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PHYTOPLANKTON DIVERSITY AND THEIR SUCCESSION IN WATER BODIES OF THE LEDNICE PARK DURING 2002 SEASON

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Abstract

RAMEZANPOOR, Z., SUKOP, I., HETEŠA, J.: *Phytoplankton diversity and their succession in water bodies of the Lednice park during 2002 season.* Acta univ. agric. et silvic. Mendel. Brun., 2004, LII, No. 2, pp. 83-96

Phytoplankton communities of three water bodies in the Lednice park were studied from 22nd April till 1st October 2002. These water bodies are the Zámecký pond, Růžový pond and the Dyje River, which is water source of both ponds.

Phytoplankton samples were taken every two weeks between 8 - 9 am. Collected phytoplankton samples were preserved with 4% formalin solution and Lugol solution (JJK) and transported to the laboratory. They were determined and counted using inverted microscope. Water temperature, pH and dissolved oxygen were measured in the field using digital portable instruments. Total of 317 phytoplankton species were determined in this study.

Heavy algal bloom was observed in the Zámecký pond in mid-summer coinciding with increase in water temperature. Fish diseases and partial mortality occurred during the period of algal bloom and unpleasant smell was dominant feature. A light algal bloom was also observed in the Růžový pond and the Dyje River nearly by the end of summer.

The main algae species responsible for blue-green algae bloom were *Anabaena flos-aquae*, *Microcystis aeruginosa, M. ichtyoblabe, M. flos-aquae* and *M. wesenbergii*. Dissolved oxygen values varied between 3.4 - 19.5 mg l^{-1}, pH ranged from 7.6 - 9.7. Secchi depth varied from 0- 65 cm in the Zámecký pond, 15-45 cm in the Růžový pond and 35-65 cm in the Dyje River. Concentration of total phosphate, nitrate and chlorophyll-a in the Dyje River before drainage into the Zámecký and Růžový pond verified heavy nutrient load (Total-P = 0.3, NO_3^- = 12 mg.l^{-1}) of the river. Although the Dyje River is main water source for both ponds, presence of relatively different phytoplankton communities in these two ponds suggest that probably different nutrient sources might be responsible for differences in phytoplankton communities and eutrophication patterns in the Zámecký pond as compared to the Růžový pond.

phytoplankton, blue-green algae bloom, *Microcystis,* eutrophication, Lednice park, Czech Republic

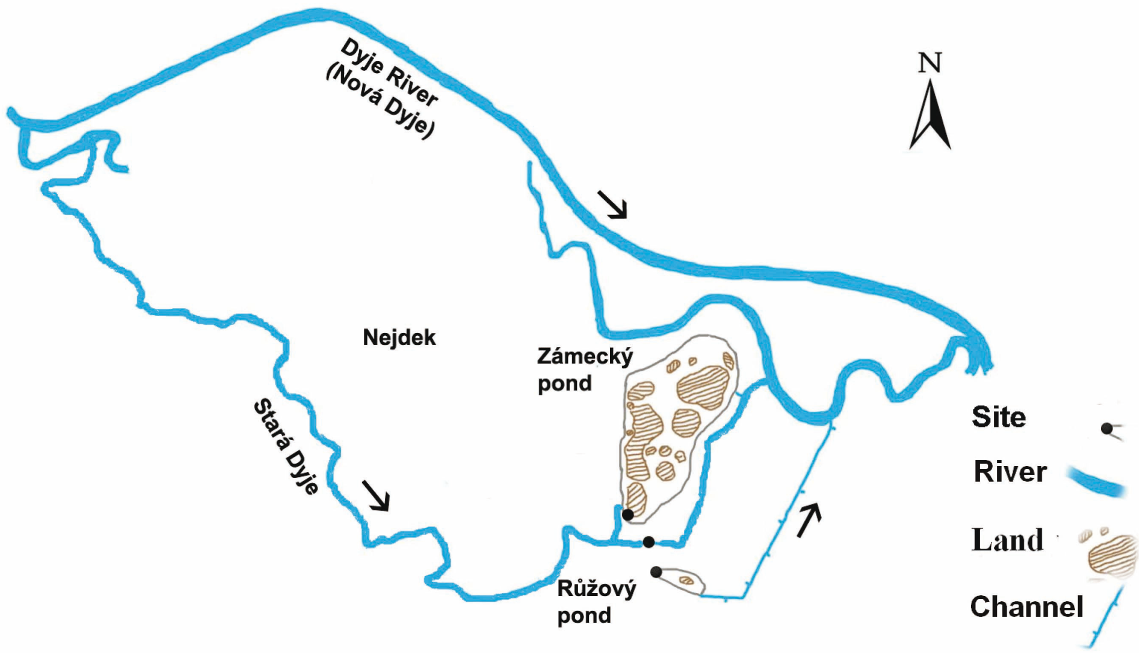
INTRODUCTION

The phytoplankton of aquatic ecosystem undergoes considerable changes even within short period of time (weeks, seasons). Sommer (1989) showed that many of these changes, called seasonal succession, could result from life activities of the previously existing phytoplankton and zooplankton, fishes, and other organisms. Referring to other authors, Odum (1983) noted that during longer periods aquatic ecosystems were developing by autogenic succession towards a state of lower trophy and higher diversity, if the input of nutrients the catchments area slowed down or ceased. However, the correspondence between trophy and diversity is not always unambiguous Elber, Schanz (1989). Uhlmann (1975) found that small, saprotrophic (highly eutrophic) and oligotrophic, shallow lake environment maintained lower number of species than similar water basins moderately loaded with sewage waters, Elber, Schanz (1989) also investigated the connection between phytoplankton diversity and stability of four Swiss lakes. They tried to explain diversity and stability variations by the changes in nutrients and grazing pressure. We are inclined to assume that stability exerts an influence on phytoplankton diversity and therefore could play an important role in succession of aquatic ecosystems.

