

SUPPLEMENTARY MATERIAL.

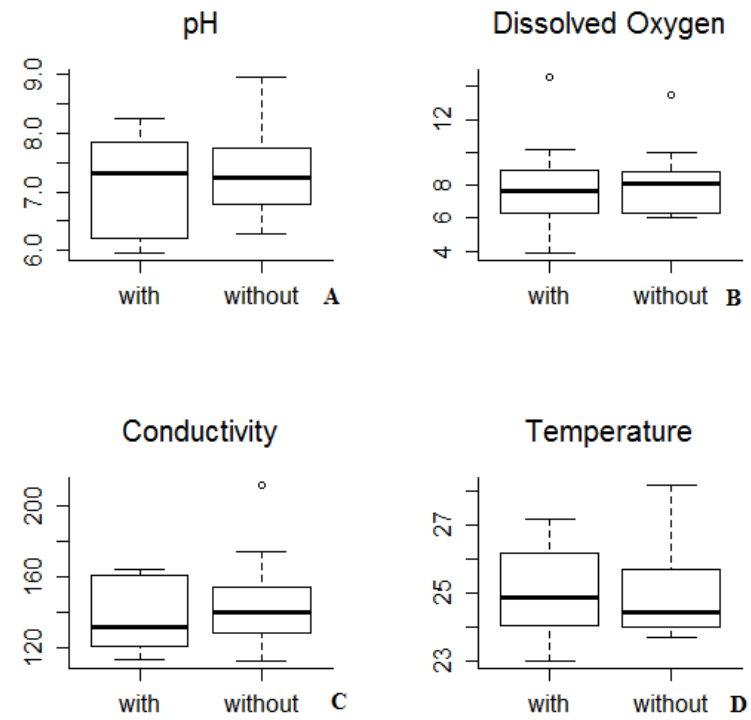


Figure S1. Average of limnological variables in mesocosms with and without macrophytes.

Table S1. Statistical results of modeling analysis for S (species richness) and the independent variables.

S ~ Macro + s(Temp.) + s(Conduct.) + s(OD) + s(pH)	Estimate	P	Adj. R²	AIC	F_{6,15}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	4.9861	< 2e-16 ***	0.459	179.0599	104.702	<.0001	1.346692	2.11E-07
Macro	1.3614	0.00358 **	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	0.7893	0.638	-	-	-	-	-	-
s(Conduct.)	1.0676	0.15	-	-	-	-	-	-
s(OD)	1.2816	0.303	-	-	-	-	-	-
s(pH)	0.4558	5.38e-10 ***	-	-	-	-	-	-
S ~ Macro + s(Temp.) + s(Conduct.) + s(OD)	Estimate	P	Adj. R²	AIC	F_{5,17}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	4.8899	< 2e-16 ***	0.341	190.6864	102.6434	<.0001	1.54208	2.95E-06
Macro	1.996	0.00076 ***	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	1	0.18	-	-	-	-	-	-
s(Conduct.)	1	0.189	-	-	-	-	-	-
s(OD)	1	0.838	-	-	-	-	-	-
S ~ Macro + s(Temp.) + s(Conduct.) + s(pH)	Estimate	P	Adj. R²	AIC	F_{5,19}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	5.0092	< 2e-16 ***	0.442	186.3413	135.487	<.0001	1.344703	4.22E-05
Macro	1.5027	0.00366 **	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	1	0.719	-	-	-	-	-	-
s(Conduct.)	1	0.271	-	-	-	-	-	-
s(pH)	1	0.017 *	-	-	-	-	-	-
S ~ Macro + s(Temp.) + s(OD) + s(pH)	Estimate	P	Adj. R²	AIC	F_{5,16}	P	Intercept - Random effects	Residual - Random effects

(Intercept)	4.9881	< 2e-16 ***	0.435	176.6125	124.2075	<.0001	1.370662	6.55E-08
Macro	1.3522	0.00441 **	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	1.2402	0.574	-	-	-	-	-	-
s(OD)	2.2427	0.384	-	-	-	-	-	-
s(pH)	0.4282	4.52e-08 ***	-	-	-	-	-	-
S ~ Macro + s(Conduct.) + s(OD) + s(pH)	Estimate	P	Adj. R²	AIC	F_{5,16}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	4.9831	< 2e-16 ***	0.466	175.1526	128.6608	<.0001	1.348111	9.76E-07
Macro	1.3744	0.00999 **	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Conduct.)	1.0889	0.240231	-	-	-	-	-	-
s(OD)	0.9121	0.229133	-	-	-	-	-	-
s(pH)	0.9995	0.000563 ***	-	-	-	-	-	-
S ~ Macro + s(Temp.) + s(Conduct.)	Estimate	P	Adj. R²	AIC	F_{4,21}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	4.9666	< 2e-16 ***	0.393	195.6826	150.4426	<.0001	1.508459	1.82E-08
Macro	1.8836	0.000108 ***	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	-0.006024	1	-	-	-	-	-	-
s(Conduct.)	-0.006234	1	-	-	-	-	-	-
S ~ Macro + s(Temp.) + s(OD)	Estimate	P	Adj. R²	AIC	F_{4,18}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	4.884	< 2e-16 ***	0.33	188.5165	125.8619	<.0001	1.57376	9.26E-07
Macro	2.0198	0.000158 ***	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	1.005	0.00608 **	-	-	-	-	-	-
s(OD)	1	0.87948	-	-	-	-	-	-

