.05	100.0±0.00	98.30±0.21	100.0±0.00	NA	99.88±0.04	100.0±0.00	99.97±0.01	99.97±2.81
	35 mgFe/L	99.94±0.04	97.69±1.12	100.0±0.00	97.27±0.11	100.0±0.00	NA	99.81±0.05	100.0±0.00	99.65±0.05	97.75±0.79
MB September 24-26, 2018	20 mgFe/L	71.91±5.38	68.55±1.94	89.27±6.55	64.38±2.83	NA	NA	75.22±7.48	100.0±0.00	86.92±2.14	72.69±3.93
	35 mgFe/L	96.39±1.29	80.58±7.53	76.56±2.31	69.09±1.63	NA	NA	98.51±1.19	100.0±0.00	93.98±2.61	71.59±8.54
MB August 13- 15, 2019	20 mgFe/L	94.27±1.67	93.91±1.64	NA	87.73±6.22	NA	100.0±0.00	97.17±3.14	NA	86.55±1.62	NA
	35 mgFe/L	99.35±0.11	99.26±0.15	NA	96.51±1.44	NA	100.0±0.00	99.97±0.01	NA	100.0±0.00	NA
PLSF June 26-28, 2019	20 mgFe/L	85.22±6.43	77.17±8.16	NA	-37.5±1.67	NA	35.11±5.01	84.66±4.07	NA	92.66±8.64	NA
	35 mgFe/L	98.99±1.06	98.66±1.44	NA	88.50±4.58	NA	100.0±0.00	99.03±0.95	NA	95.82±4.36	NA
PLSF July 24-26, 2019	20 mgFe/L	51.98±6.21	76.76±4.51	NA	-13.5±1.24	100.0±0.00	19.36±1.14	66.57±4.71	77.5±0.28	66.99±0.95	NA
	35 mgFe/L	99.11±0.11	97.93±0.28	NA	92.65±0.96	100.0±0.00	100.0±0.00	100.0±0.00	100.0±0.00	100.0±0.00	NA
PLSF August 05- 07, 2019	20 mgFe/L	78.21±6.72	72.22±6.32	NA	79.47±4.98	100.0±0.00	75.86±4.33	77.97±5.04	92.14±3.59	96.51±5.39	NA
	35 mgFe/L	99.72±0.65	98.22±0.65	NA	93.46±2.34	NA	100.0±0.00	100.0±0.00	100.0±0.00	99.97±0.01	NA

Removal effectiveness percentage (%) =  $\frac{T_0 - T_{48}}{T_0} \times 100$ . NA: no value.



**Table S5.** Environmental conditions of lake water samples in control mesocosms at T48 (Mean  $\pm$  standard deviation). Adapted from author of [1].

Parameters	Missisquoi Bay			Petit-Lac-St-François		
	Event A September 12 2018	Event B September 26 2018	Event C August 15 2019	Event a June 28 2019	Event b July 26 2019	Event c August 07 2019
Chlorophyll- <i>a</i> (RFU)	-	-	64.72 $\pm$ 0.59	3.37 $\pm$ 0.32	5.63 $\pm$ 0.16	7.88 $\pm$ 0.17
Phycocyanin (RFU)	-	-	169.21 $\pm$ 0.34	16.42 $\pm$ 0.15	0.87 $\pm$ 0.03	6.78 $\pm$ 0.16
pH	7.47 $\pm$ 0.07	-	6.33 $\pm$ 0.09	9.93 $\pm$ 0.06	8.36 $\pm$ 0.07	7.37 $\pm$ 0.15
TDS (mg/L)	105 $\pm$ 0.00	-	140.0 $\pm$ 4.24	151.0 $\pm$ 5.65	118.5 $\pm$ 0.71	121.0 $\pm$ 0.00
Temp (°C)	22.7 $\pm$ 0.17	-	22.09 $\pm$ 0.17	27.81 $\pm$ 0.41	25.37 $\pm$ 0.34	25.25 $\pm$ 0.02
TOC (mg C/L)	19.97 $\pm$ 0.24	5.46 $\pm$ 0.00	700.0 $\pm$ 23.19	11.39 $\pm$ 0.23	10.57 $\pm$ 0.21	10.19 $\pm$ 0.44
DOC (mg C/L)	12.17 $\pm$ 0.39	5.08 $\pm$ 0.05	73.48 $\pm$ 1.45	9.83 $\pm$ 0.06	10.07 $\pm$ 0.83	9.81 $\pm$ 0.07
TN (mg N/L)	5.46 $\pm$ 0.69	1.68 $\pm$ 0.01	6.84 $\pm$ 1.78	11.21 $\pm$ 1.07	1.01 $\pm$ 0.15	1.28 $\pm$ 0.05
TP ( $\mu$ g P/L)	320.92 $\pm$ 4.48	177.49 $\pm$ 21.03	2074.60 $\pm$ 20.22	603.01 $\pm$ 3.17	72.08 $\pm$ 5.32	89.29 $\pm$ 4.81
DN (mg N/L)	2.02 $\pm$ 0.001	0.48 $\pm$ 0.009	1.56 $\pm$ 0.11	0.91 $\pm$ 0.25	0.58 $\pm$ 0.00	0.63 $\pm$ 0.03
DP ( $\mu$ g P/L)	40.47 $\pm$ 1.17	15.43 $\pm$ 0.25	215.01 $\pm$ 11.61	108.06 $\pm$ 2.22	16.46 $\pm$ 1.16	21.81 $\pm$ 2.13

