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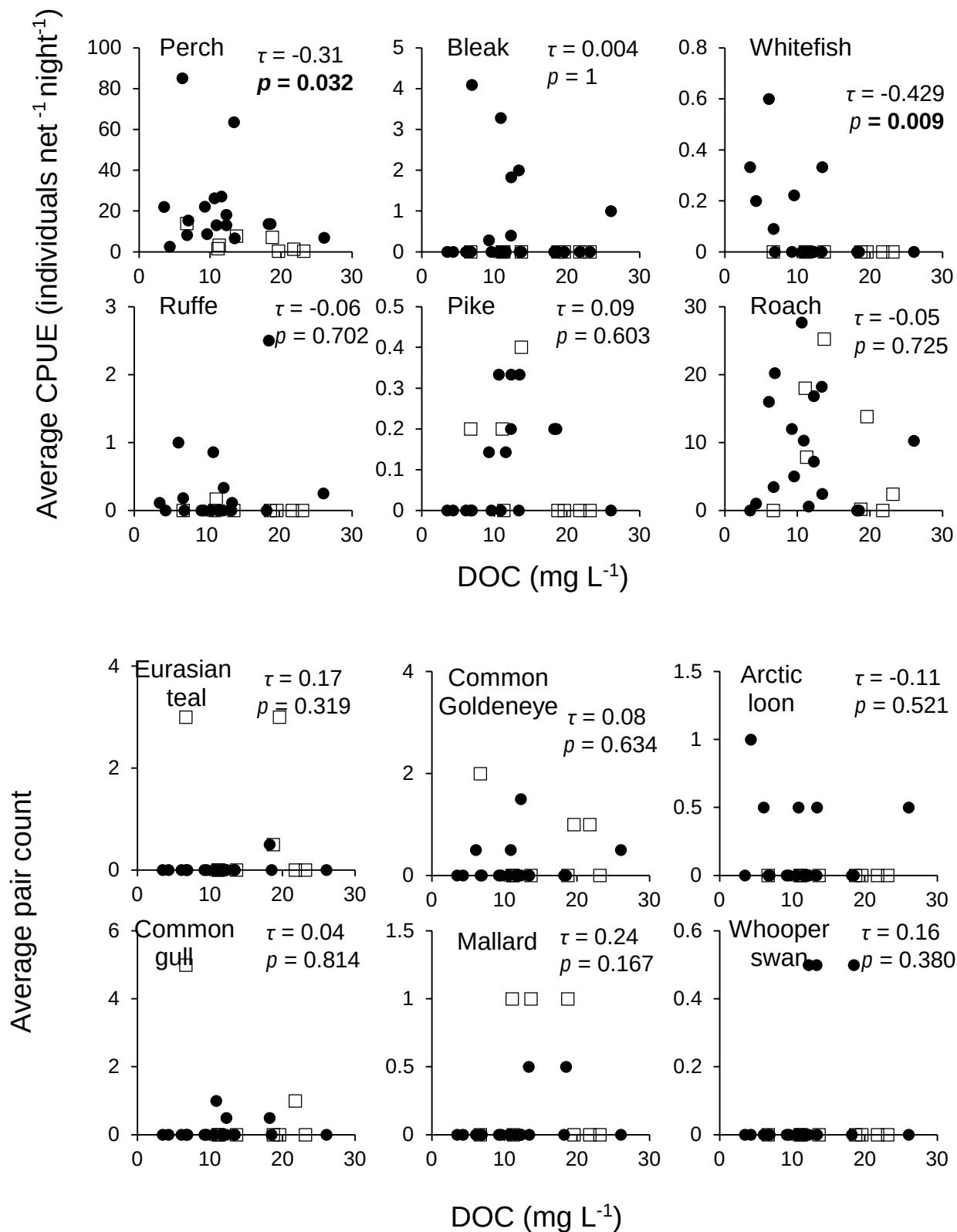
Supplementary Information of