S ~ Macro + s(Temp.) + s(pH)	Estimate	P	Adj. R²	AIC	F_{4,20}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	5.0144	< 2e-16 ***	0.44	183.6186	166.6358	<.0001	1.355055	1.41E-05
Macro	1.4798	0.00477 **	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	1	0.1801	-	-	-	-	-	-
s(pH)	1	0.0223 *	-	-	-	-	-	-
S ~ Macro + s(Conduct.) + s(pH)	Estimate	P	Adj. R²	AIC	F_{4,20}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	5.0078	< 2e-16 ***	0.453	182.4779	172.5938	<.0001	1.345541	0.000102783
Macro	1.5083	0.00356 **	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Conduct.)	1	0.0894.	-	-	-	-	-	-
s(pH)	1	0.0012 **	-	-	-	-	-	-
S ~ Macro + s(OD) + s(pH)	Estimate	P	Adj. R²	AIC	F_{4,17}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	4.9951	<2e-16 ***	0.459	172.879	158.2183	<.0001	1.37482	3.17E-06
Macro	1.3217	0.0143 *	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(OD)	1.001	0.272	-	-	-	-	-	-
s(pH)	1	2.66e-05 ***	-	-	-	-	-	-
S ~ Macro + s(Conduct.) + s(OD)	Estimate	P	Adj. R²	AIC	F_{4,18}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	4.8931	< 2e-16 ***	0.357	188.5916	125.6351	<.0001	1.575072	1.07E-07
Macro	1.9827	0.000192 ***	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Conduct.)	-0.7455	1	-	-	-	-	-	-
s(OD)	0.9993	0.352	-	-	-	-	-	-

S ~ Macro + s(Temp.)	Estimate	P	Adj. R²	AIC	F_{3,22}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	4.9626	< 2e-16 ***	0.353	193.6497	196.3092	<.0001	1.539687	9.41E-08
Macro	1.8996	0.000132 ***	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	1	0.000484 ***	-	-	-	-	-	-
S ~ Macro + s(Condu.)	Estimate	P	Adj. R²	AIC	F_{3,22}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	4.9648	< 2e-16 ***	0.344	194.3445	190.5953	<.0001	1.539646	0.001320987
Macro	1.8909	0.000911 ***	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Condu.)	1	0.000628 ***	-	-	-	-	-	-
S ~ Macro + s(OD)	Estimate	P	Adj. R²	AIC	F_{3,19}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	4.8823	< 2e-16 ***	0.218	192.556	141.4932	<.0001	1.72081	2.76E-06
Macro	2.027	0.000435	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(OD)	1	0.0642.	-	-	-	-	-	-
S ~ Macro + s(pH)	Estimate	P	Adj. R²	AIC	F_{3,21}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	5.0131	< 2e-16 ***	0.429	181.5133	214.5957	<.0001	1.371555	0.000945428
Macro	1.4836	0.00576 **	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(pH)	1	7.35e-06 ***	-	-	-	-	-	-
S ~ Macro	Estimate	P	Adj. R²	AIC	F_{2,21}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	4.9444	< 2e-16 ***	0.173	202.5272	224.7663	<.0001	1.760715	4.83E-05
Macro	1.9722	0.00193 **	-	-	-	-		
S ~ s(pH)	Estimate	P	Adj. R²	AIC	F_{2,22}	P	Intercept - Random effects	Residual - Random effects

(Intercept)	5.361	<2e-16 ***	0.332	186.8634	237.7087	<.0001	1.359404	0.000607892
Approximate significance of smooth terms	edf	<i>P</i>	-	-	-	-	-	-
s(pH)	1	3.25e-06 ***	-	-	-	-	-	-

Table S2. Statistical results of modeling analysis for H (Shannos species diversity) and the independent variables.