Algal bloom and eutrophication are the biological responses of some aquatic ecosystems to over enrichment by plant nutrients, particularly nitrogen and phosphorus. Literature reviews show that algal bloom and eutrophication are not novel for water bodies of the Lednice area Bayer, Bajkov (1929), Zapletálek (1932a, b) Jírovec (1937). Water basins of the Lednice park (Zámecký and Růžový ponds) are utilized for fish culture. Dynamic development of phytoplankton, zooplankton and zoobenthos of both ponds were studies formerly see Flídr (1998), Báňa (1999), Sukop, Kopp (2001, 2002). Dynamic development of phytoplankton Dyje River was studied by Marvan, Heteša (2002). Because the area is considered a protected area, since the year 1995 there has been slight reduction in fish stocking density and fertilizer application. As a result fish culture has been limited in favour of recreational application of the park and ponds. Although protection measures are applied, algal bloom and eutrophication are still dominant phenomena in the Zámecký pond. Objectives of the present study were determination of phytoplankton communities and succession of these water basins and mainly those involved in eutrophication.

SITE DESCRIPTION

The Lednice park (Fig. 1) is located in the southern Moravia and with elevation about 160 m above sea level. There are two ponds in the Lednice park, Zámecký and Růžový, with 30.12 and 1.57 ha areas respectively. These ponds are situated about 150 m away from each other and the Dyje River is their main source of water. Lednice area is the most temperate region in the Czech Republic. It lies on the lowest layer of sediment rock. Over this layer Jurassic limestone and dolomite occurs which influences the environmental condition of the region (Bayer, Bajkov, 1929).



1: *Study sites in the Zámecký pond, Růžový and the Dyje River*

The Dyje River is running along southern border of the Czech Republic through Nové Mlýny lowland reservoirs with very complex characteristics. These complex habitats, substrate, macrophytes and depth gradient represent a diverse habitat for fish (Benson, Magnuson, 1992). There are series of fish ponds (the Lednice fish ponds) next to the Lednice Park with different characteristics which are also subjected to algal bloom and eutrophication (Vollenweider, 1968).

MATERIALS AND METHODS

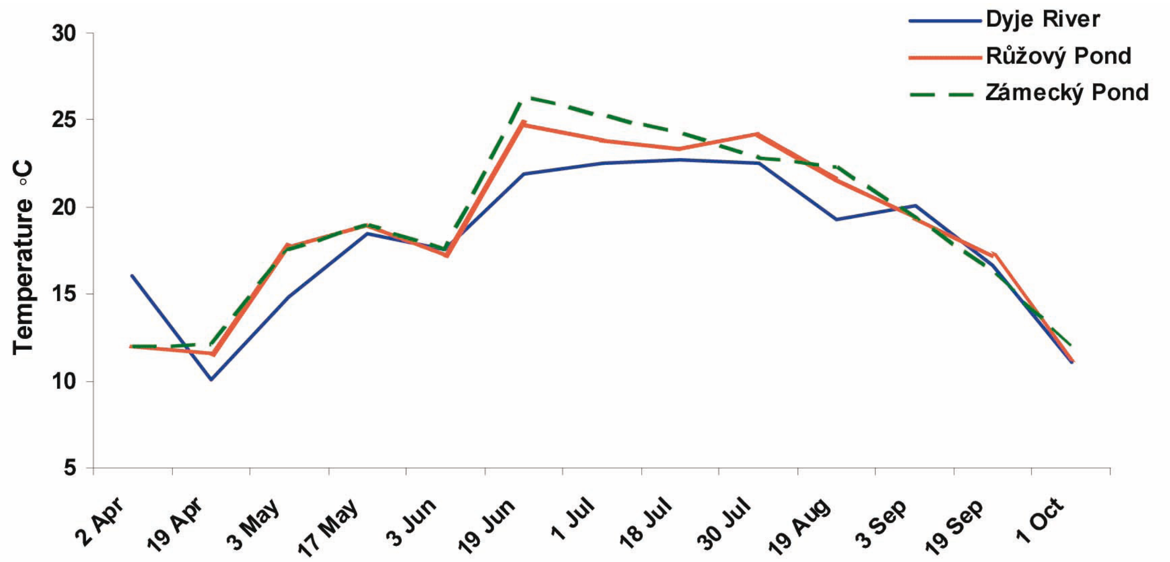
Phytoplankton samples were taken at 3 sampling sites from 22 of March till 1 of October 2002. Sampling was carried out every two weeks. A specially modified bottle was used for sampling from 20 cm under surface depth. Phytoplankton samples were fixed in Lugol and 4% formalin solution separately. Samples were transported to the laboratory and were analysed by the Zeiss NU2 microscope and counted using and inverted microscope "Meopta" at 675x magnification with 2 ml sediment chambers according to standard methods (ASTM, 1996).

Some physical and chemical factors including Secchi disc depth, air and water temperature, dissolved oxygen and pH were measured in the field using digital oxygen meter Oxi 340i and pH meter pH/ION 340i WTW and further analyses were performed in the laboratory. Determination was done according to Komárek, Anagnostidis (1998), Krammer, Lange-Bertalot (1986, 1988, 1991a, 1991b).