Environmental drivers of community composition in small boreal forest lakes

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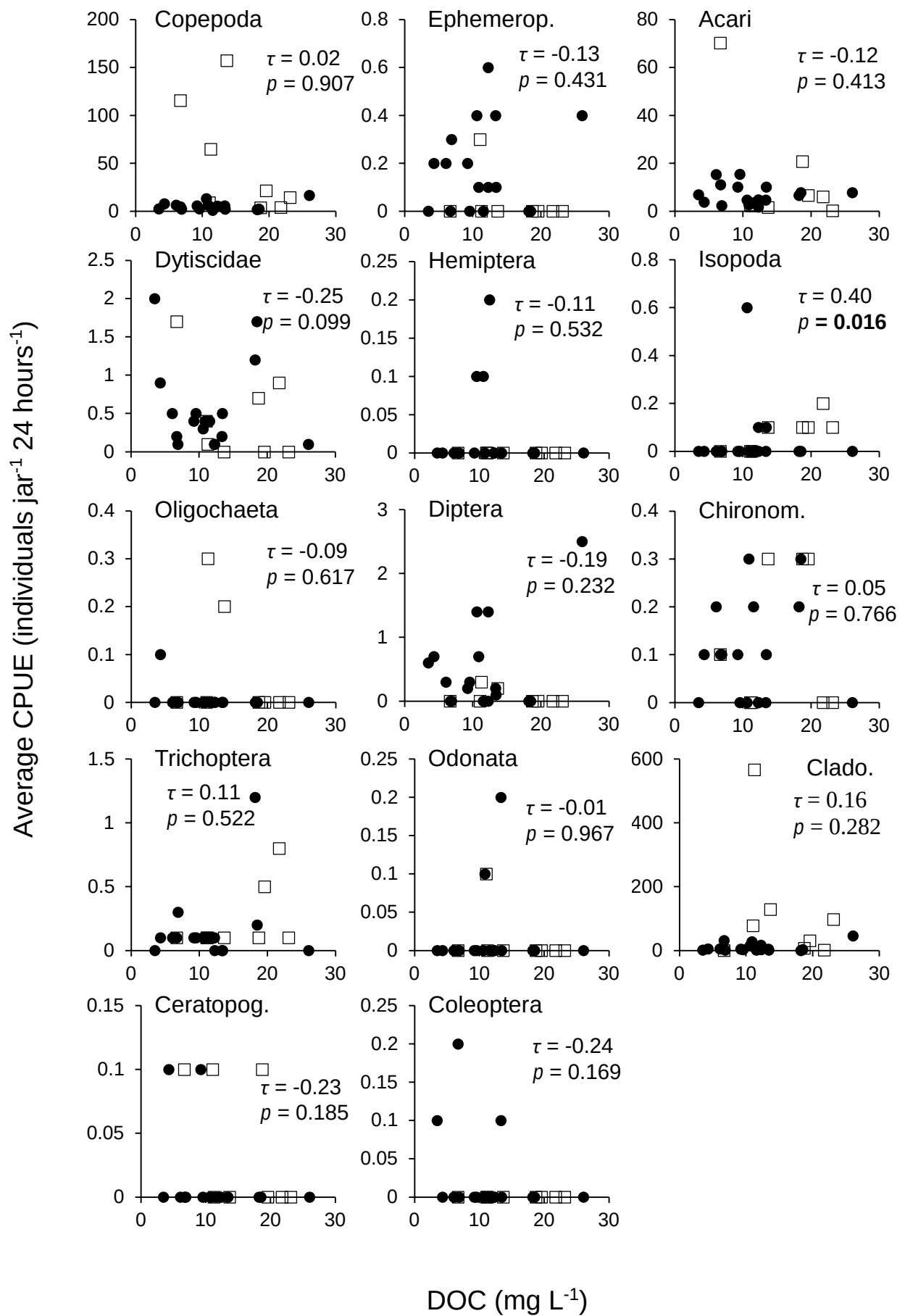


Fig. S1. Individual taxa plotted against DOC (mg L^{-1}), and Kendall τ correlation coefficient and statistical significance without correction for multiple testing. Significant values are in bold ($\alpha = 0.05$). Black dots represent the Lieksa region lakes, and squares represent the Evo region lakes. Clado. = Cladocera, Ephemerop. = Ephemeroptera, Chironom. = Chironomidae, Ceratopog. = Ceratopogonidae.

Table S1. Sampling dates of aquatic fauna and water samples.