H ~ Macro + s(Temp.) + s(Conduct.) + s(OD) + s(pH)	Estimate	P	Adj. R²	AIC	F_{6,15}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.8517	<2e-16 ***	0.333	59.19243	48.8968	<.0001	0.3449075	4.25E-08
Macro	0.27865	0.0176 *	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	0.7586	0.0291 *	-	-	-	-	-	-
s(Conduct.)	1.2257	0.2607	-	-	-	-	-	-
s(OD)	1.2456	0.3081	-	-	-	-	-	-
s(pH)	0.4419	1.58e-05 ***	-	-	-	-	-	-
H ~ Macro + s(Temp.) + s(Conduct.) + s(OD)	Estimate	P	Adj. R²	AIC	F_{5,17}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.83064	< 2e-16 ***	0.251	64.09009	52.4291	<.0001	0.3777612	3.06E-08
Macro	0.41582	0.000949 ***	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	0.7257	0.000347 ***	-	-	-	-	-	-
s(Conduct.)	0.8464	0.311002	-	-	-	-	-	-
s(OD)	1.2682	0.849992	-	-	-	-	-	-
H ~ Macro + s(Temp.) + s(Conduct.) + s(pH)	Estimate	P	Adj. R²	AIC	F_{5,19}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.85414	< 2e-16 ***	0.143	57.08308	65.9138	<.0001	0.3440422	4.39E-09
Macro	0.30044	0.00786 **	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	0.2033	1.74e-15 ***	-	-	-	-	-	-
s(Conduct.)	12.5836	0.657	-	-	-	-	-	-
s(pH)	-0.7872	0.116	-	-	-	-	-	-
H ~ Macro + s(Temp.) + s(OD) + s(pH)	Estimate	P	Adj. R²	AIC	F_{5,16}	P	Intercept - Random effects	Residual - Random effects

(Intercept)	0.85122	<2e-16 ***	0.326	56.4202	58.3485	<.0001	0.3497533	5.34E-08
Macro	0.28074	0.0183 *	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	1.1315	0.338	-	-	-	-	-	-
s(OD)	1.447	0.283	-	-	-	-	-	-
s(pH)	0.4379	2.91e-05 ***	-	-	-	-	-	-
H ~ Macro + s(Conduct.) +s(OD) + s(pH)	Estimate	P	Adj. R²	AIC	F_{5,16}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.85499	<2e-16 ***	0.319	56.90396	57.6252	<.0001	0.3516813	2.16E-07
Macro	0.26415	0.0281 *	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Conduct.)	1.0895	0.732484	-	-	-	-	-	-
s(OD)	0.913	0.273384	-	-	-	-	-	-
s(pH)	0.9995	0.000845 ***	-	-	-	-	-	-
H ~ Macro s(Temp.) + s(Conduct.)	Estimate	P	Adj. R²	AIC	F_{4,21}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.8423	< 2e-16 ***	0.302	60.79239	76.1356	<.0001	0.3700868	8.86E-11
Macro	0.39254	0.000783 ***	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	3.53E-06	<2e-16 ***	-	-	-	-	-	-
s(Conduct.)	3.65E-06	<2e-16 ***	-	-	-	-	-	-
H ~ Macro s(Temp.) + s(OD)	Estimate	P	Adj. R²	AIC	F_{4,21}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.8313	< 2e-16 ***	0.259	60.54565	66.395	<.0001	0.3796782	3.86E-08
Macro	0.4129	0.00105 **	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	1.052	0.00302 **	-	-	-	-	-	-
s(OD)	0.9361	0.83429	-	-	-	-	-	-

H ~ Macro s(Temp.) + s(pH)	Estimate	P	Adj. R²	AIC	F_{4,20}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.85281	<2e-16 ***	0.327	54.46014	81.608	<.0001	0.3491194	2.56E-08
Macro	0.30615	0.007 **	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	1.1204	0.1412	-	-	-	-	-	-
s(pH)	0.6317	0.0558 .	-	-	-	-	-	-
H ~ Macro s(Conduct.) + s(pH)	Estimate	P	Adj. R²	AIC	F_{4,20}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.85235	< 2e-16 ***	0.287	56.46647	77.7483	<.0001	0.3566511	9.21E-09
Macro	0.30808	0.00784 **	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Conduct.)	1.6668	0.994842	-	-	-	-	-	-
s(pH)	0.7045	0.000202 ***	-	-	-	-	-	-
H ~ Macro s(OD) + s(pH)	Estimate	P	Adj. R²	AIC	F_{4,17}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.85401	<2e-16 ***	0.333	53.07807	73.5472	<.0001	0.3523778	4.60E-08
Macro	0.26848	0.0248 *	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(OD)	1.2244	0.222	-	-	-	-	-	-
s(pH)	0.8061	2.34e-06 ***	-	-	-	-	-	-
H ~ Macro + s(Conduct.) s(OD)	Estimate	P	Adj. R²	AIC	F_{4,18}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.8321	< 2e-16 ***	0.18	66.16915	57.3912	<.0001	0.4041586	3.83E-09
Macro	0.40982	0.00205 **	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Conduct.)	0.01296	<2e-16 ***	-	-	-	-	-	-
s(OD)	0.99003	0.32	-	-	-	-	-	-