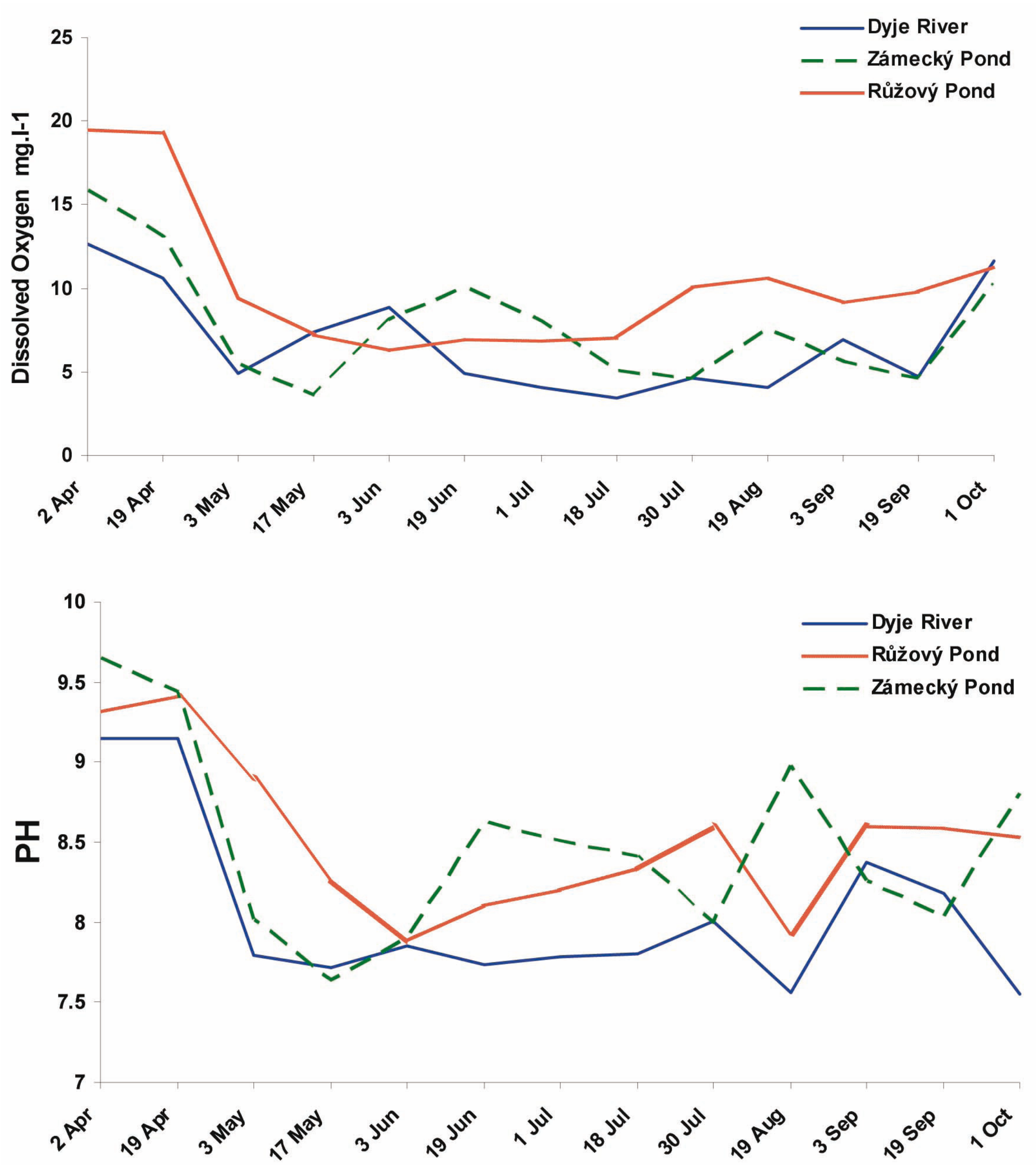
RESULTS

Although sampling sites were relatively close to each other but showed different water temperature with average of 17.7, 18.7 and 19.0 °C in the Dyje River, the Růžový and Zámecký ponds respectively as shown in Fig. 2. Transparency was minimum (practically 0) during the period of algal bloom in the Zámecký pond and the maximum was 65 cm in the Dyje River. The average depth of transparency was 53, 29 and 39 cm in the Dyje River, Růžový and Zámecký ponds respectively.

Average dissolved oxygen ranged from 6.8, 10.2 and 7.8 mg.l^{-1} in the Dyje River, Růžový and Zámecký pond respectively. Dissolved oxygen varied between 3.4 – 12.6 mg.l^{-1} in the Dyje River from May to the end of September. Maximum dissolved oxygen was measured 19.5 mg.l^{-1} in the Růžový pond in second part of April. Average value of pH was 8.1, 8.5 and 8.5 in the Dyje River, the Růžový and Zámecký pond respectively. It didn't show significant differences between sampling sites. Maximum values of pH were measured in the Zámecký pond with 9.7 in second part of April and minimum with 7.6 in first part of Oct (Fig. 3).



2: *Water temperature in Zámecký, Růžový pond and the Dyje River during the vegetation season of the year 2002*



3: *Dissolved oxygen and pH of water in the Zámecký, Růžový pond and the Dyje River during the vegetation season of the year 2002*

Total of 317 phytoplankton species were determined in the present study (table I). The Cyanophyta comprised 41% of phytoplankton cell density during the vegetation period in the Dyje River, 52% in the Zámecký and 13% in the Růžový ponds. These values in August increased to about 90% in the Dyje River and the Zámecký pond resulting in a heavy algal bloom the latter and a slighter algal bloom in the Dyje River (Fig. 4). Algal species, which were responsible for, bloom included *Anabaena flos-aquae*, *Microcystis aeruginosa, Microcystis wesenbergii, Microcystis flos-aquae* and *Aphanocapsa incerta*. Chlorophyta contributed 52% to cell density in the Růžový pond during sampling period. Centric Bacillariophyceae species dominated phytoplankton communities of the the Růžový pond in summer represented by *Stephanodiscus hantzschii, Stephanodiscus invisitatus, Cyclotella meneghiniana, Aulacoseira granulata, Cyclostephanos dubius, Actinocyclus normanii v. subsalsus.*

I: *List of phytoplankton has been detected in the Zámecký, Růžový ponds and the Dyje River (R= Růžový, Z= Zámecký, D= Dyje)*

