Abonyi, A., É. Ács, A. Hidas, I. Grigorszky, G. Várbíró, G. Borics & K. T. Kiss, 2018. Functional diversity of phytoplankton highlights long-term gradual regime shift in the middle section of the Danube River due to global warming, human impacts and oligotrophication. Freshwater Biology doi:10.1111/fwb.13084.

Supplement 3A Seasonal Mann-Kendall and Mann-Kendall trend analysis of major environmental variables in the middle Danube section, Göd (N-Budapest, Hungary) between 1979 and 2012. Tau and significance levels (in brackets) are given, as well as bootstrap confidence interval calculations (BCICs) for the Mann-Kendall tests based on 10,000 bootstrap replicates at 99% CI (in second line). Significant trends are bold and italic.

Parameter	**GLOBAL** (Seasonal M-K)	**WINTER** (Mann-K)	**SPRING** (Mann-K)	**SUMMER** (Mann-K)	**AUTUMN** (Mann-K)
Water temperature (°C)	***0.25 (***)***	0.11 (n.s.) 0.03, 0.42	0.11 (n.s.) 0.10, 0.32	***0.30 (***)*** ***0.38, 0.82***	0.07 (n.s.) 0.04, 0.25
Total suspended solids (mgL^{-1})	***-0.35 (***)***	***-0.31 (***)*** ***0.89, -0.36***	***-0.32 (***)*** ***-0.90, -0.39***	***-0.31 (***)*** ***-0.87, -0.37***	***-0.32 (***)*** ***-0.87, -0.41***
Ammonium-N ($mgN\ L^{-1}$)	***-0.66 (***)***	***-0.70 (***)*** ***-1.77, -1.02***	***-0.62 (***)*** ***-1.56, -0.91***	***-0.56 (***)*** ***-1.43, -0.78***	***-0.65 (***)*** ***-1.62, -0.96***
Nitrite-N ($mgN\ L^{-1}$)	***-0.58 (***)***	***-0.43 (***)*** ***-1.15, -0.56***	***-0.58 (***)*** ***-1.50, -0.83***	***-0.55 (***)*** ***-1.42, -0.77***	***-0.61 (***)*** ***-1.54, -0.88***
Nitrate-N ($mgN\ L^{-1}$)	***-0.20 (***)***	-0.02 (n.s.) -0.28, 0.19	-0.12 (n.s.) -0.40, -0.08	***-0.22 (**)*** ***-0.65, -0.21***	***-0.21 (**)*** ***-0.61, -0.22***
Orthophosphate-P ($\mu gP\ L^{-1}$)	***-0.57 (***)***	***-0.63 (***)*** ***-1.62, -0.88***	***-0.55 (***)*** ***-1.43, -0.78***	***-0.41 (***)*** ***-1.13, -0.50***	***-0.59 (***)*** ***-1.52, -0.85***

Supplement 3B Seasonal Mann-Kendall and Mann-Kendall trend analysis of the relative abundance of phytoplankton functional traits in the middle Danube section, Göd (N-Budapest, Hungary) between 1979 and 2012. Tau and p values (in brackets) are given, as well as bootstrap confidence interval calculations for the Mann-Kendall tests (in the second line) based on 10,000 bootstrap replicates at 99% CI. Significant trends are bold and italic. For the abbreviation of functional traits, see Table 1 in the article.

