PHYSICO-CHEMICAL CONDITIONS AND AQUATIC MACROPHYTES IN FLOODPLAIN POOLS OF THE MORAVA RIVER

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Abstract

Selected abiotic factors in the aquatic environment and the presence of aquatic macrophytes were studied at two different pools in the floodplain of the Morava River, located in the Litovelské Pomoraví Landscape Protected area near Olomouc. The first pool is a typical periodic vernal pond, which dries up during the summer. The main abiotic factor influencing the growth of plants was the intensity of photosynthetically active radiant energy (PhAR). As the oxygen saturation of water decreased, we found an increase in pH and a decrease in the total mineral nitrogen in a longitudinal profile of the pool. The occurrence of water plants in the second pool, filled with water during the whole year, was influenced by the depth gradient. The greatest biomass (dry weight) of plants was observed at transects where the emergent vegetation occurred. These parts of the pool are in a limosal ecophase during most of the year.

Rulík, M., K. Rulíková, P. Hekera & V. Uvíra: **Physikochemische Bedingungen und aquatische Makrophyten in astatischen Autümpeln**

In zwei verschiedenen Tümpeln des Überschwemmungsgebietes der March im Landschaftsschutzgebiet Litovelské Pomoraví bei Olmütz wurden ausgewählte abiotische Faktoren und Wasser-Makrophyten untersucht. Der erste Tümpel ist ein typisches astatisches Gewässer, das im Sommer austrocknet. Der abiotische Hauptfaktor, welcher das Pflanzenwachstum beeinflußt, ist die PhAR-Intensität. Die Sauerstoffsättigung des Wasser nahm ab; ansteigende pH-Werte und eine Abnahme des mineralischen Gesamtstickstoffes wurden gemessen. Im zweiten Tümpel, der ganzjährig Wasser führt, wurde das Vorkommen von Wasserpflanzen durch den Tiefengradienten beeinflußt. Die größte Biomasse (Trockengewicht) der Pflanzen wurde in Transekten mit emerser Vegetation gefunden. Diese Tümpelabschnitte befinden sich fast ganzjährig in einer limnischen Ökophase.

Rulík, M., K. Rulíková, P. Hekera & V. Uvíra: **Fysikálne chemické podmínky a sladkovodní makrofyty v astatických, periodicky zaplavovaných oblastích**

Na dvou odlišných tůních v nivě řeky Moravy (CHKO Litovelské Pomoraví) byly sledovány vybrané abiotické faktory vodního prostředí a výskyt vodních makrofyt. První tůň byla typická periodická jarní tůň, která během léta vysýchá. Hlavním abiotickým faktorem ovlivňujícím růst rostlin zde byla intenzita PhAR. V podélném profilu tůně byl zjištěn úbytek nasycení vody rozpuštěným kyslíkem, vzrůst hodnot pH a pokles množství celkového minerálního dusíku. V druhé tůni, která je naplněna vodou po celý rok, byl výskyt rostlin ovlivněn hloubkovým gradientem. Největší biomasa (sušina) makrofyt byla nalezena na transektech s emerzní vegetací, které jsou po většinu roku v limosní ekofázi.

INTRODUCTION

Floodplains of big rivers are among the areas most influenced by human activities. The Litovelské Pomoraví Landscape Protected Area is one of the last well-preserved wetlands characterised by a high diversity of biotopes within the Czech Republic (BEDNÁŘ et al. 1978, ŠTERBA & BEDNÁŘ 1979, MEKOTOVÁ & ŠTERBA 1988, HUDEC et al. 1993).

Its small pools are one of the most interesting aquatic biotopes within the floodplain. Two types of pools can be distinguished - periodic pools, drying up during the summer and pools with water during the whole year. Both types are habitats with very special fauna, communities rich in both animal and plant species (HOLZER 1978).
The aim of our project was to contribute to the understanding of the main factors influencing the occurrence of these animal and plant communities within the pools.

LOCALITY AND METHODS

Two different study localities were chosen (Fig.1):

1) A periodic vernal pool near the village of Mladec. This locality is in the forest, filled by infiltrated water from an active parallel channel of the Morava River. The sampling of water and macrophytes was carried out at 5 transects. (Fig.2)
2) A perennial pool, near the village Horka at the right bank of Morava River. Four transects were chosen for sampling. (Fig.3)

For physico-chemical parameters we decided to observe dissolved oxygen, pH, N-NO_3, N-NO_2, N-NH_4, total mineral nitrogen, conductivity, redox potential at both stations and the intensity of photosynthetically active radiant energy (PhAR) at the pool near Mladeč. The values of PhAR were measured at 06, 10, 11, 12, 15 and 16 hours at each transect using the integrating phytoactinometer (KUBÍN et al. 1985). The depths across the transects at both pools were measured.