Species	R	Z	D	Species	R	Z	D	Species	R	Z	D
CYANOPROKARYOTA				Aulacoseira gran. m. curvata			+	Nitzschia cf. gracilis	+	+	+
Anabaena flos-aquae	+	+	+	Aulacoseira italica	+	+	+	Nitzschia hungarica	+	+	+
Anabaena sigmoidea			+	Aulacoseira cf. muzzanensis			+	Nitzschia levidensis			+
Anabaena sp.		+		Caloneis permagna			+	Nitzschia linearis	+	+	+
Anabaenopsis catenata		+		Caloneis silicula	+	+	+	Nitzschia cf. palea	+	+	+
Aphanizomenon flos-aquae f.kleb.	+	+	+	Cocconeis pediculus			+	Nitzschia recta		+	+
Aphanizomenon gracile	+	+	+	Cocconeis placentula	+	+	+	Nitzschia cf. sigma		+	
Aphanizomenon issatschenkoi		+		Cyclostephanos dubius	+	+	+	Nitzschia sigmoidea	+	+	+
Aphanocapsa incerta	+	+	+	Cyclotella meneghiniana	+	+	+	Nitzschia sp.	+	+	+
Chroococcus limneticus		+	+	Cyclotella pseudostelligera			+	Nitzschia thermalis v. minor	+		
Coelosphaerium kuetzingianum			+	Cyclotella quadrijuncta	+			Nitzschia tryblionella	+	+	+
Limnothrix redekei	+		+	Cyclotella sp.	+		+	Pinnularia gibba		+	
Merismopedia tenuissima	+	+	+	Cymatopleura librilis	+	+	+	Pinnularia microstauron	+		
Microcystis aeruginosa	+	+	+	Cymbella aspera	+			Pinnularia sp.	+	+	
Microcystis flos-aquae	+	+	+	Cymbella ehrenbergii	+		+	Pinnularia viridis	+		
Microcystis ichtyoblabe	+	+	+	Cymbella minuta	+		+	Rhoicosphenia abbreviata			+
Microcystis sp.	+	+	+	Cymbella sp.		+		Skeletonema potamos	+	+	+
Microcystis viridis	+	+	+	Cymbella tumida	+			Stephanodiscus hantzschii	+	+	+
Microcystis wesenbergii	+	+	+	Diatoma tenuis		+	+	Stephanodiscus invisitatus	+	+	+
Oscillatoria limosa	+	+	+	Diatoma vulgaris	+		+	Surirella capronii			+
Phormidium sp.			+	Fragilaria capucina	+		+	Surirella minuta	+	+	+
Phormidium tenue	+	+	+	Fragilaria construens			+	Surirella ovata	+	+	+
Phormidium tergestinum			+	Fragilaria crotonensis		+	+	Surirella sp.		+	
Planktolyngbya sp.		+		Fragilaria intermedia	+			Surirella tenera			+
Planktothrix agardhii	+	+	+	Fragilaria sp.	+		+	Surirella tenuis		+	
Pseudanabaena limnetica	+	+	+	Gomphonema constrictum	+			Synedra actinastroides	+		
Woronichinia naegeliana	+	+	+	Gomphonema parvulum	+		+	Synedra acus v. acus	+	+	+
				Gomphonema sp.	+		+	Synedra berolinensis			+
CHROMOPHYTA				Gomphonema truncatum	+	+	+	Synedra parasitica	+		
Chrysophyceae			+	Gyrosigma acuminatum	+	+	+	Synedra pulchella			+
Chromulina sp.	+		+	Gyrosigma spenceri			+	Synedra tabulata	+		
Chrysococcus biporus	+	+	+	Hantzschia amphioxys			+	Synedra ulna	+	+	+
Chrysococcus punctiformis		+	+	Melosira varians	+	+	+	**Xanthophyceae**			
Chrysococcus rufescens			+	Navicula accomoda		+	+	Centritractus sp.			+
Chrysococcus sp.			+	Navicula avenacea			+	Characiopsis sp.			+
Chrysococcus triporus			+	Navicula capitata v. capitata	+	+	+	Goniochloris mutica	+	+	+
Codonomonas pascheri			+	Navicula capitata v. hungar.	+			Goniochloris sculpta	+	+	+
Kephyrion boreale			+	Navicula cryptocephalsa	+	+	+	Goniochloris smithii	+		+
Kephyrion moniliferum		+		Navicula cuspidata		+	+	Pteromonas golenkiniana		+	
Kephyrion tubiforme			+	Navicula gregaria	+	+	+	Tetraselmis cordiformis			+
Mallomonas sp.			+	Navicula menisculus v. men.	+	+	+				
Microglena punctifera			+	Navicula pupula			+	**CRYPTOPHYTA**			

