Oxygen drives benthic-pelagic decomposition pathways in shallow wetlands

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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) | PO₄³⁻ (mg/L) | SO₄²⁻ (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 | Detritivore |
|------|--------|--------------------------|------|------------|
|      |        | CG | SH | FI | DET |
| **Crangonyx pseudogracilis** | Amphipoda | 0 | 1 | 0 | 1 | 1 |
| **Gammarus pulex** | Amphipoda | 1 | 1 | 0 | 1 | 1 |
| **Argyroctena aquatica** | Aranea | 0 | 0 | 0 | 0 | 0 |
| **Sphaeridae** | Bivalvia | 0 | 0 | 1 | 1 | 1 |
| **Odontomyia sp.** | Brachycera | 1 | 1 | 0 | 1 | 1 |
| **Ablabesmyia sp.** | Chironomidae | 0 | 0 | 0 | 0 | 0 |
| **Chironomus sp.** | Chironomidae | 1 | 0 | 1 | 1 | 1 |
| **Cladopelma gr. lateralis** | Chironomidae | 1 | 0 | 0 | 1 | 1 |
| **Clionotanyx nervosus** | Chironomidae | 0 | 0 | 0 | 0 | 0 |
| **Cricotopus sp.** | Chironomidae | 1 | 0 | 0 | 1 | 1 |
| **Endochironomus sp.** | Chironomidae | 0 | 0 | 1 | 1 | 1 |
| **Microtendipes sp.** | Chironomidae | 1 | 0 | 0 | 1 | 1 |
| **Polypedilum sp.** | Chironomidae | 1 | 0 | 1 | 1 | 1 |
| **Procladius sp.** | Chironomidae | 1 | 0 | 0 | 0 | 0 |
| **Psectrocladius gr. limbatellus/sordidellus** | Chironomidae | 1 | 0 | 0 | 1 | 1 |
| **Psectrocladius gr. platypus/obvius** | Chironomidae | 1 | 0 | 0 | 0 | 0 |
| **Psectrotanyx varius** | Chironomidae | 0 | 0 | 0 | 0 | 0 |
| **Tanyphora ilicis** | Chironomidae | 1 | 0 | 1 | 1 | 1 |
| **Zavrelia marmorata** | Chironomidae | 1 | 0 | 0 | 1 | 1 |
| **Agabus bipustulatus** | Coleoptera | 1 | 1 | 0 | 0 | 0 |
| **Graphoderus cinereus** | Coleoptera | 0 | 1 | 0 | 0 | 0 |
| **Haliphus flavicollis** | Coleoptera | 0 | 1 | 0 | 0 | 0 |
| **Hydaticus seminiger** | Coleoptera | 0 | 0 | 0 | 0 | 0 |
| **Hydaticus transversalis** | Coleoptera | 0 | 0 | 0 | 0 | 0 |
| **Hydrochara caraboides** | Coleoptera | 1 | 0 | 0 | 1 | 1 |
| **Hyphrondrus ovatus** | Coleoptera | 0 | 0 | 0 | 0 | 0 |
| **Laccobius minutus** | Coleoptera | 0 | 1 | 0 | 0 | 0 |
| **Laccophilus hyalinus** | Coleoptera | 1 | 1 | 0 | 1 | 1 |
| **Laccophilus minutus** | Coleoptera | 1 | 0 | 0 | 1 | 1 |
| **Noterus crassicornis** | Coleoptera | 0 | 0 | 0 | 0 | 0 |
| **Rhantus exoletus** | Coleoptera | 0 | 0 | 0 | 0 | 0 |
| **Agabus sp.** | Coleoptera | 0 | 0 | 0 | 0 | 0 |
| **Cybister sp.** | Coleoptera | 0 | 0 | 0 | 0 | 0 |
| **Graptodytes sp.** | Coleoptera | 0 | 0 | 0 | 0 | 0 |
| **Haliplus sp.** | Coleoptera | 0 | 1 | 0 | 0 | 0 |
| **Hyphrondrus sp.** | Coleoptera | 0 | 0 | 0 | 0 | 0 |
| **Laccophilus sp.** | Coleoptera | 0 | 0 | 0 | 0 | 0 |
| **Astacidea** | Decapoda | 0 | 1 | 0 | 1 | 1 |
| **Caenis horaria** | Ephemeroptera | 1 | 0 | 0 | 1 | 1 |
| **Caenis robusta** | Ephemeroptera | 1 | 0 | 0 | 1 | 1 |
| **Cloeon dipterum** | Ephemeroptera | 1 | 0 | 0 | 1 | 1 |
### 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).