- : No data.

**Table S6.** Environmental conditions of lake water samples in mesocosms with dose of 20 mgFe/L at T48 (Mean  $\pm$  standard deviation).

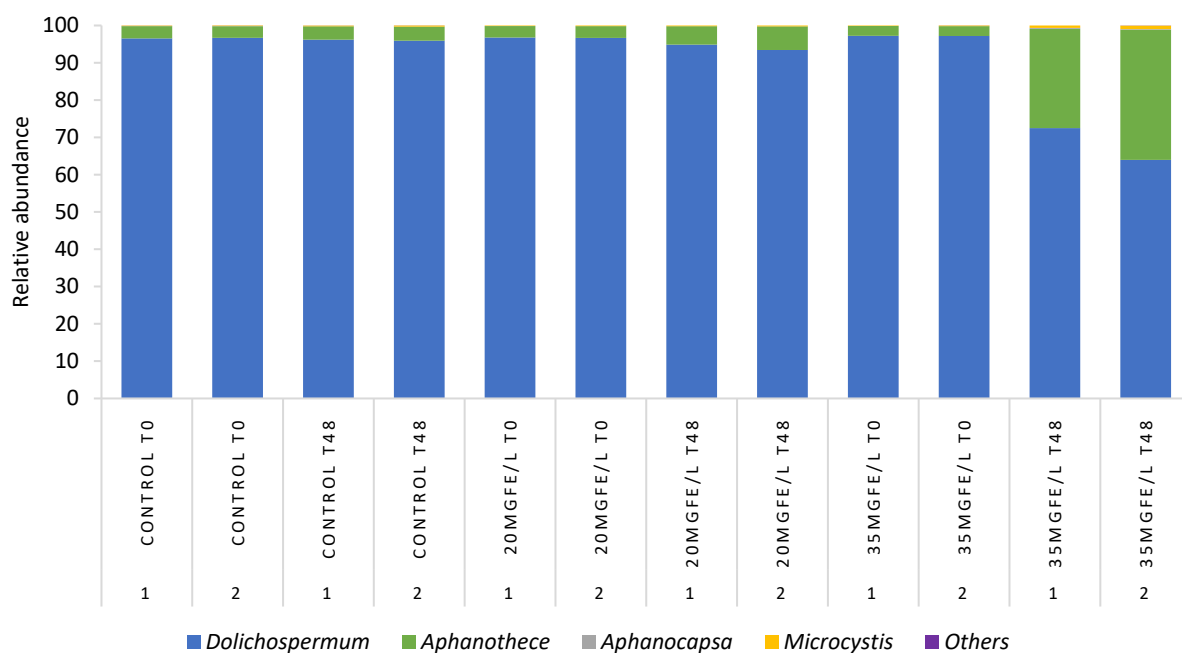
Parameters	Missisquoi Bay			Petit-Lac-St-François		
	Event A September 12 2018	Event B September 26 2018	Event C August 15 2019	Event a June 28 2019	Event b July 26 2019	Event c August 07 2019
Chlorophyll- <i>a</i> (RFU)	-	-	1.04 $\pm$ 0.002	0.08 $\pm$ 0.00	1.18 $\pm$ 0.01	0.82 $\pm$ 0.07
Phycocyanin (RFU)	-	-	33.69 $\pm$ 5.21	0.49 $\pm$ 0.05	0.54 $\pm$ 0.00	1.03 $\pm$ 0.05
pH	4.9 $\pm$ 0.04	-	5.08 $\pm$ 1.01	6.09 $\pm$ 0.01	7.70 $\pm$ 0.19	5.66 $\pm$ 0.02
TDS (mg/L)	138 $\pm$ 0.00	-	152.00 $\pm$ 0.00	130.00 $\pm$ 0.00	139.00 $\pm$ 0.00	146.00 $\pm$ 0.00
Temp (°C)	21.8 $\pm$ 0.01	-	22.95 $\pm$ 0.04	23.92 $\pm$ 0.02	25.21 $\pm$ 0.01	25.03 $\pm$ 0.01
TOC (mg C/L)	4.52 $\pm$ 0.15	2.22 $\pm$ 0.09	23.76 $\pm$ 4.52	17.56 $\pm$ 2.71	3.81 $\pm$ 0.51	3.69 $\pm$ 0.11
DOC (mg C/L)	3.21 $\pm$ 0.03	2.39 $\pm$ 0.03	22.62 $\pm$ 1.92	15.10 $\pm$ 2.87	3.63 $\pm$ 0.24	3.44 $\pm$ 0.01
TN (mg N/L)	0.67 $\pm$ 0.01	1.29 $\pm$ 0.01	4.16 $\pm$ 1.01	3.71 $\pm$ 0.48	0.55 $\pm$ 0.007	0.35 $\pm$ 0.009
TP ( $\mu$ g P/L)	8.47 $\pm$ 0.35	126.02 $\pm$ 14.54	167.73 $\pm$ 6.34	130.02 $\pm$ 14.49	20.12 $\pm$ 1.15	14.73 $\pm$ 0.71
DN (mg N/L)	0.64 $\pm$ 0.001	0.39 $\pm$ 0.01	3.28 $\pm$ 0.29	1.28 $\pm$ 0.04	0.36 $\pm$ 0.02	0.23 $\pm$ 0.001
DP ( $\mu$ g P/L)	5.51 $\pm$ 0.02	7.14 $\pm$ 0.14	60.08 $\pm$ 12.79	19.34 $\pm$ 1.44	6.72 $\pm$ 1.56	3.56 $\pm$ 0.21