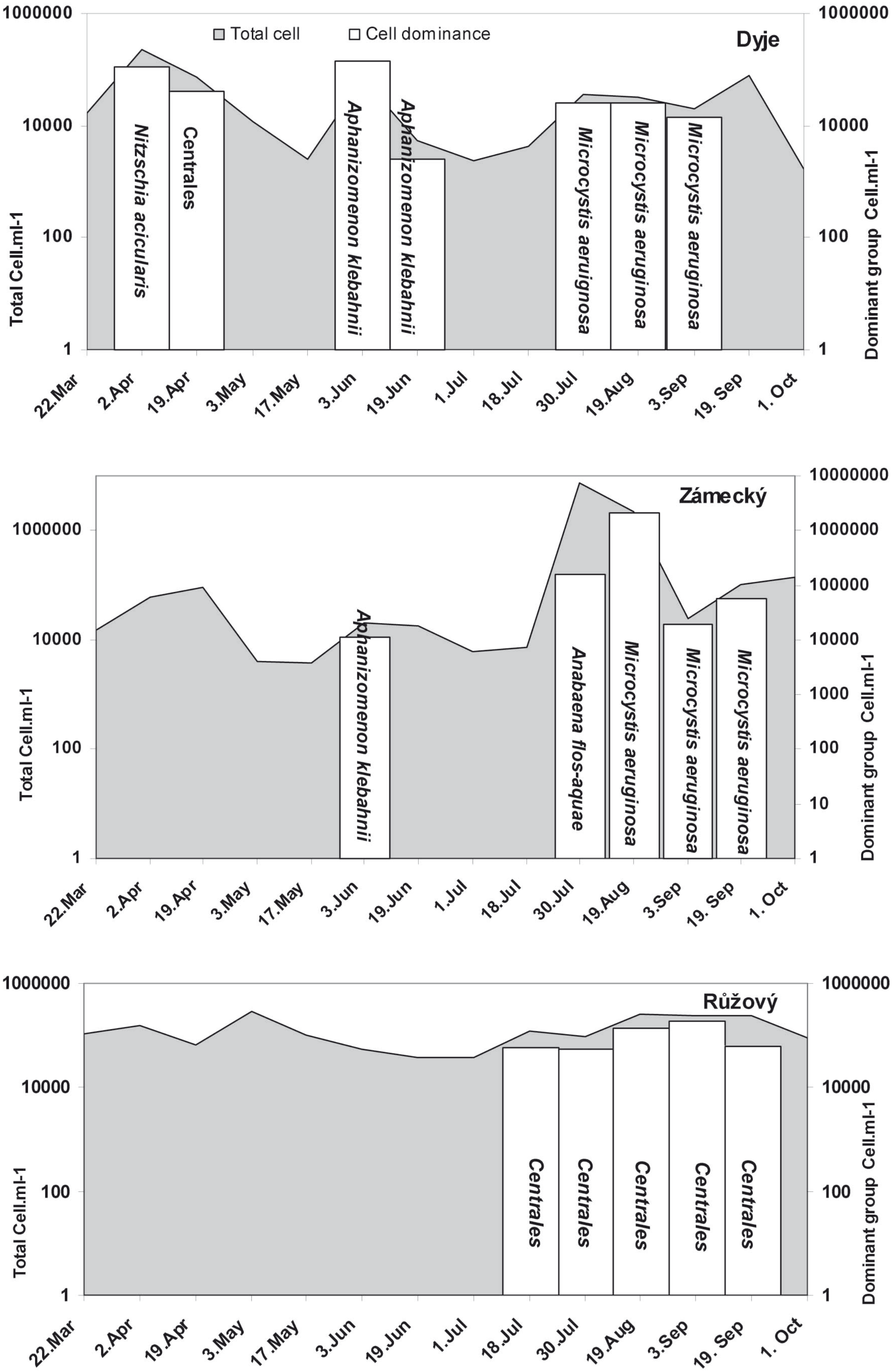
Species	R	Z	D	Species	R	Z	D	Species	R	Z	D
Bacillariophyceae				Navicula pygmaea	+			Chroomonas caudata	+	+	+
Achnanthes hungarica	+	+	+	Navicula reinhardtii		+		Chroomonas nordstedtii	+	+	+
Achnanthes lanceolata	+	+	+	Navicula rhynchocephala		+		Cryptomonas curvata	+	+	+
Achnanthes sp.			+	Navicula sp.	+	+	+	Cryptomonas marssonii	+	+	+
Actinocyclus normanii v. subs.	+	+	+	Navicula tripunctata	+	+	+	Cryptomonas obovata		+	
Amphora ovalis	+	+	+	Navicula viridula	+	+	+	Cryptomonas ovata	+	+	+
Amphora veneta	+	+		Nitzschia acicularis	+	+	+	Cryptomonas sp.		+	+
Anomoeoneis sphaerophora	+	+	+	Nitzschia amphibia			+	Rhodomonas lacustris	+	+	
Asterionella formosa	+	+	+	Nitzschia closterium			+				
Aulacoseira ambigua	+	+	+	Nitzschia dissipata			+				
Aulacoseira granulata	+	+	+	Nitzschia fonticola	+	+	+				
Aulacoseira gran. v. angustiss.	+		+	Nitzschia fruticosa	+		+				
DINOPHYTA				Dictyosphaerium elegans	+			Scenedesmus obliquus	+		+
Amphidinium sp.			+	Dictyosphaerium sp.			+	Scenedesmus opoliensis	+	+	+
Ceratium hirundinella			+	Dictyosphaerium pulchellum	+		+	Scenedesmus ovalternus		+	+
Gymnodinium sp.	+	+	+	Dictyosph. subsolitarium	+	+	+	Scenedesmus pannonicus			+
Peridinium aciculiferum		+	+	Dictyosph. tetrachotomum	+		+	Scenedesmus quadricauda	+	+	+
Peridinium sp.			+	Didymocystis inconspicua	+	+	+	Scenedesmus sp.			+
				Didymocystis planctonica	+	+	+	Schroederia robusta		+	+
CHLOROPHYTA				Didymogenes anomala			+	Schroederia setigera	+	+	+
Volvocales				Didymogenes palatina			+	Schroederia spiralis			+
Chlamydomonas ambigua			+	Eutetramorus fottii	+		+	Selenastrum gracile			+
Chlamydomonas monadina			+	Eutetramorus globosus			+	Selenastrum sp.	+		
Chlamydomonas pertusa			+	Franceia ovalis			+	Tetrachlorella alternans	+		+
Chlamydomonas sp.	+	+	+	Golenkinia radiata		+	+	Tetrachlorella ornata			+
Chlorogonium elongatum			+	Granulocystis coronata			+	Tetraedron caudatum	+	+	+
Chlorogonium fusiforme	+	+	+	Granulocystis helenae	+	+	+	Tetraedron incus	+		+
Chlorogonium minimum			+	Hyaloraphidium contortum		+	+	Tetraedron minimum	+	+	+
Chloromonas sp.			+	Kirchneriella irregularis	+		+	Tetraedron platyisthmum		+	+
Coccomonas sp.			+	Kirchneriella lunaris			+	Tetraedron triangulare			+
Eudorina elegans		+	+	Lagerheimia balatonica			+	Tetrallantos lagerheimii	+		
Gonium sociale	+	+	+	Lagerheimia chodatii	+			Tetrastrum elegans	+	+	+
Nephroselmis olivacea			+	Lagerheimia ciliata			+	Tetrastrum glabrum	+	+	+
Pandorina morum		+	+	Lagerheimia genevensis	+	+	+	Tetrastrum punctatum		+	+
Pascherina tetras			+	Lagerheimia subsalsa	+			Tetrastrum sp.			+
Pedinomonas rotunda			+	Lagerheimia wratislaviensis			+	Tetrastrum staurogeniaeforme	+	+	+
Phacotus lenticularis	+	+	+	Micractinium bornhemiense			+	Tetrastrum triangulare	+		+
Pteromonas aculeata			+	Micractinium pusillum	+	+	+	Treubaria sp.			+
Pteromonas angulosa			+	Monoraphidium arcuatum	+	+	+	Trochiscia sp.			+
Pteromonas cordiformis		+	+	Monoraphidium contortum	+	+	+				
Pteromonas golenkiniana		+		Monoraphidium griffithii	+	+	+	**Ulotrichales**			
Tetraselmis cordiformis			+	Monoraphidium komarkovae	+	+	+	Gloeotila pelagica			+
				Monoraphidium minutum	+	+	+	Gloeotila spiralis			+
Chlorococcales				Monoraphidium nanum	+	+	+	Koliella longiseta	+	+	+