H ~ Macro + s(Temp.)	Estimate	P	Adj. R²	AIC	F_{3,22}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.84276	< 2e-16 ***	0.28	57.23564	102.729	<.0001	0.3717995	6.76E-10
Macro	0.39069	0.00088 ***	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	1	0.00228 **		-	-	-	-	-
H ~ Macro + s(Conduct.)	Estimate	P	Adj. R²	AIC	F_{3,22}	P	-	-
(Intercept)	0.84156	6.01e-16 ***	0.173	63.84994	85.6052	<.0001	0.3937142	0.000112096
Macro	0.39551	0.00607 **	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Conduct.)	1	0.078 .	-	-	-	-	-	-
H ~ Macro + s(OD)	Estimate	P	Adj. R²	AIC	F_{3,19}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.83094	< 2e-16 ***	0.153	63.65093	75.3953	<.0001	0.4108678	7.95E-08
Macro	0.41455	0.00214 **	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(OD)	1	0.155	-	-	-	-	-	-
H ~ Macro + s(pH)	Estimate	P	Adj. R²	AIC	F_{3,21}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.85236	<2e-16 ***	0.309	52.46653	106.075	<.0001	0.3566513	3.52E-08
Macro	0.30806	0.0078 **	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(pH)	1	0.00038 ***	-	-	-	-	-	-
H ~ Macro	Estimate	P	Adj. R²	AIC	F_{2,21}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.839	1.01e-15 ***	0.136	63.06767	124.083	<.0001	0.4118963	1.75E-06
Macro	0.40576	0.00581 **	-	-	-	-	-	-
H ~ s(pH)	Estimate	P	Adj. R²	AIC	F_{2,22}	P	Intercept - Random effects	Residual - Random effects

(Intercept)	0.9254	<2e-16 ***	0.236	55.92572	86.1411	<.0001	0.3734573	2.09E-06
Approximate significance of smooth terms	edf	<i>P</i>	-	-	-	-	-	-
s(pH)	1	0.000211 ***		-	-	-	-	-

Table S3. Statistical results of modeling analysis for FRic (functional richness) and the independent variables.

FRic ~ Macro + s(Temp.) + s(Conduct.) + s(OD) + s(pH)	Estimate	P	Adj. R²	AIC	F_{6,15}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.09704	2.47e-09 ***	0.274	-103.43	20.61461	<.0001	0.04032004	1.03E-06
Macro	0.05082	0.0555.	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	0.9999	0.21264	-	-	-	-	-	-
s(Conduct.)	1	0.00259 **	-	-	-	-	-	-
s(OD)	1	0.19108	-	-	-	-	-	-
s(pH)	1	0.05029 .	-	-	-	-	-	-
FRic ~ Macro + s(Temp.) + s(Conduct.) + s(OD)	Estimate	P	Adj. R²	AIC	F_{5,17}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.09541	1.32e-08 ***	0.22	-107.021	22.58751	<.0001	0.04042504	2.01E-06
Macro	0.06021	0.0312 *	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	0.9999	0.70499	-	-	-	-	-	-
s(Conduct.)	1	0.00146 **	-	-	-	-	-	-
s(OD)	1	0.484	-	-	-	-	-	-
FRic ~ Macro + s(Temp.) + s(OD) + s(pH)	Estimate	P	Adj. R²	AIC	F_{5,16}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.0989	7.48e-10 ***	0.237	-99.1297	23.21101	<.0001	0.05062303	1.44E-06
Macro	0.04732	0.0713	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	1	0.4855	-	-	-	-	-	-
s(OD)	1	0.1551	-	-	-	-	-	-
s(pH)	1	0.0745 .	-	-	-	-	-	-
FRic ~ Macro + s(Conduct.) + s(OD) + s(pH)	Estimate	P	Adj. R²	AIC	F_{5,16}	P	Intercept - Random effects	Residual - Random effects

