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Title

Oxygen drives benthic and pelagic decomposition pathways in shallow wetlands

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Supplementary material 1

Water temperature was measured every ten minutes during 55 days between May and July 2016 with HOBO® Dissolved oxygen loggers U26-001. Data for each ditch was averaged for one loggers placed 10 cm under the water surface and one logger placed 4 cm above the bottom sediments. Additionally, chemical characteristics of the water and sediment in the ditches were determined on three moments in time. Conductivity was measured using the TDS & EC meter hold (HQ EZ1). Surface water samples were taken, filtered with 0.2µm Whatman GF/F glass fiber filters, and analyzed for total carbon, dissolved organic carbon, and total nitrogen on the elemental analyzer (Elementar Vario EL), and for orthophosphate, sulphate and chloride on the continuous flow analyzer (Skalar SAN++ system). The top 2 cm of four sediment cores were pooled, sieved through 500 µm, stored in a freezer at -22 °C, and milled. The organic matter content was determined after heating dry sediment samples at 550 °C for 4 h. Homogenized portions of 200 mg dry sediment were digested with 4 mL HNO₃ (65 %) and 1 mL H₂O₂ (30 %), using the microwave. Digestates were diluted and phosphorus concentrations were determined by ICP (Perkin Elmer ICP-OES 8000). A homogenized portion of dry sediment was used to determine carbon and nitrogen content, using the elemental analyzer as described above.

Oxygen	Water column								Sediment		
Benthic layer anoxic (%)	Water temp (°C)	Conductivity (µS/cm)	Tot C (mg/L)	DOC (mg/L)	Tot N (mg/L)	PO ₄ ³⁻ (mg/L)	SO ₄ ²⁻ (mg/L)	Cl (mg/L)	C:N ratio	Tot P (mg/g)	Organic matter (%)
0.3	19.7±2.2	372±131	45.6±1.5	20.6±7.9	1.4 ±0.3	0.05±0.03	14.7±2.8	28.6±13.6	12.4±6.3	0.3±0.1	5.4±1.7
4.0	19.2±2.2	404±76	44.2±6.3	18.1±5.0	1.3 ±0.1	0.03±0.01	14.4±6.4	34.7±7.8	13.0±5.5	0.2±0.1	4.3±1.0
7.2	18.3±2.1	262±31	34.5±8.3	10.5±1.6	0.9 ±0.4	0.05±0.03	1.6±0.3	12.3±0.6	15.3±1.1	0.4±0.3	10.7±6.9
10.7	19.0±2.3	204±33	31.6±4.7	12.6±1.0	0.8 ±0.1	0.03±0.01	1.2±0.3	11.7±0.7	15.4±1.1	0.3±0.3	7.8±7.7
20.4	18.6±2.1	226±6	45.9±5.2	22.8±7.5	1.5 ±0.2	0.07±0.00	4.5±1.7	7.7±1.0	15.3±3.7	1.1±0.3	26.3±2.5
37.5	19.0±2.2	365±43	58.6±29.5	33.1±27.6	2.4 ±1.2	0.07±0.04	10±3.9	28.5±14.8	14.5±4.9	0.6±0.1	13.7±0.6
38.0	19.1±1.9	395±70	48.6±4.7	19.3±3.5	1.3 ±0.1	0.07±0.09	8.9±4.7	31.5±7.0	14.8±5.2	1.1±0.4	20.5±8.5
47.3	18.9±2.3	269±37	65.8±12.1	43.8±8.0	2.6 ±0.3	0.09±0.05	8.3±4.3	9.0±1.9	14.9±4.4	0.9±0.5	25.3±22
55.1	18.4±2.4	223±10	45.7±2.1	25.4±1.0	1.5 ±0.0	0.07±0.09	7.2±1.2	7.7±0.2	14.6±3.8	0.8±0.1	26.1±1.4
57.8	17.8±2.1	273±39	37.3±7.1	11.5±1.7	0.9 ±0.3	0.08±0.01	4.5±0.9	10±0.6	13.3±4.0	0.4±0.2	7.1±4.0
58.5	19.5±2.1	386±104	56.1±11.2	30.1±12.8	2.0 ±0.7	0.05±0.05	13.2±10.4	29.2±7.5	13.6±7.5	0.6±0.1	11.2±0.5
59.4	18.5±1.9	248±28	43.7±10.3	18.4±6.2	1.1 ±0.2	0.04±0.05	2.6±1.5	5.2±1.3	14.5±4.2	0.9±0.9	22.2±23.8
69.1	17.7±1.9	226±12	33.0±2.5	10.2±2.3	0.8 ±0.1	0.09±0.03	1.5±0.2	7.8±0.1	13.9±1.1	0.4±0.3	7.3±5.0
70.7	19.4±2.3	239±44	39.3±5.3	21.1±6.5	1.3 ±0.3	0.04±0.05	3.3±4.0	16.2±3.7	15.4±4.6	0.5±0.2	16.8±15.7
91.4	19.2±2.3	276±50	39.1±9.2	15.5±5.2	0.9 ±0.3	0.04±0.04	4.1±2.3	13.0±1.9	16.6±4.8	1.1±0.1	53.9±4.3