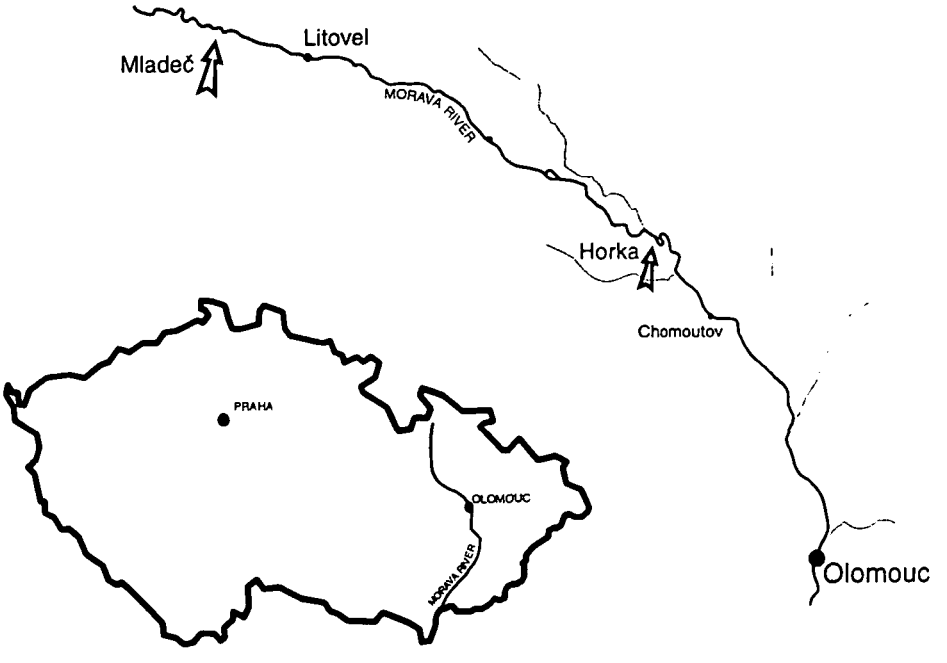

Fig. 1: Map of the Czech Republic with the Morava River. Arrows indicate the study area

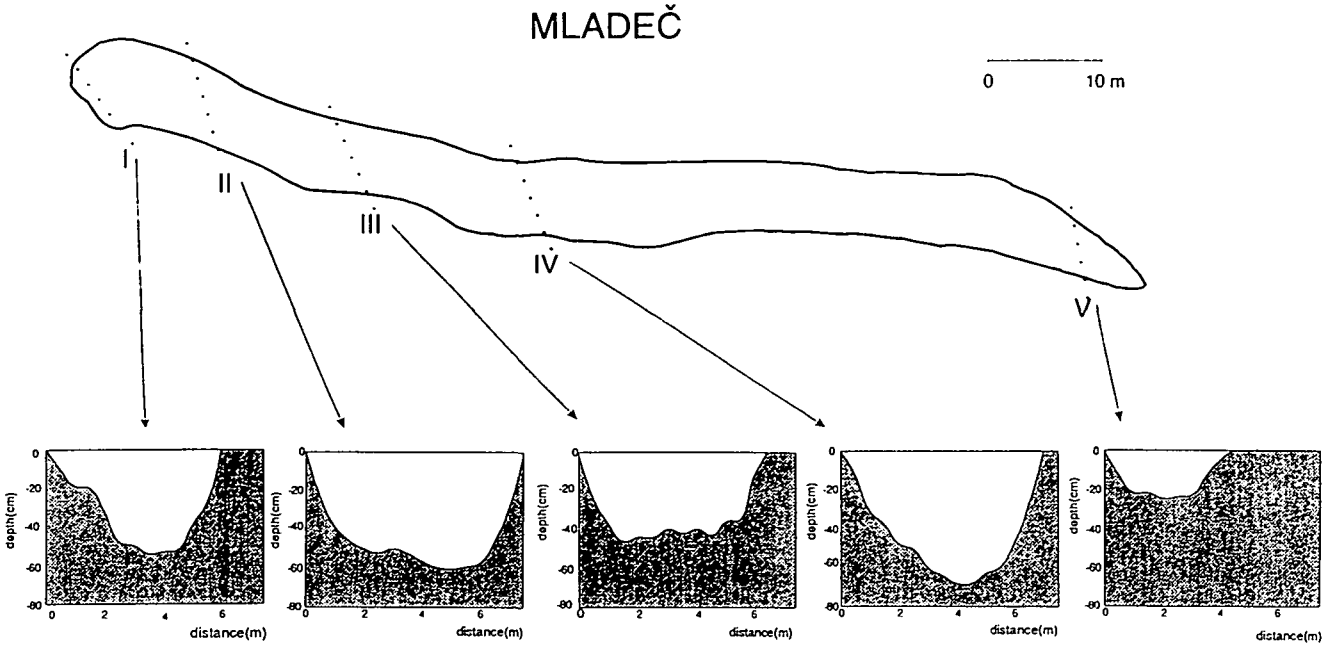

Fig. 2: Morphometric map of the periodic vernal pool near Mladeč.

