

Supplementary Material

Drivers of macrophyte and diatom diversity in a shallow hypertrophic lake

Kateřina Šumberová^{1*}, Ondřej Vild¹, Michal Ducháček³, Martina Fabšičová¹, Jan Potužák², and Markéta Fránková⁴

* Correspondence: katerina.sumberova@ibot.cas.cz

Table S3. List of epiphytic diatom samples with their codes, macrophyte species (= plant substrate, host plants) and basic environmental factors at the sampling sites. While in the dry years the samples were collected randomly in all possible places of the three sites monitored, as there were limited possibilities to collect any macrophytes in water (FD, BSB, DSB), in 2016, the gradient of water depth and distance from the bank was considered during the sampling. In 2019, another year of very low water levels in the vegetated zone, two contrast sites with different disturbance levels were selected at FD.

Explanation of table columns: **sample code:** includes information about the year (15, 16, 19), site (F = FD, B = BSB, D = DSB) and the number of a sample within the given year; **location:** FD – Fishpond dam, BSB – Babický stream bay, DSB – Dehtářský stream bay; **segment nr.** – segment of the Dehtář fishpond according to the map on Figure 1, the values in the parentheses mean the border with another segment; in 2015, only the basic location was noticed during the sampling and the particular segments were determined; **exposure to disturbances** (waves or streaming) – explanation of the scale: 0 – no streaming or wave action, intensive sedimentation of organic material, decomposition processes in anoxic conditions, 1 – small streaming or wave action, some extent of sedimentation of organic material but fine clay is prevailing in the sediment, 2 – medium wave action or streaming, no sedimentation of organic material, sediments formed by sand and fine compact clay, 3 – intensive wave action, sediment formed predominantly by sand, decomposition processes are fast and enhanced by mechanical disturbances and oxygenation; **water depth:** in 2016, various macrophyte individuals within the species occurred at different depths, we used the maximum depth values; **distance from the bank:** distance of the samples from the high bank or dense, permanent reed/sedge bed. In cases with the range of values, an arithmetical mean was used. If the plant species was collected in a reed or tall sedge bed or directly at the bank, the distance is 0, for plant species directly in front of the bank/tall sedge or reed bed, the distance is 0.5; **species class. 1** – species classification according to their ecological requirements and life history traits: RBE – reed bed species – perennial graminoids and herbs growing in reed and tall sedge beds (incl. *Salix*), FLO – free floating & floating-leaved species – "true" aquatic plants with at least some leaves floating on the water surface, SUB – submerged species – "true" aquatic plants entirely submerged under water surface, AMP – amphibious species – low-growing annual and perennial species at sites with fluctuating water levels (incl. *Rumex obtusifolius*); **species class. 2** – species classification according to leaf morphology and plant size: GR-t – graminoids – tall, GR-s – graminoids – short, LaL – large-leaved (usually tall plants, non-graminoids) – leaf blade usually much larger than 2 cm, SmL – small-leaved (usually small plants, non-graminoids) – leaf blade usually up to 2 cm (in the case of

heterophyly/large differences in size between leaves on one and the same plant individual, we consider the size/form of leaves which we collected from the site, e.g. *Ranunculus sceleratus* and *Batrachium peltatum*; in many of these plants, roots floating in water were also collected), FiL – fine-leaved – narrow leaves or leaf segments (in submerged plants, or submerged leaves in amphibious species – *Oenanthe aquatica* – including fine branches in *Chara braunii*).