FTs	GLOBAL (Seasonal M-K)	WINTER (Mann-K)	SPRING (Mann-K)	SUMMER (Mann-K)	AUTUMN (Mann-K)
S	***0.10 (**)***	-0.02 (n.s.)	***0.17 (*)***	0.08 (n.s.)	0.10 (n.s.)
		-0.19, 0.13	***0.16, 0.51***	-0.07, 0.40	-0.02, 0.42
M	***-0.12 (***)***	-0.05 (n.s.)	***-0.25 (***)***	-0.0269 (n.s.)	***-0.133 (*)***
		-0.27, 0.06	***-0.73, -0.28***	-0.29, 0.19	***-0.49, -0.04***
L	0.04 (n.s.)	0.08 (n.s.)	***0.23 (***)***	***-0.17 (*)***	0.08 (n.s.)
		-0.05, 0.36	***0.20, 0.71***	***-0.58, -0.09***	-0.06, 0.36
XL	***-0.08 (*)***	***-0.18 (*)***	0.04 (n.s.)	-0.07 (n.s.)	-0.12 (n.s.)
		-0.56, -0.14	-0.11, 0.28	-0.33, 0.06	-0.44, -0.04
GAL	***0.21 (***)***	***0.19 (**)***	***0.38 (***)***	-0.00 (n.s.)	***0.212 (**)***
		0.18, 0.59	***0.49, 1.02***	-0.22, 0.18	***0.23, 0.62***
FLA	***0.36 (***)***	***0.30 (***)***	***0.32 (***)***	***0.29 (***)***	***0.51 (***)***
		0.37, 0.85	***0.35, 0.91***	***0.35, 0.82***	***0.72, 1.30***
SIN	***-0.19 (***)***	0.06 (n.s.)	***-0.25 (***)***	***-0.21 (**)***	-0.11 (n.s.)
		-0.07, 0.30	***-0.70, -0.31***	***-0.59, -0.23***	-0.40, -0.07
COL	0.01 (n.s.)	-0.07 (n.s.)	***0.19 (**)***	-0.13 (n.s.)	-0.03 (n.s.)
		-0.33, 0.06	***0.21, 0.55***	-0.49, -0.02	-0.25, 0.13
FIL	***0.21 (***)***	-0.03 (n.s.)	***0.36 (***)***	***0.23 (***)***	0.08 (n.s.)
		-0.24, 0.12	***0.48, 0.95***	***0.24, 0.69***	-0.03, 0.34
SIR	***-0.24 (***)***	***-0.16 (*)***	***-0.31 (***)***	-0.05 (n.s.)	***-0.34 (***)***
		-0.51, -0.12	***-0.87, -0.39***	-0.31, 0.12	***-0.92, -0.43***
VAC	***0.15 (***)***	0.09 (n.s.)	***0.17 (*)***	0.136 (n.s.)	0.0878 (n.s.)
		-0.05, 0.41	***0.14, 0.54***	0.05, 0.49	-0.05, 0.40
N2R	0.02 (n.s.)	0.02 (n.s.)	***0.16 (*)***	-0.03 (n.s.)	-0.08 (n.s.)
		-0.18, 0.24	***0.11, 0.52***	-0.24, 0.13	-0.32, 0.02
CHB	-0.00 (n.s.)	0.00 (n.s.)	***0.18 (**)***	***-0.19 (**)***	-0.05 (n.s.)
		-0.19, 0.21	***0.19, 0.52***	***-0.62, -0.15***	-0.32, 0.12
CHC	-0.02 (n.s.)	0.04 (n.s.)	***-0.188 (**)***	***0.134 (*)***	0.01 (n.s.)
		-0.12, 0.28	***-0.54, -0.21***	***0.03, 0.51***	-0.19, 0.23
PYC	***0.41 (***)***	***0.20 (**)***	***0.37 (***)***	***0.45 (***)***	***0.51 (***)***
		0.20, 0.58	***0.44, 1.02***	***0.61, 1.20***	***0.72, 1.30***
BEN	***0.11 (**)***	0.05 (n.s.)	***0.24 (***)***	0.00 (n.s.)	***0.17 (*)***
		-0.11, 0.31	***0.28, 0.68***	-0.22, 0.23	***0.14, 0.53***
PLA	***-0.11 (**)***	-0.05 (n.s.)	***-0.24 (***)***	-0.00 (n.s.)	***-0.17 (*)***
		-0.32, 0.11	***-0.69, -0.28***	-0.23, 0.22	***-0.53, -0.14***

Supplement 3C Seasonal Mann-Kendall and Mann-Kendall trend analysis of the relative abundance of phytoplankton functional groups (FGs) *sensu* Reynolds in the middle Danube section, Göd (N-Budapest, Hungary) between 1979 and 2012. Tau and p values (in brackets) are given, as well as bootstrap confidence interval calculations for the Mann-Kendall tests (in the second line) based on 10,000 bootstrap replicates at 99% CI. Significant trends are bold and italic. For the abbreviation of FGs, see Reynolds *et al.* (2002), Borics *et al.* (2007), and Padisák, Crossetti & Naselli-Flores (2009).