Supplementary Table S1: Overview of the physicochemical characteristics of the water column and sediment in each ditch (water temperature n = 17280 readings, other parameters n = 3 samples, mean ± sd).

Supplementary material 2

Taxa	Family	Functional feeding group			Food	Detri- tivore
		CG	SH	FI	DET	
<i>Crangonyx pseudogracilis</i>	Amphipoda	0	1	0	1	1
<i>Gammarus pulex</i>	Amphipoda	1	1	0	1	1
<i>Argyroneta aquatica</i>	Aranea	0	0	0	0	0
Sphaeriidae	Bivalvia	0	0	1	1	1
<i>Odontomyia</i> sp.	Brachycera	1	1	0	1	1
<i>Ablabesmyia</i> sp.	Chironomidae ¹	0	0	0	0	0
<i>Chironomus</i> sp.	Chironomidae ¹	1	0	1	1	1
<i>Cladopelma</i> gr. <i>lateralis</i>	Chironomidae ¹	1	0	0	1	1
<i>Clinotanypus nervosus</i>	Chironomidae ¹	0	0	0	0	0
<i>Cricotopus</i> sp.	Chironomidae ¹	1	0	0	1	1
<i>Endochironomus</i> sp.	Chironomidae ¹	0	0	1	1	1
<i>Microtendipes</i> sp.	Chironomidae ¹	1	0	0	1	1
<i>Polypedilum</i> sp.	Chironomidae ¹	1	0	1	1	1
<i>Procladius</i> sp.	Chironomidae ¹	0	0	0	0	0
<i>Psectrocladius</i> gr. <i>limbatellus/sordidellus</i>	Chironomidae ¹	1	0	0	1	1
<i>Psectrocladius</i> gr. <i>platypus/obvius</i>	Chironomidae ¹	1	0	0	0	0
<i>psectrotanypus varius</i>	Chironomidae ¹	0	0	0	0	0
<i>Tanypus kraatzi</i>	Chironomidae ¹	1	0	0	1	1
<i>Zavrelia marmorata</i>	Chironomidae ¹	1	0	0	1	1
<i>Agabus bipustulatus</i>	Coleoptera	0	1	0	0	0
<i>Graphoderus cinereus</i>	Coleoptera	0	0	0	0	0
<i>Haliphus flavicollis</i>	Coleoptera	0	1	0	0	0
<i>Hydaticus seminiger</i>	Coleoptera	0	0	0	0	0
<i>Hydaticus transversalis</i>	Coleoptera	0	0	0	0	0
<i>Hydrochara caraboides</i>	Coleoptera	0	1	0	1	1
<i>Hyphydrus ovatus</i>	Coleoptera	0	0	0	0	0
<i>Laccobius minutus</i>	Coleoptera	1	1	0	1	1
<i>laccophilus hyalinus</i>	Coleoptera	1	1	0	1	1
<i>Laccophilus minutus</i>	Coleoptera	1	1	0	1	1
<i>Noterus clavicornis</i>	Coleoptera	0	0	0	0	0
<i>Noterus crassicornis</i>	Coleoptera	0	0	0	0	0
<i>Rhantus exoletus</i>	Coleoptera	0	0	0	0	0
<i>Agabus</i> sp.	Coleoptera lv. ²	0	0	0	0	0
<i>Cybister</i> sp.	Coleoptera lv. ²	0	0	0	0	0
<i>Graptodytes</i> sp.	Coleoptera lv. ²	0	0	0	0	0
<i>Haliphus</i> sp.	Coleoptera lv. ²	0	1	0	0	0
<i>hydrophilus</i> sp.	Coleoptera lv. ²	0	0	0	0	0
<i>Hyphydrus</i> sp.	Coleoptera lv. ²	0	0	0	0	0
<i>Laccophilus</i> sp.	Coleoptera lv. ²	0	0	0	0	0
Astacidea	Decapoda	0	1	0	1	1
<i>Caenis horaria</i>	Ephemeroptera	1	0	0	1	1
<i>Caenis robusta</i>	Ephemeroptera	1	0	0	1	1
<i>Cloeon dipterum</i>	Ephemeroptera	1	0	0	1	1

