Influence of Morphometric parameters of the Věstonice pond-type reservoir on the Developmental patterns of Phytoplankton and Zooplankton

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Introduction

The Věstonice pond-type reservoir is a constituent of the largest water work in south Moravia. This reservoir is situated on the confluence of the rivers Dyje, Jihlava and Svratka. The area of this reservoir is 1031 ha. The capacity of this reservoir is 34 mil. m^3 with an average depth of 3.4 m. After establishment of the natural reservation– Věstonice reservoir (1st. April 1994) it was decided that a bio-corridor would be constructed. The bio-corridor should facilitate fluent transition of organisms between the floodplain forest above and down the reservoir. In order to construct the bio-corridor it was necessary to decrease the water level of Věstonice reservoir about 85 cm. Decrease in water level caused morphological division of the reservoir and also changed developmental conditions of its fauna and flora.
Concerning fish production the Věstonice reservoir belongs to the most productive areas in the Czech Republic. Ramsar convention and some other international convections support the importance of this area (Vlašín, 1997).

Materials and Methods

During the year 2000 (March – November) samples of phytoplankton and zooplankton were taken in a monthly intervals. Five localities were chosen at different places of the reservoir for sampling (see the Map number 1). Phytoplankton samples were fixed in Lugol solution. It was concentrated on membrane ultra filter (Marvan, 1957). The samples were identified and based on the results obtained phytoplankton species were analysed. The main groups of phytoplankton *Cyanobacteria, Bacillariophyceae, Chlorophyceae, Euglenophyta* and *Others* are presented in the percentage shares in the graph number 1.
Zooplanktons were removed from the plankton net and fixed in formaldehyde. Samples were identified and based on the results obtained zooplankton species were analysed. The main groups of zooplankton *Cladocera, Copepoda* and *Rotatoria* are presented in the percentage shares in the Graph number 2. The quantity of phytoplankton and zooplankton was expressed by scale (Hindak, 1978).
The physical and chemical parameters (dissolved oxygen concentration, pH, water temperature and conductivity) were also measured. The device WTW OXI 196 was used to measure dissolved oxygen concentration, percentage saturation of water by oxygen and water temperature. pH values were measured using WTW pH 196T. Hanna conductivity- meter Conmet 1 determined conductivity.