(Intercept)	0.09724	1.73e-09 ***	0.284	-105.83	24.89402	<.0001	0.04220281	1.33E-06
Macro	0.05143	0.0518.	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Conduct.)	1	0.00504 **	-	-	-	-	-	-
s(OD)	1	0.12969	-	-	-	-	-	-
s(pH)	1	0.11555	-	-	-	-	-	-
FRic ~ Macro + s(Temp.) + s(Conduct) + s(pH)	Estimate	P	Adj. R²	AIC	F_{5,19}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.010207	0.000000000208 ***	0.284	- 112.702	27.71089	<.0001	0.04422201	1.69E-06
Macro	0.05232	0.0432*	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	1	0.51495	-	-	-	-	-	-
s(Conduct.)	1	0.00832 **	-	-	-	-	-	-
s(pH)	1	0.21394	-	-	-	-	-	-
FRic ~ Macro + s(Temp.) + s(Conduct.)	Estimate	P	Adj. R²	AIC	F_{4,21}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.10163	3.37e-10 ***	0.278	- 118.207	34.39474	<.0001	0.04438241	1.98E-06
Macro	0.05875	0.0246 *	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	1	0.89758	-	-	-	-	-	-
s(Conduct.)	1	0.00411 **	-	-	-	-	-	-
FRic ~ Macro + s(Temp.) + s(OD)	Estimate	P	Adj. R²	AIC	F_{4,18}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.09613	4.68e-09 ***	0.187	- 101.962	26.50052	<.0001	0.05175656	2.69E-06
Macro	0.06158	0.0237 *	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	1	0.0087 **	-	-	-	-	-	-
s(OD)	1	0.3919	-	-	-	-	-	-

FRic ~ Macro + s(Temp.) + s(pH)	Estimate	P	Adj. R²	AIC	F_{4,20}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.10275	1.02e-10 ***	0.244	- 110.009	33.1294	<.0001	0.0517324	2.69E-06
Macro	0.05041	0.0492 *	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	1	0.212	-	-	-	-	-	-
s(pH)	1	0.242	-	-	-	-	-	-
FRic ~ Macro + s(Conduct.) + s(pH)	Estimate	P	Adj. R²	AIC	F_{4,20}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.10216	1.43e-10 ***	0.301	- 116.265	35.53441	<.0001	0.04493307	3.66E-06
Macro	0.05213	0.0426 *	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Conduct.)	1	0.00475 **	-	-	-	-	-	-
s(pH)	1	0.27215	-	-	-	-	-	-
FRic ~ Macro + s(OD) + s(pH)	Estimate	P	Adj. R²	AIC	F_{4,17}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.09925	4.57e-10 ***	0.255	- 102.632	29.96154	<.0001	0.05168988	3.20E-06
Macro	0.04576	0.0778	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(OD)	1	0.17431	-	-	-	-	-	-
s(pH)	1	0.00147 **	-	-	-	-	-	-
FRic ~ Macro + s(Conduct.) + s(OD)	Estimate	P	Adj. R²	AIC	F_{4,18}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.09555	8.66e-09 ***	0.247	- 110.883	29.22444	<.0001	0.04104337	3.06E-06
Macro	0.06016	0.0295 *	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Conduct.)	1	2.51e-05 ***	-	-	-	-	-	-
s(OD)	1	0.291	-	-	-	-	-	-

FRic ~ Macro + s(Temp.)	Estimate	P	Adj. R²	AIC	F_{3,22}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.10135	1.89e-10 ***	0.232	-114.44	43.96141	<.0001	0.0531284	1.38E-05
Macro	0.05984	0.0199 *	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	1	0.00175 **	-	-	-	-	-	-
FRic ~ Macro + s(Condu.)	Estimate	P	Adj. R²	AIC	F_{3,22}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.10163	2.62e-10 ***	0.296	-122.191	47.10812	<.0001	0.04455111	1.19E-05
Macro	0.05874	0.024 *	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Condu.)	1	1e-05 ***	-	-	-	-	-	-
FRic ~ Macro + s(OD)	Estimate	P	Adj. R²	AIC	F_{3,19}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.09578	6.51e-09 ***	0.112	-98.9841	32.61191	<.0001	0.05983104	1.43E-05
Macro	0.06298	0.0229 *	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(OD)	1	0.345	-	-	-	-	-	-
FRic ~ Macro + s(pH)	Estimate	P	Adj. R²	AIC	F_{3,21}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.10278	1.33e-10 ***	0.236	-112.363	43.21245	<.0001	0.05270307	1.45E-05
Macro	0.05031	0.0531 .	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(pH)	1	0.000929 ***	-	-	-	-	-	-
FRic ~ Macro	Estimate	P	Adj. R²	AIC	F_{2,21}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.10078	3.53e-10 ***	0.112	-108.708	59.09359	<.0001	0.06357566	0.000945171
Macro	0.06214	0.0181 *	-	-	-	-	-	-
FRic ~ s(pH)	Estimate	P	Adj. R²	AIC	F_{2,23}	P	Intercept - Random effects	Residual - Random effects

(Intercept)	0.11631	1.05e-12 ***	0.191	- 119.089	58.44119	<.0001	0.04452547	5.88E-05
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Condu.t.)	1	6.67e-06 ***	-	-	-	-	-	-

Table S4. Statistical results of modeling analysis for FEve (functional evenness) and the independent variables.