| sample code | macrophyte species | location | segment nr. | exposure to disturbances | Year | water depth | distance from the bank | species class. 1 | species class. 2 |
|-------------|------------------------------------|----------|-------------|--------------------------|------|-------------|------------------------|------------------|------------------|
| F1-15 | <i>Batrachium peltatum</i> | FD | 3 | 2 | 2015 | 5 | 20 | FLO | SmL |
| F2-15 | <i>Zannichellia palustris</i> | FD | 3 | 2 | 2015 | 5 | 20 | SUB | FiL |
| F3-15 | <i>Elatine hydropiper</i> | FD | 3 | 2 | 2015 | 5 | 20 | AMP | SmL |
| F4-15 | <i>Chara braunii</i> | FD | 3 | 2 | 2015 | 4 | 20 | SUB | FiL |
| F5-15 | <i>Potamogeton pusillus</i> | FD | 3 | 2 | 2015 | 7 | 20 | SUB | FiL |
| F6-15 | <i>Veronica anagallis-aquatica</i> | FD | 3 | 2 | 2015 | 1 | 20 | AMP | LaL |
| F7-15 | <i>Bolboschoenus laticarpus</i> | FD | 3 | 2 | 2015 | 10 | 20 | RBE | GR-t |
| F8-15 | <i>Limosella aquatica</i> | FD | 3 | 2 | 2015 | 2 | 20 | AMP | SmL |
| B9-15 | <i>Ranunculus sceleratus</i> | BSB | 7 | 2 | 2015 | 1 | 125 | AMP | SmL |
| B10-15 | <i>Limosella aquatica</i> | BSB | 7 | 2 | 2015 | 1 | 125 | AMP | SmL |
| B11-15 | <i>Veronica anagallis aquatica</i> | BSB | 7 | 2 | 2015 | 1 | 125 | AMP | LaL |
| B12-15 | <i>Alopecurus aequalis</i> | BSB | 7 | 2 | 2015 | 1 | 125 | AMP | GR-s |
| B13-15 | <i>Zannichellia palustris</i> | BSB | 10 | 3 | 2015 | 1 | 125 | SUB | FiL |
| B14-15 | <i>Elatine hydropiper</i> | BSB | 10 | 3 | 2015 | 1 | 125 | AMP | SmL |
| B15-15 | <i>Bolboschoenus laticarpus</i> | BSB | 10 | 2 | 2015 | 1 | 125 | RBE | GR-t |
| B16-15 | <i>Chara braunii</i> | BSB | 11 | 3 | 2015 | 1 | 125 | SUB | FiL |
| B17-15 | <i>Elatine hydropiper</i> | BSB | 11 | 3 | 2015 | 1 | 125 | AMP | SmL |
| D18-15 | <i>Oenanthe aquatica</i> | DSB | 18 | 2 | 2015 | 1 | 45 | RBE | FiL |
| D19-15 | <i>Veronica anagallis aquatica</i> | DSB | 18 | 2 | 2015 | 1 | 45 | AMP | LaL |
| D20-15 | <i>Rumex obtusifolius</i> | DSB | 18 | 2 | 2015 | 1 | 45 | AMP | LaL |
| D21-15 | <i>Zannichellia palustris</i> | DSB | 18 | 3 | 2015 | 5 | 45 | SUB | FiL |
| F1-16 | <i>Bolboschoenus laticarpus</i> | FD | 2 | 2 | 2016 | 70 | 5 | RBE | GR-t |
| F2-16 | <i>Carex gracilis</i> | FD | 2 | 1 | 2016 | 37 | 4 | RBE | GR-t |
| F3-16 | <i>Phalaris arundinacea</i> | FD | 2 | 1 | 2016 | 37 | 2,5 | RBE | GR-t |

