

Drivers of macrophyte and diatom diversity in a shallow hypertrophic lake

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Table S1. Summary of the factors used in NMDS ordinations of macrophyte and diatom species assemblages. All the factors were included into the preliminary analyses, in order to detect the factors with a potentially high importance for the species composition and, at the same time, with a low correlation level with each other.

The table shows originally measured/estimated factors, information source and if they are numerical (N), estimated on ordinal scale (O) or categorical (C). In the table, the summary of the data is presented in one of the following forms: **(a)** at numerical values – averages, minima and maxima, either of absolute values or of the percentages (in some cases only a range, if an average would not be reasonable), **(b)** at ordinal values – proportion of occurrence in each category of the ordinal scale, **(c)** at categorical values – number of segments with an occurrence of a given factor (with the exception of the year of the management cycle, valid for the whole fishpond).

The calculations are given separately for each year at factors with values ranging between individual years.

Abbreviations and abbreviated descriptions:

veg. = vegetation, sur. land = surrounding landscape

data source: www.mapy.cz – national mapping server which also includes online aerial photographs and provides various measurement functions; field – field data sampling (including the data derived from collected materials); fish farm – data obtained from fish farmers

year of the data sampling	type	data source	2014	2015	2016	2019
number of investigated segments			30	30	30	19
environmental factors used in analyses						
segment length [m]	N	www.mapy.cz	386 (min. 71/max. 1358)			
segment area	N	www.mapy.cz	2132 (min. 115/max. 8500)	10633 (min. 295/max. 58550)	1414 (min. 85/max. 5420)	7430 (min. 165/max. 21430)
spring exposure [% of classes]	O	www.mapy.cz	0 – 10%; 1 – 40%; 2 – 47%; 3 – 3%; 4 – 0%	0 – 0%; 1 – 0%; 2 – 20%; 3 – 67%; 4 – 13%	0 – 27%; 1 – 37%; 2 – 20%; 3 – 16%; 4 – 0%	0 – 0%; 1 – 0%; 2 – 42%; 3 – 42%; 4 – 16%
summer exposure [% of classes]	O	www.mapy.cz	0 – 17%; 1 – 33%; 2 – 47%; 3 – 3%; 4 – 0%	0 – 0%; 1 – 0%; 2 – 20%; 3 – 63%; 4 – 27%	0 – 100%	0 – 0%; 1 – 0%; 2 – 31%; 3 – 53%; 4 – 16%
permanent reed bed and shrub veg. width [m]	N	www.mapy.cz	19.7 (min. 0/max. 64)			
willow shrub share [%]	N	www.mapy.cz	30% (min. 0/max. 95%)			
permanent reed bed share [%]	N	www.mapy.cz	52% (min. 0/max. 100%)			
sur. land. – arable land [%]	N	www.mapy.cz	25% (min. 0/max. 100%)			
sur. land. – pastures [%]	N	www.mapy.cz	20% (min. 0/max. 100%)			
sur. land. – other grasslands [%]	N	www.mapy.cz	17% (min. 0/max. 95%)			
sur. land. – scrub and forest veg. [%]	N	www.mapy.cz	25% (min. 0/max. 100%)			
sur. land. – settlement areas, roads [%]	N	www.mapy.cz	11% (min. 0/max. 95%)			
mud occurrence [% of classes]	O	field	0 – 20%; 1 – 44 %; 2 – 13%; 3 – 10%; 4 – 13%	0 – 3%; 1 – 40 %; 2 – 27%; 3 – 10%; 4 – 20%	0 – 20%; 1 – 44 %; 2 – 13%; 3 – 10%; 4 – 13%	0 – 5%; 1 – 42%; 2 – 16%; 3 – 16%; 4 – 21%
mud depth [% of classes]	O	field	0 – 20%; 1 – 23%; 2 – 34%; 3 – 23%	0 – 3%; 1 – 27%; 2 – 27%; 3 – 43%	0 – 20%; 1 – 23%; 2 – 34%; 3 – 23%	0 – 5%; 1 – 22%; 2 – 26%; 3 – 47%
organic detritus [number of segments]	C	field	19	16	22	7
stones [number of segments]	C	field	21	22	21	12
distance from large inflows [m]	N	www.mapy.cz	min. 30/max. 1950			
number of small inflows [absolute counts]	N	www.mapy.cz & field	min. 0/max. 8			
distance from fishpond dam [m]	N	www.mapy.cz	min. 230/max. 2150			
research intensity [number of visits]	N	field	2–6	2–7	2–7	3
year of the management cycle	C	fish farm	2nd	1st	2nd	1st
manure [number of segments]	C	fish farm & field	6	7	8	6
liming [number of segments]	C	fish farm & field	2	3	1	0
fish feeding [number of segments]	C	fish farm & field	6	4	4	3