FEve ~ Macro + s(Temp.) + s(Conduct.) + s(OD) + s(pH)	Estimate	P	Adj. R²	AIC	F_{6,15}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.40802	2.43e-13 ***	0.0437	14.9128	28.5196	<.0001	0.2063701	2.19E-06
Macro	0.13031	0.109	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	1	0.0834 .	-	-	-	-	-	-
s(Conduct.)	1	0.2364	-	-	-	-	-	-
s(OD)	1	0.1975	-	-	-	-	-	-
s(pH)	1	0.6204	-	-	-	-	-	-
FEve ~ Macro + s(Temp.) + s(Conduct.) + s(OD)	Estimate	P	Adj. R²	AIC	F_{5,17}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.4073	1.1e-13 ***	0.0671	10.2904	35.3423	<.0001	0.2047044	3.80E-06
Macro	0.10885	0.153	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	1	0.0324 *	-	-	-	-	-	-
s(Conduct.)	1	0.182	-	-	-	-	-	-
s(OD)	1	0.0950 .	-	-	-	-	-	-
FEve ~ Macro + s(Temp.) + s(Conduct.) + s(pH)	Estimate	P	Adj. R²	AIC	F_{5,19}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.41469	<2e-16 ***	0.122	9.164695	40.2789	<.0001	0.2066433	7.99E-10
Macro	0.12833	0.0499 *	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	-0.003517	1	-	-	-	-	-	-
s(Conduct.)	-0.007389	1	-	-	-	-	-	-
s(pH)	-0.004066	1	-	-	-	-	-	-
FEve ~ Macro + s(Temp.) + s(OD) + s(pH)	Estimate	P	Adj. R²	AIC	F_{5,16}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.40734	4.67e-13 ***	0.0354	12.37914	32.7014	<.0001	0.2063511	4.40E-06
Macro	0.13171	0.115	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	1	0.2	-	-	-	-	-	-

s(OD.)	1	0.201	-	-	-	-	-	-
s(pH)	1	0.716	-	-	-	-	-	-
FEve ~ Macro + s(Conduct.) + s(OD) + s(pH)	Estimate	P	Adj. R²	AIC	F_{5,16}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.41038	5.88e-13 ***	-0.00247	14.09228	31.373	<.0001	0.2112105	5.28E-06
Macro	0.11878	0.16	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Conduct.)	1	0.863	-	-	-	-	-	-
s(OD.)	1	0.229	-	-	-	-	-	-
s(pH)	1	0.42	-	-	-	-	-	-
FEve ~ Macro + s(Temp.) + s(Conduct.)	Estimate	P	Adj. R²	AIC	F_{4,21}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.41397	1.34e-14 ***	0.0495	6.038493	47.5844	<.0001	0.203535	0.00013885
Macro	0.10849	0.146	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	1	0.0788 .	-	-	-	-	-	-
s(Conduct.)	1	0.2106	-	-	-	-	-	-
FEve ~ Macro + s(Temp.) + s(OD)	Estimate	P	Adj. R²	AIC	F_{4,18}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.4077	2.36e-13 ***	0.0499	8.154151	41.683	<.0001	0.2054625	2.94E-06
Macro	0.10607	0.179	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	1	0.0918 .	-	-	-	-	-	-
s(OD)	1	0.1134	-	-	-	-	-	-
FEve ~ Macro + s(Temp.) + s(pH)	Estimate	P	Adj. R²	AIC	F_{4,20}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.41385	1.49e-14 ***	0.0504	6.658756	48.1271	<.0001	0.2067556	3.57E-05
Macro	0.1315	0.0887 .	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	1	0.126	-	-	-	-	-	-
s(pH)	1	0.246	-	-	-	-	-	-

FEve ~ Macro + s(Conduct.) + s(pH)	Estimate	P	Adj. R²	AIC	F_{4,20}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.41362	5.63e-14 ***	-0.00162	9.103332	43.8472	<.0001	0.2090867	7.31E-06
Macro	0.13219	0.0997 .	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Conduct.)	1	0.929	-	-	-	-	-	-
s(pH)	1	0.967	-	-	-	-	-	-
FEve ~ Macro + s(OD) + s(pH)	Estimate	P	Adj. R²	AIC	F_{4,17}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.41004	4.75e-13 ***	0.0216	10.12322	39.9575	<.0001	0.2106271	5.37E-06
Macro	0.11996	0.155	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(OD)	1	0.228	-	-	-	-	-	-
s(pH)	1	0.412	-	-	-	-	-	-
FEve ~ Macro + s(OD) + s(Conduct.)	Estimate	P	Adj. R²	AIC	F_{4,18}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.40754	6.05e-13 ***	-0.0147	11.13447	38.5279	<.0001	0.2128866	8.99E-06
Macro	0.10651	0.19	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(OD)	1	0.447	-	-	-	-	-	-
s(Conduct.)	1	0.865	-	-	-	-	-	-
FEve ~ Macro + s(Temp.)	Estimate	P	Adj. R²	AIC	F_{3,22}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.41445	2.85e-14 ***	0.0363	3.667224	60.2166	<.0001	0.203637	3.06E-05
Macro	0.10653	0.167	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	1	0.215	-	-	-	-	-	-
FEve ~ Macro + s(Conduct.)	Estimate	P	Adj. R²	AIC	F_{3,22}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.41373	5.43e-14 ***	0.00334	5.271965	57.6085	<.0001	0.2068272	3.06E-05
Macro	0.10942	0.163	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-