Species	R	Z	D	Species	R	Z	D	Species	R	Z	D
Actinastrum aciculare	+	+	+	Nephrochlamys rotunda	+	+	+	Koliella spirotaenia			+
Actinastrum hantzschii	+	+	+	Nephrochlamys willeana	+	+	+				
Ankyra ancora		+	+	Oocystis elliptica			+	**Conjugales**			
Ankyra judayi			+	Oocystis lacustris	+	+	+	Closterium acutum			+
Ankyra lanceolata			+	Oocystis parva	+	+	+	Closterium limneticum	+	+	+
Botryococcus braunii			+	Oocystis solitaria	+		+	Closterium pronum			+
Chlorella sp.	+	+	+	Paradoxia multiseta			+	Cosmarium sp.			+
Chodatella citriformis			+	Pediastrum boryanum	+	+	+	Staurastrum chaetoceras			+
Chodatella subsalsa			+	Pediastrum duplex	+	+	+	Staurastrum longipes			+
Coelastrum astroideum	+		+	Pediastrum simplex		+	+	Staurastrum pingue	+	+	+
Coelastrum microporum	+	+	+	Pediastrum sturmii		+					
Coelastrum sphaericum	+			Pediastrum tetras	+	+	+	**EUGLENOPHYTA**			
Coenococcus planctonicus			+	Planktosphaeria gelatinosa			+	Euglena cf. aculeata	+		
Crucigenia quadrata		+		Polyedriopsis spinulosa	+		+	Euglena acus	+	+	+
Crucigenia tetrapedia	+	+	+	Scenedesmus abundans	+	+	+	Euglena agilis	+	+	+
Crucigeniella apiculata	+		+	Scenedesmus acuminatus	+	+	+	Euglena ehrenbergii	+		
Crucigeniella neglecta	+		+	Scenedesmus armatus			+	Euglena geniculata		+	+
Crucigeniella rectangularis	+			Scenedesmus bicaudatus	+	+	+	Euglena granulata	+		
Dichotomococcus curvatus			+	Scenedesmus denticulatus	+		+	Euglena oxyuris	+	+	+
Dictyosphaerium anomalum			+	Scenedesmus disciformis	+		+	Euglena polymorpha			+
Dictyosphaer. chlorelloides			+	Scenedesmus linearis	+	+	+	Euglena sociabilis			+
Dictyosph. ehrenbergianum		+	+	Scenedesmus magnus			+	Euglena sp.	+	+	+
Euglena spiroides				Phacus longicauda	+	+	+	Trachelomonas granulosa			+
Euglena texta		+	+	Phacus platyaulax	+			Trachelomonas hispida			+
Euglena tripteris		+		Phacus pyrum	+	+	+	Trachelomonas planctonica			+
Euglena variabilis			+	Phacus sp.	+	+	+	Trachelomonas sp.	+	+	+
Euglena viridis		+	+	Phacus triqueter			+	Trachelomonas volvocina			+
Phacus alatus				Phacus wettsteinii			+				
Phacus curvicauda		+		Strombomonas acuminata	+		+				

DISCUSSION

A look at the diversity and succession of algal community of the Dyje River shows that Bacillariophycae was dominant in spring and from this time onward no dominant and sub-dominant phytoplankton was observed in early June when *Aphanizomenon flos-aquae v. klehbanii* was dominant for a short period. By the end of July *Microcystis aeruginosa* dominated phytoplankton community with less than 1 x 10^6 cell.ml^{-1}and a light bloom was recorded due to its growth. The Zámecký pond showed similar pattern as the Dyje River differing in cell concentration of *Microcystis aeruginosa* during algal bloom which was more than 1 x 10^6 cell.ml^{-1} in the Zámecký pond and presence of *Anabaena flos-aquae* for a short period before bloom of *Microcystis aeruginosa*. As *Microcystis aeruginosa* started its bloom *Anabaena flos-aquae* disappeared from the pond. In the Růžový Pond no phytoplankton species was observed to be dominant. Only order Centrales was dominant in summer.