**Table S7.** Environmental conditions of lake water samples in mesocosms with dose of 35 mgFe/L at T48 (Mean  $\pm$  standard deviation).

Parameters	Missisquoi Bay			Petit-Lac-St-François		
	Event A September 12 2018	Event B September 26 2018	Event C August 15 2019	Event a June 28 2019	Event b July 26 2019	Event c August 07 2019
Chlorophyll- <i>a</i> (RFU)	-	-	1.05 $\pm$ 0.002	0.01 $\pm$ 0.00	0.09 $\pm$ 0.007	0.01 $\pm$ 0.00
Phycocyanin (RFU)	-	-	29.69 $\pm$ 1.13	0.05 $\pm$ 0.00	0.11 $\pm$ 0.00	0.015 $\pm$ 0.007
pH	3.95 $\pm$ 0.08	-	4.01 $\pm$ 0.13	4.47 $\pm$ 0.15	4.1 $\pm$ 0.02	4.01 $\pm$ 0.05
TDS (mg/L)	198 $\pm$ 0.00	-	221.5 $\pm$ 9.81	285.01 $\pm$ 7.12	228.00 $\pm$ 0.00	296.50 $\pm$ 2.12
Temp (°C)	21.05 $\pm$ 0.01	-	22.83 $\pm$ 0.12	27.73 $\pm$ 0.33	25.26 $\pm$ 0.03	24.69 $\pm$ 0.33
TOC (mg C/L)	4.01 $\pm$ 0.06	2.18 $\pm$ 0.09	22.02 $\pm$ 0.41	5.68 $\pm$ 0.34	2.27 $\pm$ 0.31	1.68 $\pm$ 0.01
DOC (mg C/L)	3.71 $\pm$ 0.01	2.41 $\pm$ 0.03	21.07 $\pm$ 0.91	7.31 $\pm$ 0.10	1.87 $\pm$ 0.21	1.87 $\pm$ 0.10
TN (mg N/L)	0.67 $\pm$ 0.01	1.07 $\pm$ 0.02	4.06 $\pm$ 0.15	0.95 $\pm$ 0.01	0.28 $\pm$ 0.007	0.29 $\pm$ 0.007
TP ( $\mu$ g P/L)	8.83 $\pm$ 0.56	109.97 $\pm$ 23.21	146.44 $\pm$ 7.81	29.29 $\pm$ 0.73	6.58 $\pm$ 1.71	4.86 $\pm$ 0.82
DN (mg N/L)	0.63 $\pm$ 0.001	0.41 $\pm$ 0.007	2.93 $\pm$ 0.08	0.72 $\pm$ 0.04	0.25 $\pm$ 0.001	0.27 $\pm$ 0.00
DP ( $\mu$ g P/L)	7.11 $\pm$ 0.04	6.92 $\pm$ 0.04	64.71 $\pm$ 4.23	17.99 $\pm$ 2.02	4.49 $\pm$ 0.11	4.01 $\pm$ 0.19