s(Conduct.)	1	0.906	-	-	-	-	-	-
FEve ~ Macro + s(OD)	Estimate	P	Adj. R²	AIC	F_{3,19}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.40757	3.97e-13 ***	0.00931	7.163052	53.0868	<.0001	0.2140321	8.76E-05
Macro	0.10672	0.187	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(OD)	1	0.449	-	-	-	-	-	-
FEve ~ Macro + s(pH)	Estimate	P	Adj. R²	AIC	F_{3,21}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.41366	4.07e-14 ***	0.021	5.111778	59.8796	<.0001	0.209231	0.000303023
Macro	0.13204	0.0997.	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(pH)	1	0.994	-	-	-	-	-	-
FEve ~ Macro	Estimate	P	Adj. R²	AIC	F_{3,21}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.41364	3.81e-14 ***	0.0251	1.286275	88.719	<.0001	0.2073389	0.002020912
Macro	0.10978	0.16	-	-	-	-	-	-
FEve ~ s(pH)	Estimate	P	Adj. R²	AIC	F_{2,23}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.44109	<2e-16 ***	0.0132	3.647883	84.1855	<.0001	0.2036918	4.77E-05
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(pH)	1	0.203	-	-	-	-	-	-

Table S5. Statistical results of modeling analysis for FDis (functional dispersion) and the independent variables.

FDis ~ Macro + s(Temp.) + s(Conduct.) + s(OD) + s(pH)	Estimate	P	Adj. R²	AIC	F_{6,15}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.121992	5.31e-15 ***	0.239	-102.9898	39.96396	<.0001	0.05377382	6.85E-07
Macro	0.050888	0.0196 *	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	0.9998	0.0361 *	-	-	-	-	-	-
s(Conduct.)	1	0.9217	-	-	-	-	-	-
s(OD)	1	0.9745	-	-	-	-	-	-
s(pH)	1	0.5942	-	-	-	-	-	-
FDis ~ Macro + s(Temp.) + s(Conduct.) + s(OD)	Estimate	P	Adj. R²	AIC	F_{5,17}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.121631	<2e-16 ***	0.284	-109.2359	51.86884	<.0001	0.05505966	6.42E-10
Macro	0.05514	0.0023 **	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	-8.74E-05	<2e-16 ***	-	-	-	-	-	-
s(Conduct.)	-1.73E-02	1	-	-	-	-	-	-
s(OD)	1.00E+00	0.794	-	-	-	-	-	-
FDis ~ Macro + s(Temp.) + s(Conduct.) + s(pH)	Estimate	P	Adj. R²	AIC	F_{5,19}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.122688	8.07e-16 ***	0.234	-116.3628	49.66803	<.0001	0.05162933	1.60E-06
Macro	0.045803	0.0287 *	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	1	0.0458 *	-	-	-	-	-	-
s(Conduct.)	1	0.9546	-	-	-	-	-	-
s(pH)	1	0.7798	-	-	-	-	-	-
FDis ~ Macro + s(Temp.) + s(OD) + s(pH)	Estimate	P	Adj. R²	AIC	F_{5,16}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.121989	3.39e-15 ***	0.259	-106.9797	49.29939	<.0001	0.05384142	1.27E-06
Macro	0.050923	0.0193 *	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	6.785	0.0129 *	-	-	-	-	-	-
s(OD)	0.001	0.9749	-	-	-	-	-	-
s(pH)	0.279	0.6004	-	-	-	-	-	-
FDis ~ Macro + s(Conduct.) + s(OD) + s(pH)	Estimate	P	Adj. R²	AIC	F_{5,16}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.122945	<2e-16 ***	0.181	-102.4585	44.81259	<.0001	0.05750019	1.34E-08