Results and Discussions

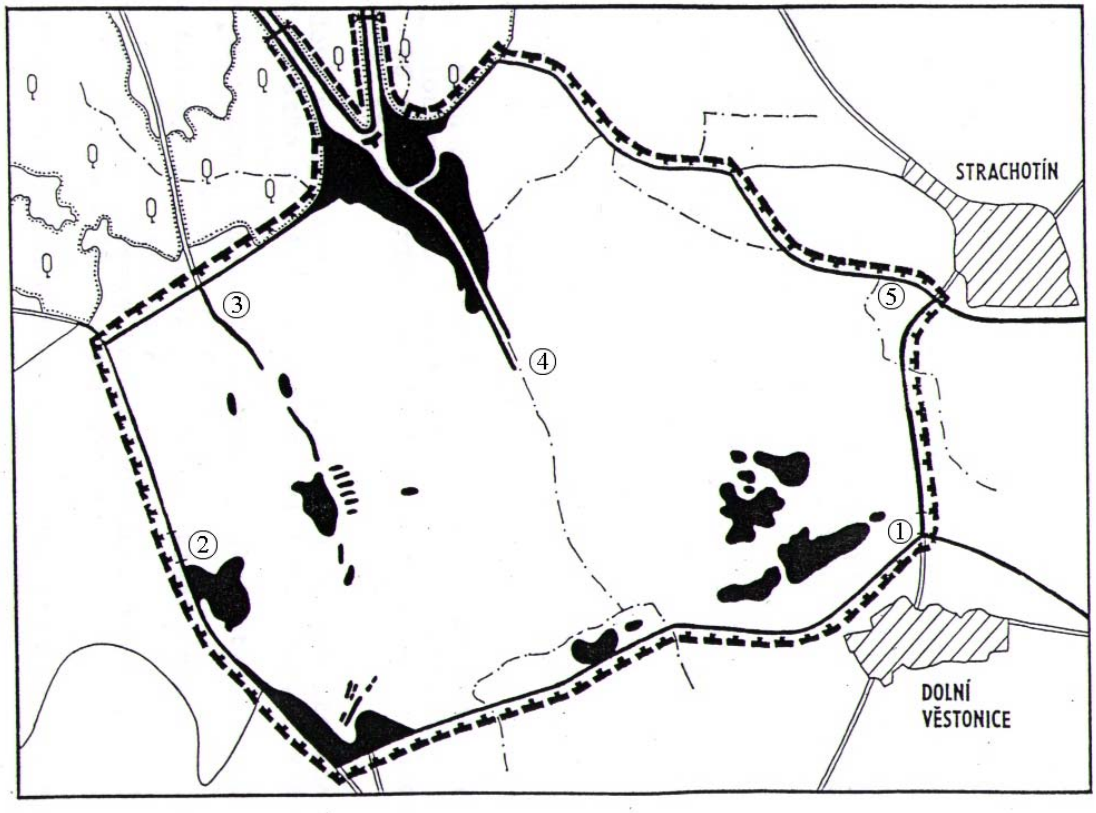
The quantity of phytoplankton is shown in Graph number 1. In spring (March – April) *Bacillariophyceae* were the dominant phytoplankton species but in May the green algae were dominant. The representatives of *Cyanobacteria* started to appear there in higher quantity. In summer (June-August) bloom of blue-green algae occurred in all localities. Blue-green algae were the main dominant group until October, when the representatives of *Bacillariophyceae* started to appear again.
Heteša and Sukop (1990) found the same developmental pattern with spring maximum of diatom *Stephanodiscus hantzschii* and summer dominance of blue- green algae of genus *Microcystis* and *Aphanizomenon.*

The quantity of zooplankton is shown in Graph number 2. Zooplankton was largely composed of representatives of *Copepoda* and *Rotatoria* in March and April. During the summer *Cladocera* was the main dominant group formed mostly by medium species.
Zooplankton developments in the Věstonice reservoir depend especially on predation pressure of fish stocks. Larger cladocerans are found in little quantity only at the beginning of the growing season, when owing to lower temperature fish don't accept the food yet. *Rotatoria* or smaller species of genus *Cladocera* have the dominant position during the whole year (Sukop 1994).
Values of measured physical and chemical parameters are shown in the Table number 1. The Svratka inflow has the main influence on water quality of the Věstonice reservoir. Dissolved oxygen content of water shows typical spring maximum and summer minimum. Nutrient content in water doesn't show any expressive trend (Tůma et al. 2000).