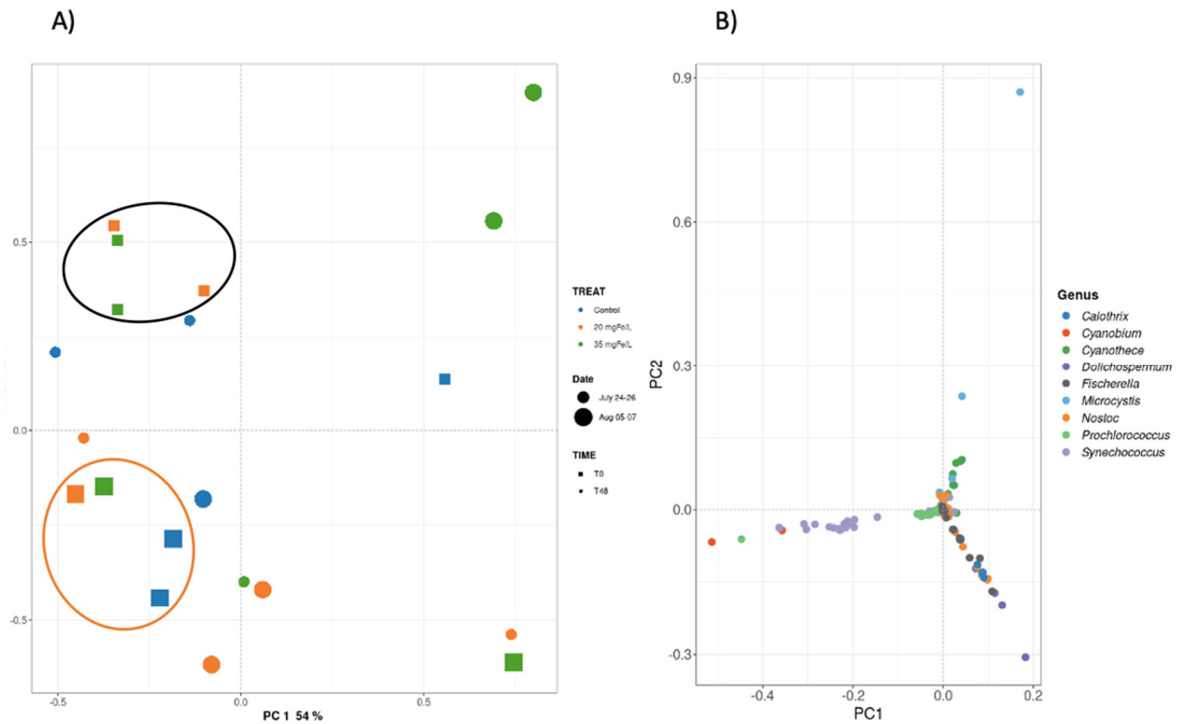
**Table S8.** Pairwise Kruskal-Wallis test, showing differences in changing of the species richness and Shannon indices at genus level between control mesocosms and mesocosms with dose of 20 mgFe/L, control mesocosms and mesocosms with dose of 35 mgFe/L, mesocosms with dose of 20 mgFe/L and 35 mgFe/L after 48 hours in Missisquoi Bay and Petit Lac St. François (p-value< 0.05).