Heavy algal bloom was observed in the Zámecký pond in accordance with increase in water temperature. Although the Dyje River is common source of water for the Růžový and Zámecký ponds but they characteristics of phytoplankton communities especially during the algal bloom were somewhat different in the Zámecký pond. It seems that the Dyje River probably is not the only nutrient source of these ponds and other factors might be concerned. Centric Bacillariophyceae were dominant in the



4: *Density of cells and dominant group in the Zámecký, Růžový pond and the Dyje River during the vegetation season of the year 2002*

Růžový pond in summer while at the same time Cyanophyta species were dominant in the Zámecký pond.

High values of chlorophyll-a, nitrate and phosphate were recorded in Stará Dyje River (table II). This river passes through urban area and Nové Mlýny reservoirs where it probably is influenced by anthropogenic activities and nutrient rich Nové Mlýny water. This could justify existence of rich phytoplankton community in the Dyje River. Although this to some extent proves heavy load of nutrient into the Růžový and Zámecký ponds but yet does not explain differences between them and point sources of nutrients or pollution might be causes for these differences. There are two categories of point source pollutions, which are wastewater and industrial wastewater discharge, either directly to waterbody by outfall or indirectly to the water body via ground water by spray irrigation, percolation, or drain fields. These pollutants also play significant roles in algal bloom and subsequent eutrophication (Vollenweider, 1968).

The main phytoplankton species determined in the period of blue-green algae bloom, were *Microcystis* sp. and *Anabaena flos-aquae,* which are generally found in eutrophic waters.

According to Hutchinson (1967) water of intermediate fertility is dominated by dinoflagellates (*Peridinium, Ceratium*) and diatoms (*Cyclotella, Stephanodiscus, Asterionella formosa*) with desmids but of the genera *Staurastrum, Closterium* and *Cosmarium,* other green algae (*Scenedesmus, Pediastrum*) and perhaps some filamentous blue-green algae, either fixing N_2 or not (*Oscillatoria*) which is in agreement with our findings in the Růžový pond that is categorized as mesotrophic- eutrophic.

The Dyje River loads large amount of nutrient into the ponds and causes algal bloom, this in turn fosters euthrophication risk and the ultimate consequences of eutrophication are the filling up of a pond and adverse effects on environment or public health (Pitois *et al.,* 2001).

CONCLUSION

Water bodies in the Lednice park are characterized by high alkalinity. Our objectives were to understanding community of phytoplankton involved in eutrophication. in these two ponds. The study proved presence of eutrophication causes and heavy algal bloom in Zámecký pond and also dominant cyanophyta during summer. Presence of species of *Microcystis* sp., especially bloom of *Microcystis aeruginosa* in the Zámecký pond because of high toxicity is dangerous for aquatic animals and birds that live in this area. Justification and precise causatives of the eutrophication problem needs further detailed study on nutrient values in water column and sediment. In case of differences among phytoplankton communities between the Zámecký and Růžový ponds during the period of algal bloom it is necessary to carry out long term comparative studies covering all aspects of ecological studies such as algae, benthos, fish, physical and chemical parameters both ponds.

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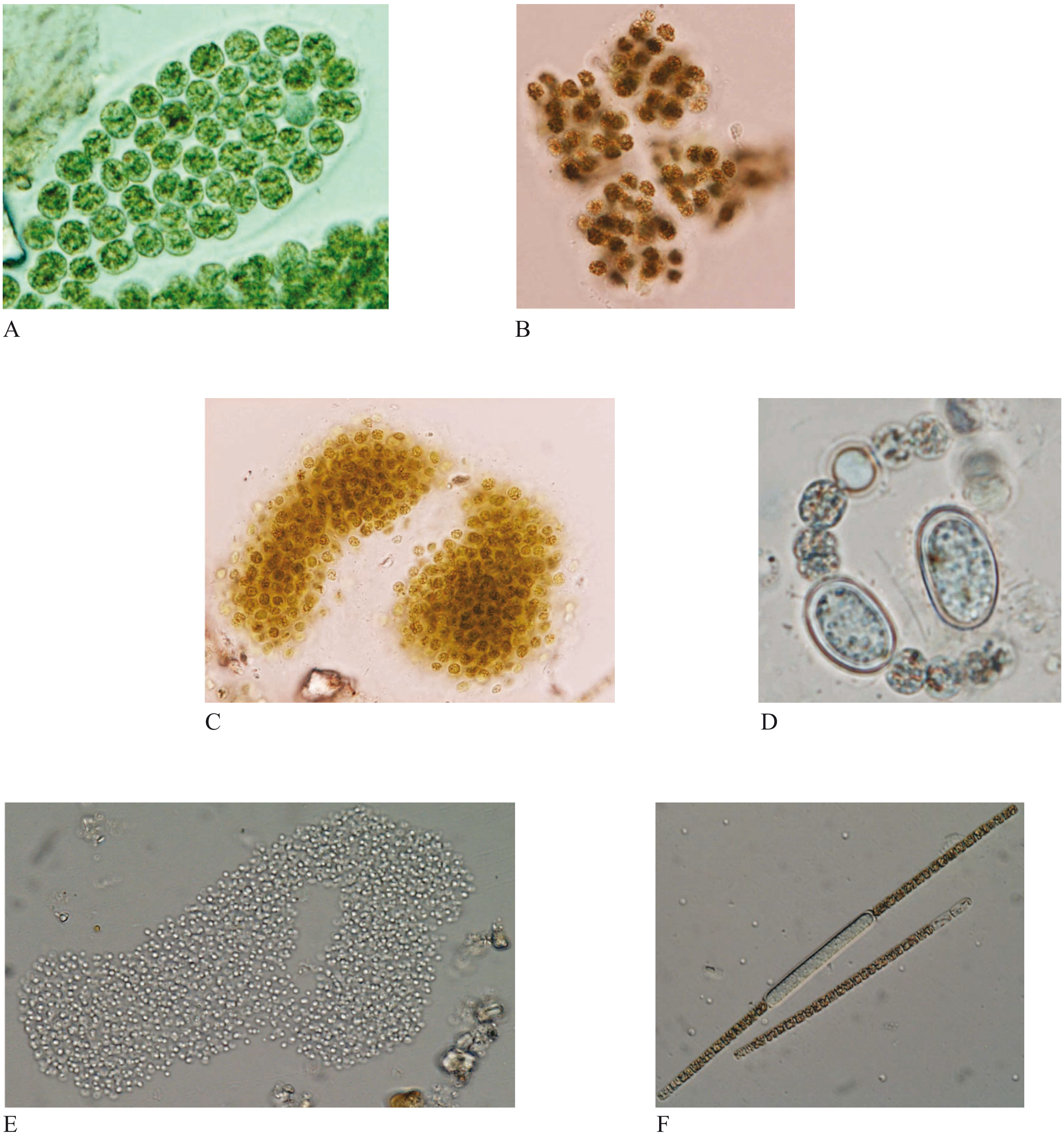
II: *Chemical characteristic of Zámecký, Růžový ponds and some part of the Dyje River (Stará Dyje and Nová Dyje)*