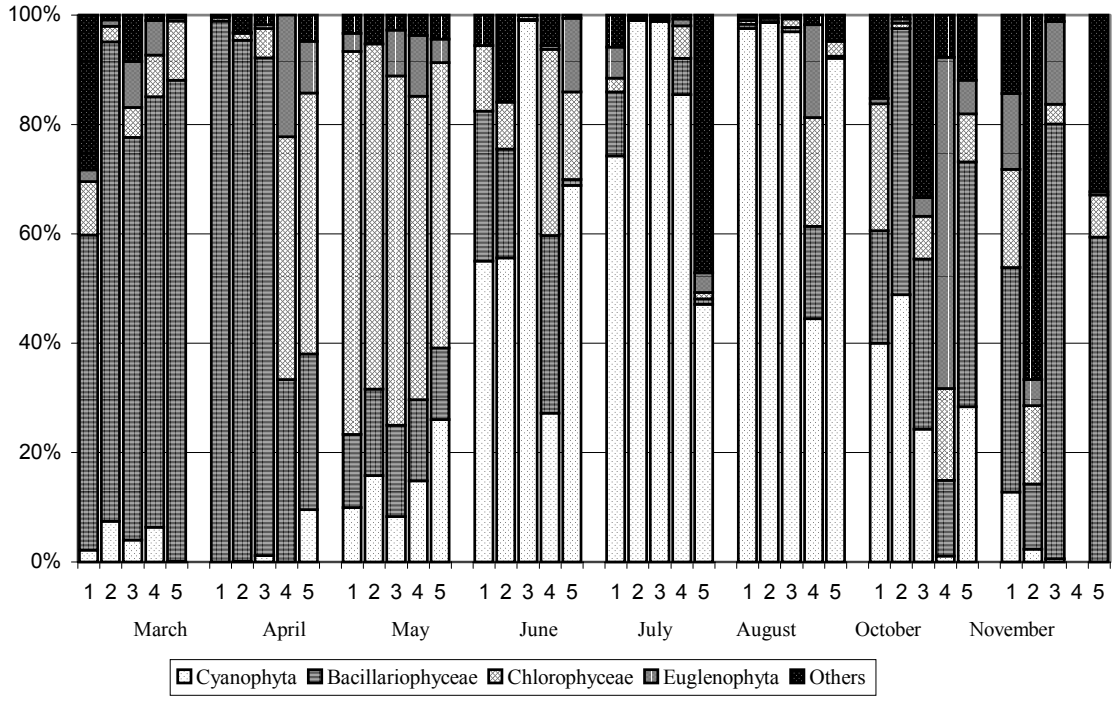
Conclusion

Between the individual localities quantitative and qualitative differences in occurrence of phytoplankton and zooplankton were observed. Values of physical and chemical parameters were also varied. The Jihlava and Svratka inflows have the most expressive influence on phytoplankton communities. In summer the wind has an expressive influence when the bloom of blue-green algae is present. Fish stock has the main influence on zooplankton structure. Values of measured physical and chemical parameters fluctuated mostly depending on the quantity of primary producers. The Jihlava and Svratka rivers have the influence on water chemistry as well.

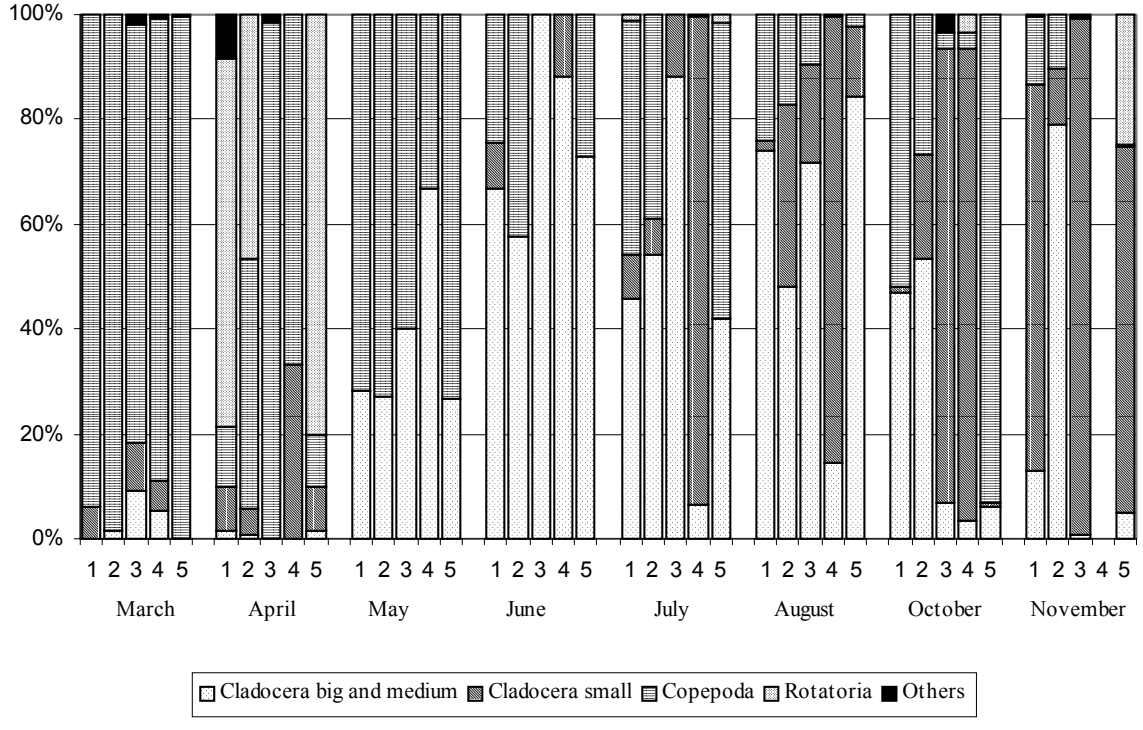
Map 1: Sampling site of localities in Věstonice pond-type reservoir.