		<i>df</i>	<i>chi-squared</i>	<i>p-value</i>
Missisquoi Bay	<i>Richness</i>	1	1.218	0.264
	<i>Shannon</i>	1	0.561	0.452
Petit Lac St. François	<i>Richness</i>	1	1.334	0.248
	<i>Shannon</i>	1	0.044	0.833

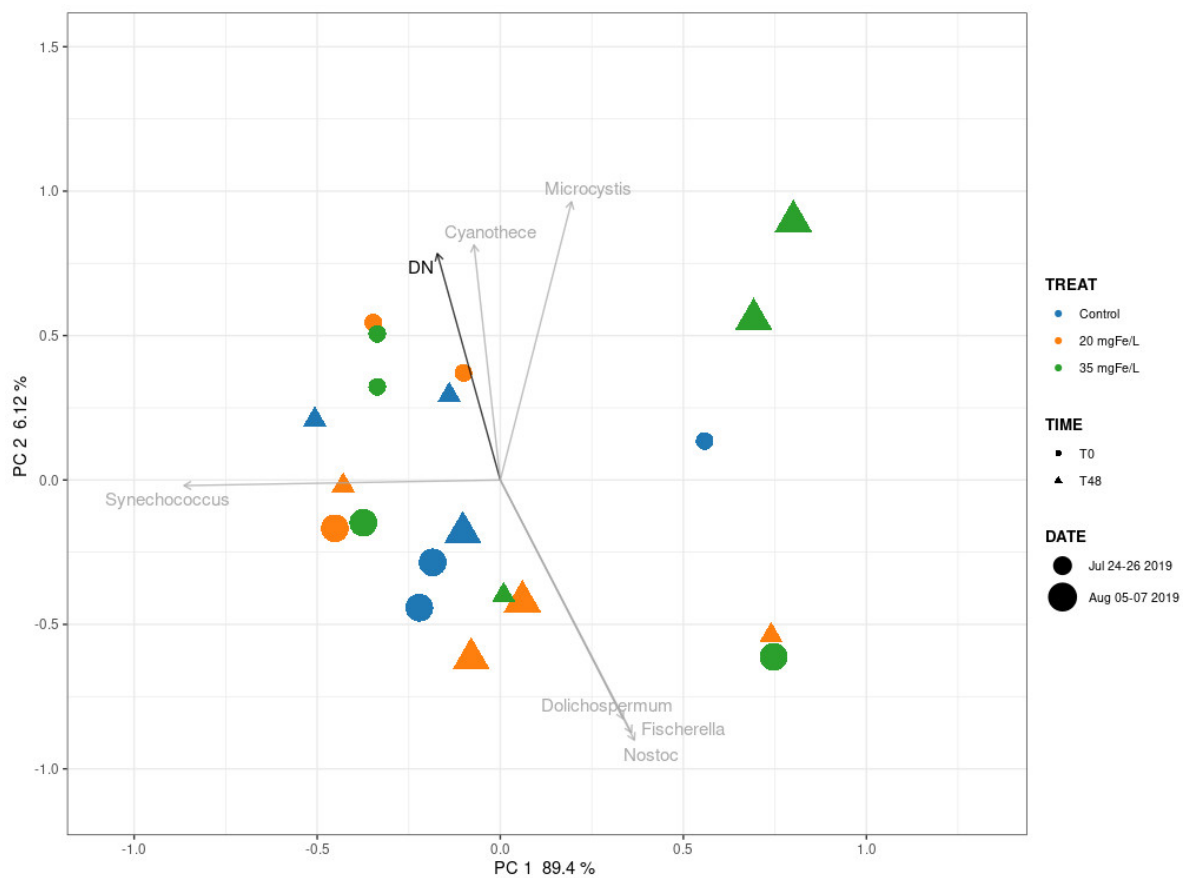


**Figure S1.** Cyanobacterial relative abundance at genus level in the control, 20 mgFe/L and 35 mgFe/L mesocosms in Missisquoi Bay in August 08 (T0) and August 10 (T48), 2018.