<i>Anisus vortex</i>	Gastropoda	0	0	0	1	0
<i>Bithynia leachii</i>	Gastropoda	0	0	1	1	1
<i>Bithynia tentaculata</i>	Gastropoda	0	0	1	1	1
<i>Gyraulus albus</i>	Gastropoda	0	0	0	0	0
<i>Gyraulus crista</i>	Gastropoda	0	0	0	0	0
<i>Lymnaea stagnalis</i>	Gastropoda	0	0	0	1	0
<i>Physa fontinalis</i>	Gastropoda	0	0	0	1	0
<i>Physella acuta</i>	Gastropoda	0	0	0	1	0
<i>Planorbis carinatus</i>	Gastropoda	0	0	0	1	0
<i>Radix labiata/balthica</i>	Gastropoda	0	0	0	1	0
<i>Valvata piscinalis</i>	Gastropoda	0	0	0	1	0
<i>Corixa punctata</i>	Heteroptera	1	0	0	1	1
Corixidae	Heteroptera	1	0	0	1	1
<i>Cymatia coleoprata</i>	Heteroptera	0	0	0	0	0
<i>Ilyocoris cimicoides</i>	Heteroptera	0	0	0	0	0
<i>Notonecta</i> sp.	Heteroptera	0	0	0	0	0
<i>Plea minutissima</i>	Heteroptera	0	0	0	0	0
<i>Ranatra linearis</i>	Heteroptera	0	0	0	0	0
<i>Sigara distincta</i>	Heteroptera	1	0	0	1	1
<i>Sigara falleni</i>	Heteroptera	1	0	0	1	1
<i>Sigara fossarum</i>	Heteroptera	1	0	0	1	1
<i>Sigara semistriata</i>	Heteroptera	1	0	0	1	1
<i>Sigara striata</i>	Heteroptera	1	0	0	1	1
<i>Erpobdella octoculata</i>	Hirudinea	0	0	0	0	0
Hydracarina	Hydracarina	0	0	0	0	0
<i>Asellus aquaticus</i>	Isopoda	1	1	0	1	1
<i>Proasellus meridianus</i>	Isopoda	1	1	0	1	1
<i>Sialis lutaria</i>	Megaloptera	0	0	0	0	0
Anophelinae	Nematocera	1	0	0	1	1
Ceratopogonidae	Nematocera	0	0	0	0	0
<i>Chaoborus</i> sp.	Nematocera	0	0	0	0	0
<i>Dixella</i> sp.	Nematocera	1	0	1	1	1
Aeschnidae	Odonata	0	0	0	0	0
Coenagrionidae	Odonata	0	0	0	0	0
Oligochaeta	Oligochaeta	1	0	0	1	1
Tricladida	Platyhelminthes	0	0	0	0	0
<i>Agrypnia pagetana</i>	Trichoptera	0	1	0	0	0
<i>Athripsodes aterrimus</i>	Trichoptera	0	1	0	0	0
<i>Holocentropus picicornis</i>	Trichoptera	0	0	0	0	0
<i>Oecetis struckii</i>	Trichoptera	0	1	0	0	0
<i>Triaenodes bicolor</i>	Trichoptera	0	1	0	1	1
<i>Tricholeiochiton fagesi</i>	Trichoptera	0	0	0	0	0

Supplementary Table S2: List of detritivores based on combination of functional feeding group (CG = collector gatherer, SH = shredder, FI = filter feeder) and food (DET = detritus or dead plant). Information based on Tachet (2010). 1) Additional information Chironomidae based on Moller Pilot (2009, 2013). 2) Coleoptera larvae (lv) were assessed separate from adults for feeding groups (not for richness).