Graph 1. Expression of quantity of main groups phytoplankton on localities Věstonice pond-type reservoir in 2000.



Graph 2. Expression of quantity of main groups zooplankton on lokalities Věstonice pond-type reservoir in 2000.



Tab. 1 Values of measured physical and chemical parameters in localities Věstonice reservoir in 2000

Locality	Parameter	Month of sampling							
		III.	IV.	V.	VI.	VII.	VIII.	X.	XI.
I.	pH	8.63	9.25	9.19	9.52	9.64	9.88	8.71	8.51
	Dissolved oxygen concentration (%)	95	111	89	108	125	137	84	73
	Water temperature (°C)	7.1	17.0	21.7	18.5	21.5	20.6	14.2	7.2
	Conductivity (mS. m^{-1})	44.8	49.9	53.2	59.4	56.4	59.4	64.1	63.0
	Time of sampling (hour)	11:00	10:15	11:00	8:30	10:00	12:30	11:00	10:15
II.	pH	8.69	9.42	9.44	9.91	9.84	9.67	8.57	8.54
	Dissolved oxygen concentration (%)	90	110	80	211	111	81	73	81
	Water temperature (°C)	7.1	17.5	19.8	19.1	21.0	20.2	13.9	7.2
	Conductivity (mS. m^{-1})	48.5	57.0	58.0	61.6	60.8	65.2	65.7	62.6
	Time of sampling (hour)	11:45	11:00	12:00	9:15	10:30	13:10	11:30	10:45
III.	pH	9.29	9.16	9.40	9.59	9.79	9.65	8.81	8.40
	Dissolved oxygen concentration (%)	104	137	108	65	127	101	81	81
	Water temperature (°C)	7.8	18.7	22.0	18.7	23.3	20.2	15.2	7.8
	Conductivity (mS. m^{-1})	50.4	51.8	54.5	61.0	60.5	60.7	65.4	66.0
	Time of sampling (hour)	12:15	11:30	12:30	9:30	11:00	13:30	12:00	11:15
IV.	pH	7.88	8.64	8.13	8.32	8.98	7.95	8.36	
	Dissolved oxygen concentration (%)	78	171	85	113	172	48	63	
	Water temperature (°C)	5.8	17.4	22.1	17.8	22.4	18.6	15.3	
	Conductivity (mS. m^{-1})	39.1	54.7	57.9	60.1	57.4	64.7	62.1	
	Time of sampling (hour)	13:00	12:00	13:00	10:30	11:20	14:00	12:45	
V.	pH	8.26	9.56	8.63	9.63	9.78	9.72	8.60	8.45
	Dissolved oxygen concentration (%)	79	190	72	201	215	129	68	84
	Water temperature (°C)	7.1	17.7	21.1	210	22.3	19.7	14.6	7.3
	Conductivity (mS. m^{-1})	39.8	49.7	55.7	54.8	53.3	58.3	62.9	62.8
	Time of sampling (hour)	13:45	13:15	13:45	11:10	12:15	14:45	13:30	12:00

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