Locality	pH			Dis.Oxygen mg.l-1			Tot-P mg.l-1			NH_4 mg.l-1			NO_3^- mg.l-1			Chl-a µg.l-1			EC µS.cm-1			Refrence
	Min	Max	Avg	Min	Max	Avg.	Min	Max	Avg.	Min	Max	Avg.	Min	Max	Avg.	Min	Max	Avg.	Min	Max	Avg.	
Zámecký	7.0	8.9	8.2	3.6	13.3	8.3													475	563	523	Báňa, 1999
Zámecký	7.6	9.3	8.8	4.9	30.2	11.8													-	574	465	Báňa, 1999
Zámecký	8.2	9.2	8.9	6.7	17.4	12.3													473	585	537	Sukop, Kopp,2001
Růžový	7.1	9.0	8.1	3.3	15.7	8.3													435	598	544	Báňa, 1999
Růžový	7.4	8.6	7.9	3.2	9.2	5.2													533	679	592	Báňa, 1999
Nová Dyje	7.6	8.2	8.0	7.1	10.2	8.7	0.2	0.6	0.3	0.23	0.44	0.31	2.8	23.5	12.0	1.2	28.5	16.2				Marvan, Heteša, 2002
Stará Dyje	7.6	7.9	7.8	3.8	7.7	6.4	0.2	0.7	0.3	0.22	0.53	0.31	3.4	22.9	12.6	6.6	14.0	9.2				Marvan, Heteša, 2002



5: ***A.*** *Microcystis wesenbergii 400x;* ***B.*** *Microcystis viridis 400x;* ***C.*** *Microcystis aeruginosa 400x;* ***D.*** *Anabaena flos-aquae 400x;* ***E.*** *Aphanocapsa incerta 400x;* ***F.*** *Aphanizemenon klebahnii 400x*

SOUHRN

Diverzita fytoplanktonu a jeho sukcese ve vodách lednického parku v roce 2002

Společenstva fytoplanktonu byla studována v období od 22. dubna do 1. října 2002 na třech vodních biotopech v lednickém parku: v Zámeckém rybníku, v Růžovém rybníku a v řece Dyji, která oba rybníky napájí. Vzorky vody byly odebírány ráno mezi 8-9 hodinou ve 14 denních intervalech. Vzorky byly fixovány Lugolovým roztokem, konzervovány ve 4% roztoku formalínu a převezeny do laboratoře. Vzorky fytoplanktonu byly počítány za užití inverzního mikroskopu. Hodnoty teploty vody, pH vody a množství rozpuštěného kyslíku byly měřeny přenosným digitálním pH metrem a oxymetrem. Během sledování bylo zjištěno 317 druhů fytoplanktonu.

Silný rozvoj fytoplanktonu nastal v Zámeckém rybníku uprostřed léta v souvislosti s rostoucí teplotou vody. V této době docházelo k onemocnění ryb, občasným úhynům a nepříjemnému zapáchání vody. Slabší rozvoj fytoplanktonu pozorovaný v Růžovém rybníku a v řece Dyji nastal koncem léta. Hlavními druhy fytoplanktonu vyvolávajícími „vodní květ“ byly sinice: *Anabaena flos-aquae, Microcystis aeruginosa, M. ichtyoblabe, M. flos-aquae, M. wesenbergii.* Hodnoty rozpuštěného kyslíku kolísaly od 3,4 do 19,5 mg .l^{-1}, hodnoty pH kolísaly od 7,6 do 9,7. Průhlednost vody byla měřena Secchiho deskou, kolísala v Zámeckém rybníku od 0 do 65 cm, v Růžovém rybníku od 15 do 45 cm a v řece Dyji od 35 do 65 cm. Koncentrace celkového fosforu, dusičnanů a chlorofylu a v řece Dyji před vtokem do obou rybníků vykazovala silné (celkový-P = 0.3, NO_3^- = 12 mg.l^{-1}) zatížení živinami. Ačkoliv je řeka Dyje hlavním napájecím zdrojem obou rybníků, přítomnost zcela odlišných společenstev fytoplanktonu v obou rybnících naznačuje, že pravděpodobně existují různé zdroje živin, které vyvolávají rozdíly ve složení společenstev fytoplanktonu a eutrofizaci Zámeckého rybníka ve srovnání s Růžovým rybníkem.

fytoplankton, vodní květ, *Microcystis*, eutrofizace, lednický park, Česká republika

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