Lake	Coordinate (N, E)	Date of sampling				Water sampling	
		Region	Fish	Invertebrate	Water birds	Sample 1	Sample 2
Aitalampi	63.23°N 30.88°E	Lieksa	21-22.7.20	21-22.7.20	1.6.2020, 24.5.2022	29.6.2020	3.8.2020
Hirsikankaan Rasku	63.16°N 30.63°E	Lieksa	7-8.7.20	7-8.7.20	31.5.2020, 27.5.2022	29.6.2020	3.8.2020
Hukkalampi	63.21°N 30.93°E	Lieksa	28-29.7.20	28-29.7.20	1.6.2020, 24.5.2022	29.6.2020	3.8.2020
Iso Saunajärvi	63.18°N 30.68°E	Lieksa	29-30.7.20	29-30.7.20	31.5.2020, 24.5.2022	29.6.2020	3.8.2020
Kaivoslampi	63.19°N 30.65°E	Lieksa	9-10.7.20	9-10.7.20	31.5.2020, 24.5.2022	29.6.2020	3.8.2020
Kalaton-Väärä	63.16°N 30.78°E	Lieksa	16-17.7.20	16-17.7.20	31.5.2020, 24.5.2022	29.6.2020	3.8.2020
Kangas-Piilo	63.18°N 30.84°E	Lieksa	23.7.2020	23.7.2020	1.6.2020, 24.5.2022	29.6.2020	3.8.2020
Litmonlampi	63.18°N 30.65°E	Lieksa	9-10.7.20	9-10.7.20	31.5.2020, 24.5.2022	29.6.2020	3.8.2020
Nikkilänlampi	63.17°N 30.94°E	Lieksa	23-24.7.20	23-24.7.20	1.6.2020, 27.5.2022	29.6.2020	3.8.2020
Pieni Saunajärvi	63.17°N 30.68°E	Lieksa	14-15.7.20	14-15.7.20	31.5.2020, 24.5.2022	29.6.2020	3.8.2020
Pieni Venejärvi	63.18°N 30.71°E	Lieksa	14-15.7.20	14-15.7.20	31.5.2020, 27.5.2022	29.6.2020	3.8.2020
Pieni-Piilo	63.16°N 30.84°E	Lieksa	28-29.7.20	28-29.7.20	31.5.2020, 24.5.2022	29.6.2020	3.8.2020
Pikku-Hukka	63.08°N 30.49°E	Lieksa	2-3.7.20	2-3.7.20	1.6.2020, 26.5.2022	29.6.2020	3.8.2020
Raate	63.09°N 30.49°E	Lieksa	2-3.7.20	2-3.7.20	1.6.2020, 26.5.2022	29.6.2020	3.8.2020
Synkkä-Rasku	63.17°N 30.61°E	Lieksa	7-8.7.20	7-8.7.20	31.5.2020, 27.5.2022	29.6.2020	3.8.2020
Valkealampi	63.22°N 30.89°E	Lieksa	21-22.7.20	21-22.7.20	1.6.2020, 24.5.2022	29.6.2020	3.8.2020
Valkea-Väärä	63.16°N 30.78°E	Lieksa	16-17.7.20	16-17.7.20	31.5.2020, 24.5.2022	29.6.2020	3.8.2020
Iso Mustajärvi	61.21°N 25.11°E	Evo	8-9.8.20	3-4.6.20	29.4.2020		5.8.2020
Iso Ruuhijärvi	61.22°N 25.06°E	Evo	9-10.8.20	3-4.6.20	5.5.2021		5.8.2020
Iso Valkjärvi	61.18°N 25.10°E	Evo	5-6.8.20	3-4.6.20	29.4.2020		5.8.2020
Pitkänniemenjärvi	61.21°N 25.12°E	Evo	9-10.8.20	10-11.6.20	3.5.2020		5.8.2020
Haukijärvi	61.22°N 25.13°E	Evo	7-8.8.20	3-4.6.20	6.5.2021		5.8.2020
Hautjärvi	61.20°N 25.14°E	Evo	6-7.8.20	10-11.6.20	3.5.2019		3.8.2020
Horkkajärvi	61.21°N 25.15°E	Evo	7-8.7.20	3-4.7.20	18.5.2022		5.8.2020
Kaitalammi	61.19°N 25.12°E	Evo	5-6.8.20	10-11.6.20	18.5.2022		5.8.2020