FGs	GLOBAL (Seasonal M-K)	WINTER (Mann-K)	SPRING (Mann-K)	SUMMER (Mann-K)	AUTUMN (Mann-K)
A	-0.13 (**)	-0.14 (n.s.) -0.50, -0.04	0.07 (n.s.) -0.05, 0.35	-0.21 (**) -0.66, -0.15	-0.18 (*) -0.60, -0.13
B	-0.01 (n.s.)	0.0681 (n.s.) -0.12, 0.40	0.15 (*) 0.06, 0.54	-0.01 (n.s.) -0.25, 0.22	-0.26 (***) -0.80, -0.23
C	-0.11 (**)	-0.06 (n.s.) -0.36, 0.11	-0.09 (n.s.) -0.37, 0.01	-0.07 (n.s.) -0.367, 0.08	-0.24 (***) -0.71, -0.23
D	-0.23 (***)	-0.17 (*) -0.53, -0.13	-0.31 (***) -0.87, -0.36	-0.07 (n.s.) -0.35, 0.07	-0.33 (***) -0.91, -0.41
E	0.16 (***)	0.37 (***) 0.44, 1.02	0.25 (***) 0.27, 0.73	-0.12 (n.s.) -0.45, -0.01	0.13 (n.s.) 0.04, 0.49
F	-0.10 (**)	-0.13 (n.s.) -0.50, -0.04	0.07 (n.s.) -0.02, 0.30	-0.24 (***) -0.75, -0.22	-0.11 (n.s.) -0.44, 0.01
G	-0.07 (n.s.)	0.17 (*) 0.13, 0.54	0.08 (n.s.) 0.00, 0.34	-0.23 (***) -0.69, -0.23	-0.16 (*) -0.56, -0.09
H1	0.02 (n.s.)	0.02 (n.s.) -0.18, 0.24	0.18 (*) 0.14, 0.57	-0.04 (n.s.) -0.26, 0.11	-0.09 (n.s.) -0.36, -0.01
J	0.02 (n.s.)	-0.01 (n.s.) -0.18, 0.14	0.23 (***) 0.28, 0.62	-0.16 (*) -0.56, -0.09	-0.09 (n.s.) -0.39, 0.02
K	0.07 (n.s.)	-0.16 (n.s.) -1.80, 0.59	0.26 (**) -0.29, 1.19	0.12 (n.s.) -0.09, 0.58	-0.05 (n.s.) -0.44, 0.22
L0	0.03 (n.s.)	-0.07 (n.s.) -0.38, 0.11	0.13 (n.s.) 0.03, 0.48	0.18 (**) 0.11, 0.61	-0.09 (n.s.) -0.39, 0.01
M	0.19 (***)	0.13 (n.s.) -0.06, 0.56	0.09 (n.s.) -0.41, 0.69	0.23 (**) 0.18, 0.73	0.14 (n.s.) 0.01, 0.55
P	0.27 (***)	0.26 (***) 0.21, 0.81	0.46 (***) 0.58, 1.24	0.16 (*) 0.08, 0.53	0.13 (n.s.) 0.06, 0.46
Q	0.11 (n.s.)	-0.04 (n.s.) -1.68, 0.81	0.02 (n.s.) -1.56, 0.92	0.08 (n.s.) -0.20, 0.49	0.18 (*) -0.53, 1.06
S1	0.12 (***)	0.04 (n.s.) -0.14, 0.31	0.25 (***) 0.28, 0.73	-0.01 (n.s.) -0.19, 0.17	0.16 (*) 0.13, 0.51
S2	-0.20 (***)	-0.28 (***) -0.82, -0.29	-0.11 (n.s.) -0.43, -0.01	-0.06 (n.s.) -0.31, 0.06	-0.16 (*) -0.54, -0.11
T	0.10 (*)	-0.06 (n.s.) -1.60, 0.78	0.17 (*) 0.11, 0.60	0.02 (n.s.) -0.19, 0.26	0.16 (*) 0.05, 0.57
TB	0.12 (***)	0.05 (n.s.) -0.13, 0.32	0.18 (**) 0.16, 0.57	-0.01 (n.s.) -0.21, 0.17	0.23 (***) 0.26, 0.65
TC	-0.26 (***)	-0.05 (n.s.)	-0.11 (n.s.)	-0.40 (***)	-0.43 (***)