Explanations of factors:

segment length – measured along the fishpond high bank; **segment area** – maximum extent of vegetated zones in the given year; **spring exposure** – extent of bottom exposure in spring (until the end of May); scale – none – 0, narrow belt along the bank (up to 1 m from the high bank) – 1, middle sized belt along the bank (up to 10 m) – 2, broad belt along the bank (more than 10 m from the high bank) – 3, very broad belt along the bank (more than 50 m from the high bank) – 4; **summer exposure** – extent of bottom exposure in summer and autumn (from the beginning of June until the end of October); scale – none – 0, narrow belt along the bank (up to 1 m from the high bank) – 1, middle sized belt along the bank (up to 10 m) – 2, broad belt along the bank (more than 10 m from the high bank) – 3, very broad belt along the bank (more than 50 m from the high bank) – 4; **permanent reed bed and shrub vegetation width** (m) – whole, i.e. including high bank, buffer zone between open water and the surrounding landscape type (average of three measurements from typical sites, i.e. extremes were excluded); it may be missing or less than 100%, if some of the landscape types occurred directly on the high bank; **willow shrub share** (%) – proportion of the buffer zone occupied by willow shrubs; buffer zone may also include disturbed areas which are not considered); **permanent reed bed share** (%) – proportion of the buffer zone, occupied by reed and tall sedge beds (including *Phalaris arundinacea* stand); **surrounding landscape** – for each of the categories listed in the table, its % proportion on the length of the whole segment is considered; the type of landscape surrounding the fishpond is considered, i.e. without the belt of reed beds and shrubs on the fishpond high bank; **mud occurrence** – representation of a muddy surface layer (at least 1 cm deep) in the segment (based on situation when the bottom is exposed); scale: none or up to 5 % – 0, up to 25 % – 1, up to 50 % – 2, up to 75 % – 3, more than 75 % – 4; **mud depth** – maximum depth of the muddy sediment in the segment (based on situation when the bottom is exposed); scale: less than 1 cm – 0, 1–5 cm – 1, up to 10 cm – 2, more than 10 cm – 3; **organic detritus** – occurrence of undecomposed organic detritus (tree leafs, pieces of wood, remnants of wetland plants, particularly perennials) on a soil surface in an important part of the segment (> 20 % of the segment size); **stones** – occurrence of gravel and large stones (larger than 2 cm) in an important part of the segment (> 20 % of the segment size); **distance from large inflows** – distance from the nearest large inflow (= Babický stream, Dehtářský stream, Kamenný stream), measured from the middle of the segment (m); **number of small inflows** – number of small inflows in a given segment (unnamed canals and ditches, most of them bringing water from surrounding pastures and arable land); **distance from the fishpond dam**, measured from the middle of the segment to the fishpond outflow in the middle of the fishpond dam; **manure** – occurrence of manure or its remnants (in detectable amounts); it might be also spread by water from another segment or spread from the bank to water from the surrounding cattle farms; **liming** – occurrence of remnants of lime on the exposed bottom; **fish feeding** – occurrence of remnants of fish feed.

Other factors, not included in the analyses

amounts of manure, lime and fish feed – largely applied directly to the aquatic environments (with the exception of some segments, see the table). The yearly values available from fish farmers are thus valid for the whole fishpond, with high impact on trophy, however, the direct impact on individual study sites is difficult to quantify and therefore the data were not included into analyses. Fish feeding and liming were performed in each of the years, manuring by the fish farm was excluded in 2014. Amounts commonly used in semi-intensive fish farming (see Francová et al. [19,20,68] and Rutegwa et al. [17] for more detail) were applied.

bird grazing and nesting – quite common and in some periods and places with a rather high impact on vegetation (particularly *Carex acuta*, *Bolboschoenus* spp.) but difficult to quantify.

fish farming works (e.g. reconstructions, summer fish catch, autumn fish harvesting, controls) – these works are performed either outside of the growing season or are difficult to quantify; they are important particularly as seed dispersal vectors.

recreation – its intensity (e.g. swimming) is higher at the dam but some people also move to other parts of the fishpond; difficult to quantify.