Macro	0.047124	0.0171 *	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Conduct.)	1.02	0.194	-	-	-	-	-	-
s(OD)	0.8616	0.983	-	-	-	-	-	-
s(pH)	0.999	0.276	-	-	-	-	-	-
FDis ~ Macro + s(Temp.) + s(Conduct.)	Estimate	P	Adj. R²	AIC	F_{4,21}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.121838	3.19e-16 ***	0.245	-122.7222	66.88306	<.0001	0.05281566	2.52E-06
Macro	0.051759	0.0103 *	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	1	0.0426 *	-	-	-	-	-	-
s(Conduct.)	1	0.79	-	-	-	-	-	-
FDis ~ Macro + s(Temp.) + s(OD)	Estimate	P	Adj. R²	AIC	F_{4,18}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.12159	< 2e-16 ***	0.228	-113.162	66.33108	<.0001	0.05510489	2.06E-10
Macro	0.055309	0.00235 **	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	0.1289	<2e-16 ***	-	-	-	-	-	-
s(OD)	3.8374	0.888	-	-	-	-	-	-
FDis ~ Macro + s(Temp.) + s(pH)	Estimate	P	Adj. R²	AIC	F_{4,20}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.122676	5.4e-16 ***	0.252	-120.3594	63.58798	<.0001	0.05164577	2.82E-06
Macro	0.045847	0.0283 *	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	1	0.0121 *	-	-	-	-	-	-
s(pH)	1	0.7825	-	-	-	-	-	-
FDis ~ Macro + s(Conduct.) + s(pH)	Estimate	P	Adj. R²	AIC	F_{4,20}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.122373	<2e-16 ***	0.185	-116.4058	62.98002	<.0001	0.0566953	5.97E-09
Macro	0.047149	0.0102 *	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Conduct.)	1.6106	0.205	-	-	-	-	-	-
s(pH)	0.7071	0.129	-	-	-	-	-	-
FDis ~ Macro + s(OD) + s(pH)	Estimate	P	Adj. R²	AIC	F_{4,17}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.123477	3.6e-16 ***	0.117	-104.5882	54.64496	<.0001	0.05873534	4.56E-09
Macro	0.044781	0.025 *	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-

s(OD)	3.5395	0.9763	-	-	-	-	-	-
s(pH)	0.6234	0.0161 *	-	-	-	-	-	-
FDis ~ Macro + s(Conduct.) + s(OD)	Estimate	P	Adj. R²	AIC	F_{4,18}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.12181	< 2e-16 ***	0.192	-108.9122	59.42965	<.0001	0.05776941	1.92E-09
Macro	0.05441	0.00397 **	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Conduct.)	1.0206	0.0347 *	-	-	-	-	-	-
s(OD)	0.9938	0.4338	-	-	-	-	-	-
FDis ~ Macro + s(Temp.)	Estimate	P	Adj. R²	AIC	F_{3,22}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.121811	2.37e-16 ***	0.261	-126.6475	90.81522	<.0001	0.05278487	1.06E-05
Macro	0.051867	0.0102 *	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Temp.)	1	0.00132 **	-	-	-	-	-	-
FDis ~ Macro + s(Conduct.)	Estimate	P	Adj. R²	AIC	F_{3,22}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.121744	<2e-16 ***	0.196	-122.5052	87.85586	<.0001	0.05717145	2.75E-11
Macro	0.052135	0.0034 **	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(Conduct.)	1	0.0178 *	-	-	-	-	-	-
FDis ~ Macro + s(OD)	Estimate	P	Adj. R²	AIC	F_{3,19}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.121526	< 2e-16 ***	0.134	-108.7048	72.67729	<.0001	0.06053413	8.71E-08
Macro	0.055567	0.00483 **	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(OD)	1	0.135	-	-	-	-	-	-
FDis ~ Macro + s(pH)	Estimate	P	Adj. R²	AIC	F_{3,21}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.122542	<2e-16 ***	0.171	-118.1873	81.28844	<.0001	0.05804926	1.55E-08
Macro	0.046429	0.0132 *	-	-	-	-	-	-
Approximate significance of smooth terms	edf	P	-	-	-	-	-	-
s(pH)	1	0.0264 *	-	-	-	-	-	-
FDis ~ Macro	Estimate	P	Adj. R²	AIC	F_{2,21}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.12124	2.13e-15 ***	0.111	-120.5804	116.399	<.0001	0.060811	1.16E-06
Macro	0.05415	0.012 *	-	-	-	-	-	-
FDis ~ s(Temp.)	Estimate	P	Adj. R²	AIC	F_{2,23}	P	Intercept - Random effects	Residual - Random effects
(Intercept)	0.134777	<2e-16 ***	0.155	-122.1571	104.4756	<.0001	0.05259965	8.79E-05

Approximate significance of smooth terms	edf	<i>P</i>	-	-	-	-	-	-
s(Temp.)	1	0.00074 ***	-	-	-	-	-	-