		-0.29, 0.10	-0.43, -0.01	***-1.09, -0.49***	***-1.17, -0.56***
U	0.07 (n.s.)	0.04 (n.s.)	***0.17 (*)***	-0.02 (n.s.)	-0.01 (n.s.)
		-0.82, 0.78	***-1.14, 1.24***	-1.05, 0.71	-1.61, 0.87
W1	***-0.18 (***)***	***-0.22 (**)***	-0.05 (n.s.)	-0.13 (n.s.)	***-0.30 (***)***
		-0.66, -0.23	-0.31, 0.12	-0.44, -0.07	***-0.81, -0.37***
W2	***-0.26 (***)***	-0.14 (n.s.)	***-0.27 (***)***	***-0.36 (***)***	***-0.25 (***)***
		-0.58, -0.00	***-0.82, -0.24***	***-0.98, -0.45***	***-0.72, -0.26***
WS	***-0.11 (**)***	0.02 (n.s.)	0.07 (n.s.)	***-0.30 (***)***	***-0.17 (*)***
		-0.17, 0.26	-0.07, 0.34	***-0.85, -0.35***	***-0.56, -0.14***
X1	***-0.12 (**)***	-0.13 (n.s.)	0.02 (n.s.)	***-0.14 (*)***	***-0.21 (**)***
		-0.42, -0.07	-0.07, 0.16	***-0.51, -0.05***	***-0.66, -0.18***
X2	***0.39 (***)***	***0.33 (***)***	***0.33 (***)***	***0.31 (***)***	***0.55 (***)***
		0.40, 0.91	***0.36, 0.94***	***0.38, 0.86***	***0.79, 1.41***
X3	***0.22 (***)***	***0.29 (***)***	***0.35 (***)***	0.08 (n.s.)	***0.16 (*)***
		0.32, 0.85	***0.43, 0.99***	-0.07, 0.37	***0.11, 0.52***
Y	***0.11 (**)***	0.03 (n.s.)	***0.23 (***)***	0.01 (n.s.)	***0.17 (*)***
		-0.11, 0.23	***0.22, 0.71***	-0.15, 0.19	***0.17, 0.52***

Supplement 3D Seasonal Mann-Kendall and Mann-Kendall trend analysis of functional evenness (FEVE), functional divergence (FDIV) and functional dispersion (FDIS) based on phytoplankton functional traits and phytoplankton functional groups *sensu* Reynolds in the middle Danube section, Göd (N-Budapest, Hungary) between 1979 and 2012. Tau and significance levels (in brackets) are given, as well as bootstrap confidence interval calculations (BCICs) for the Mann-K tests based on 10,000 bootstrap replicates at 99% CI (in second line). Significant trends are bold and italic.

Functional metric	**GLOBAL** (Seasonal M-K)	**WINTER** (Mann-K)	**SPRING** (Mann-K)	**SUMMER** (Mann-K)	**AUTUMN** (Mann-K)
Functional traits					
FEVE	***0.21 (***)***	0.00 (n.s.)	0.03 (n.s.)	***0.36 (***)***	***0.32 (***)***
		-0.24, 0.24	-0.12, 0.24	***0.48, 0.96***	***0.40, 0.89***
FDIV	***0.09 (*)***	0.08 (n.s.)	***0.14 (*)***	0.08 (n.s.)	0.00 (n.s.)
		-0.02, 0.36	***0.11, 0.44***	-0.04, 0.35	-0.13, 0.15
FDIS	***0.31 (***)***	***0.14 (*)***	***0.34 (***)***	***0.21 (**)***	***0.39 (***)***
		0.09, 0.48	***0.43, 0.92***	***0.20, 0.64***	***0.53, 1.02***
Functional groups					
FEVE	0.01 (n.s.)	***-0.23 (**)***	***-0.18 (**)***	***0.21 (**)***	***0.27 (***)***
		-0.71, -0.21	***-0.53, -0.20***	***0.17, 0.67***	***0.29, 0.79***
FDIV	***0.13 (***)***	***0.18 (*)***	0.12 (n.s.)	-0.07 (n.s.)	***0.31 (***)***
		0.16, 0.56	0.03, 0.46	-0.36, 0.09	***0.38, 0.85***
FDIS	***0.19 (***)***	0.14 (n.s.)	***0.32 (***)***	0.05 (n.s.)	***0.20 (**)***
		0.07, 0.47	***0.38, 0.89***	-0.13, 0.31	***0.17, 0.62***

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