Table S2. Simper test results of taxa contributing to Bray-Curtis metacommunity dissimilarity between lakes grouped by region (Lieksa, Evo). Taxa with permuted significance ($P < 0.10$) are presented. Lieksa and Evo lakes present average in the group, Average = average contribution to dissimilarity, sd = standard deviation of contribution, ratio = average to standard deviation ration, avg.group = average abundance (double standardized proportion) in group. Statistically significant taxa ($P < 0.05$) are in bold.

	average	sd	ratio	Lieksa	Evo	P
Cladocera	0.04	0.06	0.68	0.01	0.09	0.005
Mallard (<i>Anas platyrhynchos</i>)	0.04	0.05	0.83	0.01	0.08	0.023
Copepoda	0.03	0.03	1.11	0.01	0.08	0.001
Teal (<i>Anas crecca</i>)	0.03	0.04	0.63	0.00	0.05	0.033
Isopoda	0.03	0.04	0.80	0.02	0.07	0.066
Oligochaeta	0.03	0.06	0.52	0.00	0.06	0.088
Perch (<i>Perca fluviatilis</i>)	0.03	0.02	1.22	0.06	0.01	0.088

Table S3. Simper test results of taxa contributing to Bray-Curtis species dissimilarity between lakes grouped by dissolved organic carbon (DOC). Taxa with permuted significance ($P < 0.10$) are presented. DOC (mg L⁻¹) classes represent average in the group. Average = average contribution to dissimilarity, sd = standard deviation of contribution, ratio = average to standard deviation ration, avg.group = average abundance (double standardized proportion) in group. Statistically significant taxa ($P < 0.05$) are in bold.

Groups 1--2						
Taxa	average	sd	ratio	DOC < 10	10 ≤ DOC ≤ 20	P
Whitefish (<i>Coregonus lavaretus</i>)	0.05	0.04	1.09	0.09	0.01	0.002
Coleoptera	0.04	0.08	0.55	0.08	0.01	0.084
Acari	0.02	0.02	1.13	0.06	0.02	0.007
Groups 2--3						
Species	average	sd	ratio	10 ≤ DOC ≤ 20	DOC > 20	P
Trichoptera	0.07	0.05	1.30	0.04	0.14	0.021
Isopoda	0.07	0.05	1.31	0.03	0.14	0.027
Diptera	0.05	0.06	0.93	0.02	0.11	0.062
Common goldeneye (<i>Bucephala clangula</i>)	0.05	0.04	1.11	0.03	0.10	0.053
Copepoda	0.03	0.03	0.98	0.03	0.06	0.099
Groups 1--3						
Species	average	sd	ratio	DOC < 10	DOC > 20	P
Isopoda	0.07	0.06	1.21	0	0.14	0.019
Trichoptera	0.06	0.05	1.33	0.03	0.14	0.033
Diptera	0.05	0.05	0.96	0.03	0.10	0.08
Whitefish (<i>Coregonus lavaretus</i>)	0.05	0.04	1.05	0.09	0	0.07
Common goldeneye (<i>Bucephala clangula</i>)	0.05	0.04	1.12	0.02	0.09	0.067

Table S4. Interset correlation of environmental variables to canonical axes.

Variable	CCA1	CCA2
Total-P	-0.58	0.08
Area	0.67	0.08
pH	-0.11	0.68

Table S5. Association of taxa to canonical axes.

	CCA1	CCA2
Perch	0.09	-0.05
Pike	0.09	-0.02
Roach	0.05	0.33
Ruffe	0.73	-0.05
Whitefish	0.49	0.13
Bleak	0.82	0.05
Ceratopogonidae	-0.64	0.19
Chironomidae	-0.31	-0.02
Cladocera	-0.15	0.17
Coleoptera	0.38	-0.14
Copepoda	-0.14	0.03
Dytiscidae	0.04	-0.28
Ephemeroptera	0.55	0.22
Hemiptera	-0.04	-0.41
Acari	-0.06	-0.11
Isopoda	-0.68	-0.11
Oligochaeta	-0.28	1.08
Trichoptera	-0.36	-0.31
Diptera	0.56	-0.09
Odonata	0.52	0.74
Mallard	-0.70	0.78
Eurasian teal	-1.25	-0.49
Common goldeneye	-0.30	-0.51
Arctic loon	0.52	-0.23
Whooper swan	0.55	-0.47
Common gull	0.19	-0.80