

Table S1. The geochemical characteristics of overlying water and sediment among different areas.

Parameters	Sampling site (Mean \pm SD)		
	CR(n=4)	NR(n=4)	TR(n=4)
Depth (m)	11.74 \pm 0.68	12.33 \pm 0.48	11.38 \pm 0.22
Transparency (m)	3.83 \pm 0.05	3.60 \pm 0.00	3.88 \pm 0.38
T (°C)	19.89 \pm 0.23	20.27 \pm 0.51	20.25 \pm 0.19
Salinity	32.66 \pm 0.04	32.85 \pm 0.07	32.80 \pm 0.07
pH	8.46 \pm 0.03	8.49 \pm 0.01	8.47 \pm 0.00
DO (mg/L)	8.49 \pm 0.15	8.49 \pm 0.14	8.68 \pm 0.14
COD _{Cr} (mg/L)	2.45 \pm 0.33	2.19 \pm 0.38	1.78 \pm 0.49
NO ₂ ⁻ (mg/L)	0.08 \pm 0.04	0.11 \pm 0.05	0.13 \pm 0.02
NO ₃ ⁻ (mg/L)	5.16 \pm 0.57	4.18 \pm 1.24	4.75 \pm 0.44
NH ₄ ⁺ (mg/L)	1.42 \pm 0.18	1.57 \pm 0.11	1.50 \pm 0.17
TN (μmol/L)	40.57 \pm 2.33	34.45 \pm 3.33	35.25 \pm 4.39
SRP (mg/L)	0.86 \pm 0.44	0.19 \pm 0.05	0.27 \pm 0.07
TP (μmol/L)	0.90 \pm 0.42	0.21 \pm 0.05	0.40 \pm 0.13
Chla (ug/L)	1.24 \pm 0.19	1.16 \pm 0.19	0.96 \pm 0.38
SpH	8.42 \pm 0.03	8.41 \pm 0.07	8.31 \pm 0.09
TOC (%)	1.93 \pm 0.06	1.76 \pm 0.17	1.87 \pm 0.11
Cu (mg/kg)	17.51 \pm 3.36	19.52 \pm 1.25	17.60 \pm 0.91
Pb (mg/kg)	31.10 \pm 4.95	33.18 \pm 3.00	28.57 \pm 2.99
Zn (mg/kg)	44.70 \pm 5.52	50.35 \pm 4.11	51.85 \pm 8.70
Cd (mg/kg)	0.04 \pm 0.02	0.04 \pm 0.01	0.04 \pm 0.02
Hg (mg/kg)	0.07 \pm 0.00	0.07 \pm 0.00	0.08 \pm 0.02
As (mg/kg)	5.90 \pm 0.47	6.04 \pm 1.02	7.75 \pm 1.07

T: Overlying water of temperature; SpH: Sediment pH.

Table S2. Kruskal-Wallis with Dunn's multiple-comparisons test of Physicochemical characteristics of the overlying water and sediment samples between sampling sites.

Parameters	(I)Sampling site	(J)Sampling site	(I)Median	(J)Median	P
Depth	CR	NR	11.525	12.200	-0.675
	CR	TR	11.525	11.300	0.225
	NR	TR	12.200	11.300	0.900
Transparency	CR	NR	3.805	3.600	0.205
	CR	TR	3.805	3.900	-0.095
	NR	TR	3.600	3.900	-0.300
T	CR	NR	19.920	20.250	-0.330
	CR	TR	19.920	20.300	-0.380
	NR	TR	20.250	20.300	-0.050
Salinity	CR	NR	32.675	32.880	-0.205
	CR	TR	32.675	32.780	-0.105
	NR	TR	32.880	32.780	0.100
pH	CR	NR	8.470	8.495	-0.025
	CR	TR	8.470	8.470	0.000
	NR	TR	8.495	8.470	0.025
DO	CR	NR	8.470	8.500	-0.030
	CR	TR	8.470	8.675	-0.205

COD _{cr}	NR	TR	8.500	8.675	-0.175
	CR	NR	2.600	2.180	0.420
	CR	TR	2.600	1.800	0.800
	NR	TR	2.180	1.800	0.380
NO ₂ ⁻	CR	NR	0.080	0.125	-0.045
	CR	TR	0.080	0.120	-0.040
	NR	TR	0.125	0.120	0.005
	CR	NR	5.180	4.525	0.655
NO ₃ ⁻	CR	TR	5.180	4.595	0.585
	NR	TR	4.525	4.595	-0.070
	CR	NR	1.425	1.560	-0.135
	CR	TR	1.425	1.480	-0.055
NH ₄ ⁺	NR	TR	1.560	1.480	0.080
	CR	NR	39.685	34.400	5.285
	CR	TR	39.685	34.200	5.485
	NR	TR	34.400	34.200	0.200
SRP	CR	NR	0.910	0.185	0.725
	CR	TR	0.910	0.265	0.645
	NR	TR	0.185	0.265	-0.080
	CR	NR	0.955	0.210	0.745
TP	CR	TR	0.955	0.375	0.580
	NR	TR	0.210	0.375	-0.165
	CR	NR	1.315	1.155	0.160
	CR	TR	1.315	1.035	0.280
Chla	NR	TR	1.155	1.035	0.120
	CR	NR	8.410	8.430	-0.020
	CR	TR	8.410	8.345	0.065
	NR	TR	8.430	8.345	0.085
SpH	CR	NR	1.945	1.755	0.190
	CR	TR	1.945	1.880	0.065
	NR	TR	1.755	1.880	-0.125
	CR	NR	18.620	19.750	-1.130
Cu	CR	TR	18.620	17.500	1.120
	NR	TR	19.750	17.500	2.250
	CR	NR	33.410	32.650	0.760
	CR	TR	33.410	28.000	5.410
Pb	NR	TR	32.650	28.000	4.650
	CR	NR	45.990	49.450	-3.460
	CR	TR	45.990	48.550	-2.560
	NR	TR	49.450	48.550	0.900
Cd	CR	NR	0.035	0.045	-0.010
	CR	TR	0.035	0.040	-0.005
	NR	TR	0.045	0.040	0.005
	CR	NR	0.070	0.070	0.000
Hg	CR	TR	0.070	0.070	0.000
	NR	TR	0.070	0.070	0.000
	CR	NR	6.010	6.115	-0.105
	CR	TR	6.010	7.815	-1.805

NR	TR	6.115	7.815	-1.700
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T: Overlying water of temperature; SpH: Sediment pH. $P<0.05$ ** $P<0.01$

Table S3. Kruskal-Wallis with Dunn's multiple-comparisons test of FAPROTAX model predicted between sampling sites.

Function predicted	(I)Sampling site	(J)Sampling site	<i>P</i>
cellulolysis	CR	NR	0.556
	CR	TR	0.078
	NR	TR	0.019*
dark hydrogen oxidation	CR	NR	0.009**
	CR	TR	0.049*
	NR	TR	0.512
fermentation	CR	NR	0.011*
	CR	TR	0.202
	NR	TR	0.202
intracellular parasites	CR	NR	0.239
	CR	TR	0.141
	NR	TR	0.008**
thiosulfate respiration	CR	NR	0.072
	CR	TR	0.017*
	NR	TR	0.549

* $P<0.05$ ** $P<0.01$