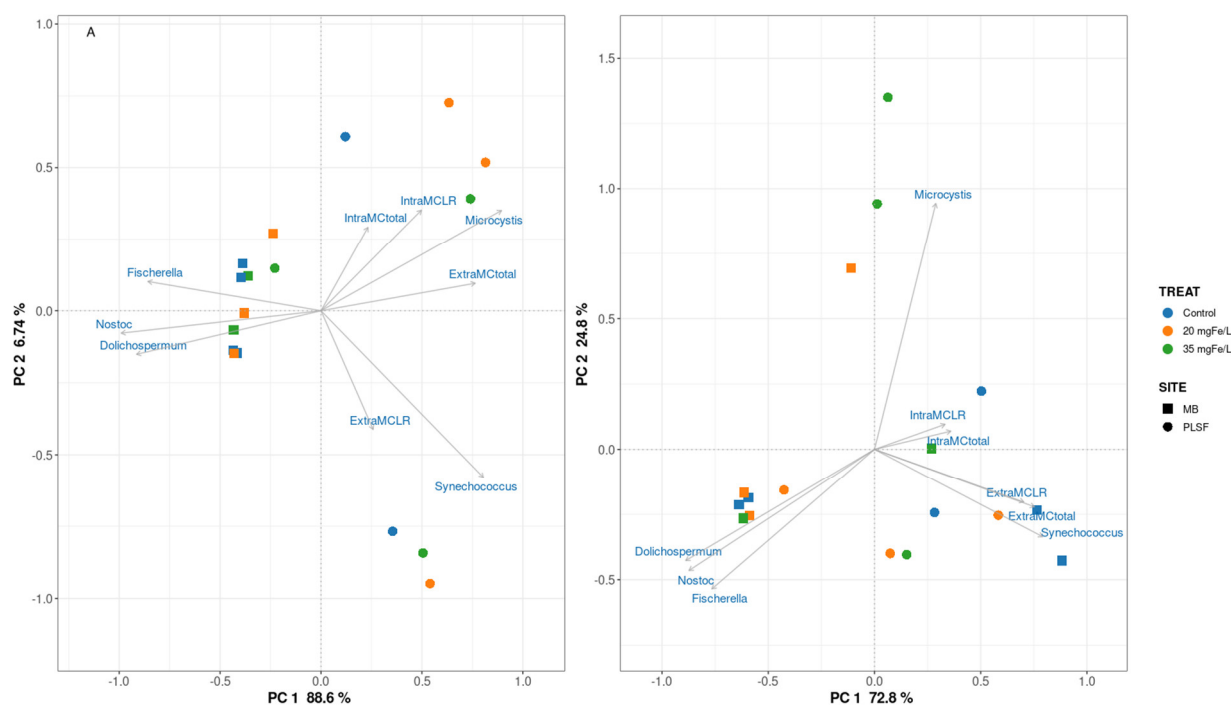




**Figure S3.** Principal components analysis (PCA) of the normalized relative abundance of cyanobacteria community composition in control, 20 mgFe/L and 35 mgFe/L mesocosms with respect to genus abundance in Petit Lac St. François. (a) PCA analysis of cyanobacterial community following coagulation; (b) Data are plotted following the genus-level classification.



**Figure S4.** Principal components analysis (PCA) of the normalized relative abundance of cyanobacteria community composition in control, 20 mgFe/L and 35 mgFe/L mesocosms with respect to genus abundance in Petit Lac St. François (PLSF). (a) PCA analysis of cyanobacterial community following coagulation; (b) Data are plotted following the genus-level classification.



**Figure S5.** Principal components analysis (PCA) of the normalized relative abundance of cyanobacteria community composition in control, 20 mgFe/L and 35 mgFe/L mesocosms with respect to intra- and extracellular total microcystins, MC-LR in Missisquoi Bay and Petit Lac St. François at T0 (left panel) and T48 (right panel).

## References

1. Le, K.T.; Goitom, E.; Trigui, H.; Sauvé, S.; Prévost, M.; Dorner, S. The Effects of Ferric Sulfate ( $\text{Fe}_2(\text{SO}_4)_3$ ) on the Removal of Cyanobacteria and Cyanotoxins: A Mesocosm Experiment. *Toxins* **2021**, *13*, 753. <https://doi.org/10.3390/toxins13110753>.