| sample code | macrophyte species | location | segment nr. | exposure to disturbances | Year | water depth | distance from the bank | species class. 1 | species class. 2 |
|-------------|------------------------------------|----------|-------------|--------------------------|------|-------------|------------------------|------------------|------------------|
| F4-16 | <i>Glyceria maxima</i> | FD | 2 | 1 | 2016 | 37 | 2 | RBE | GR-t |
| F5-16 | <i>Salix triandra</i> | FD | 2 | 2 | 2016 | 47 | 2,5 | RBE | LaL |
| F6-16 | <i>Persicaria amphibia</i> | FD | 2 | 1 | 2016 | 37 | 2,5 | FLO | LaL |
| F7-16 | <i>Bolboschoenus laticarpus</i> | FD | 3 | 1 | 2016 | 52 | 0,5 | RBE | GR-t |
| F8-16 | <i>Lemna gibba</i> | FD | 3 | 0 | 2016 | 38 | 0 | FLO | SmL |
| F9-16 | <i>Spirodela polyrhiza</i> | FD | 3 | 0 | 2016 | 38 | 0 | FLO | SmL |
| F10-16 | <i>Lythrum salicaria</i> | FD | 4 | 1 | 2016 | 42 | 2,5 | RBE | LaL |
| F11-16 | <i>Poa palustris</i> | FD | 4 | 1 | 2016 | 42 | 2,5 | AMP | GR-s |
| B12-16 | <i>Phragmites australis</i> | BSB | 6 | 3 | 2016 | 37 | 2 | RBE | GR-t |
| B13-16 | <i>Phalaris arundinacea</i> | BSB | 6 | 3 | 2016 | 30 | 1 | RBE | GR-t |
| B14-16 | <i>Alopecurus aequalis</i> | BSB | 6(7) | 1 | 2016 | 38 | 7,5 | AMP | GR-s |
| B15-16 | <i>Spirodela polyrhiza</i> | BSB | 6(7) | 1 | 2016 | 38 | 10 | FLO | SmL |
| B16-16 | <i>Lemna gibba</i> | BSB | 6(7) | 1 | 2016 | 38 | 7,5 | FLO | SmL |
| B17-16 | <i>Glyceria maxima</i> | BSB | 7(6) | 0 | 2016 | 20 | 0,5 | RBE | GR-t |
| B18-16 | <i>Ranunculus sceleratus</i> | BSB | 7(6) | 1 | 2016 | 30 | 3 | AMP | SmL |
| B19-16 | <i>Persicaria hydropiper</i> | BSB | 7(6) | 1 | 2016 | 30 | 3 | AMP | LaL |
| B20-16 | <i>Veronica anagallis aquatica</i> | BSB | 7(6) | 1 | 2016 | 30 | 3 | AMP | LaL |
| B21-16 | <i>Persicaria amphibia</i> | BSB | 7 | 2 | 2016 | 34 | 25 | FLO | LaL |
| B22-16 | <i>Poa palustris</i> | BSB | 7 | 1 | 2016 | 25 | 15 | AMP | GR-s |
| B23-16 | <i>Juncus effusus</i> | BSB | 7 | 0 | 2016 | 25 | 5 | RBE | GR-t |
| B24-16 | <i>Ranunculus flammula</i> | BSB | 7 | 1 | 2016 | 25 | 7,5 | AMP | SmL |
| B25-16 | <i>Agrostis stolonifera</i> | BSB | 7 | 1 | 2016 | 15 | 5 | AMP | GR-s |
| B26-16 | <i>Alopecurus geniculatus</i> | BSB | 7 | 1 | 2016 | 15 | 4 | AMP | GR-s |
| B27-16 | <i>Juncus articulatus</i> | BSB | 7 | 1 | 2016 | 30 | 10 | AMP | GR-s |
| B28-16 | <i>Veronica scutellata</i> | BSB | 7 | 1 | 2016 | 15 | 3 | AMP | SmL |
| B29-16 | <i>Potamogeton crispus</i> | BSB | 8 | 2 | 2016 | 50 | 1 | SUB | SmL |
| F1-19 | <i>Bolboschoenus laticarpus</i> | FD | 3 | 2 | 2019 | 5 | 7 | RBE | GR-t |

| sample code | macrophyte species | location | segment nr. | exposure to disturbances | Year | water depth | distance from the bank | species class. 1 | species class. 2 |
|---------------|---------------------------------|----------|-------------|--------------------------|------|-------------|------------------------|------------------|------------------|
| F2-19 | <i>Limosella aquatica</i> | FD | 3 | 2 | 2019 | 5 | 7 | AMP | SmL |
| F3-19 | <i>Zannichellia palustris</i> | FD | 3 | 2 | 2019 | 5 | 7 | SUB | FiL |
| F4-19 | <i>Elatine hydropiper</i> | FD | 3 | 2 | 2019 | 5 | 7 | AMP | SmL |
| FN5-19 | <i>Bolboschoenus laticarpus</i> | FD | 4 | 1 | 2019 | 6 | 12 | RBE | GR-t |
| FN6-19 | <i>Limosella aquatica</i> | FD | 4 | 1 | 2019 | 6 | 12 | AMP | SmL |
| FN7-19 | <i>Elatine hydropiper</i> | FD | 4 | 1 | 2019 | 6 | 12 | AMP | SmL |
| FN8-19 | <i>Zannichellia palustris</i> | FD | 4 | 1 | 2019 | 6 | 12 | SUB | FiL |