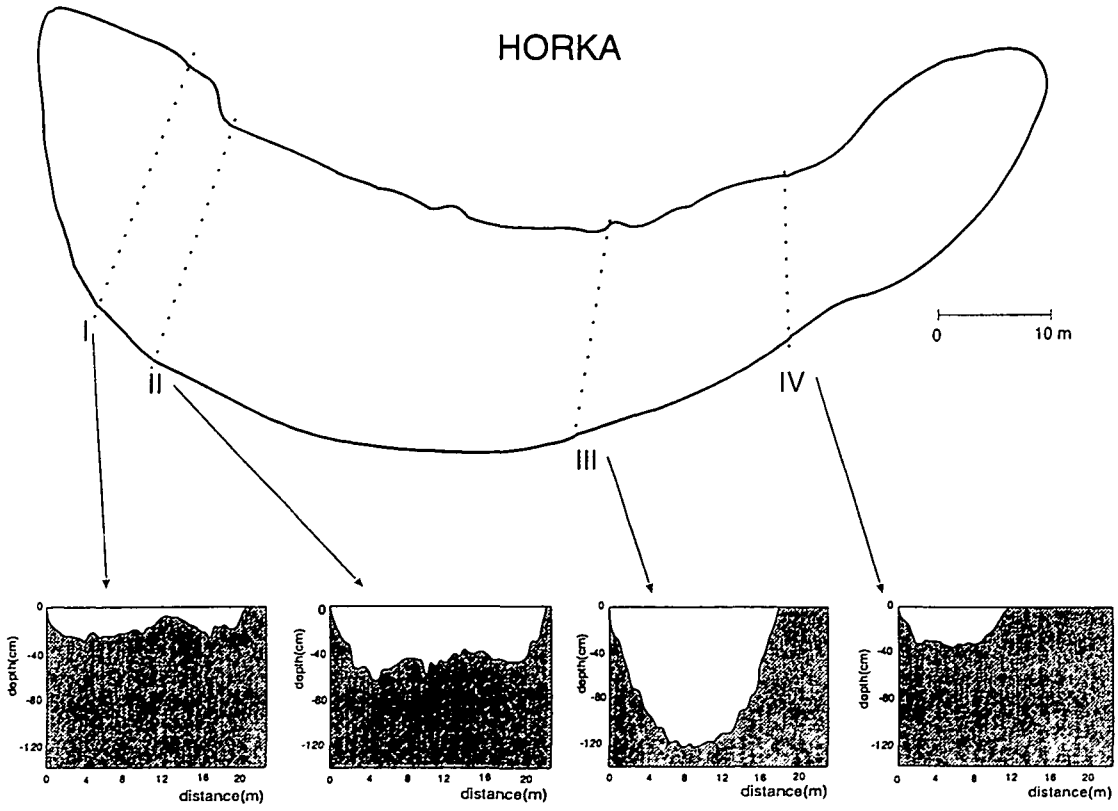

Fig. 3: Morphometric map of the pool near Horka

which allowed for sampling of plants together with associated macroinvertebrate fauna. Plant biomass was expressed as dry weight per m^2.

RESULTS

The occurrence of aquatic macrophytes in the periodic pool near Mladeč was observed at transects 1 and 3. The growths were composed of 2 species - *Allopecurus aequalis* and *Galium palustre*. At the first transect, plant biomass was almost five times higher (Fig.4.). The growth of these macrophytes was limited by PhAR intensity. Changes in PhAR intensity during the day are shown for all transects in Fig.4. The maximun intensity was found at 12 and 15 hours at the first transect while at the third transect the maximum was found at 11 hours. In addition at the fourth transect a relatively high PhAR intensity was observed but the occurrence of plants at this location was limited by deep water (Fig.2).

The second pool near Horka is situated at an open area not shaded by trees; that is why no gradient in PhAR intensity was found. The water depth is the main factor influencing the distribution of plant species in this pool. The first and fourth transects were situated in the shallow parts of the pool (Fig.3). For most of the year those parts are in a limosal ecophase and are characterized by the occurrence of emergent plants - *Rorippa palustris* and *Allopecurus aequalis*. At both of these transects higher plant biomass was found in comparison to the biomass found at transects 2 and 3. These sites were located in the deep part of the pool (Fig. 5.). They were in hydroecophase during the whole year and the submerged species *Elodea canadensis* and *Ceratophyllum demersum* occurred here (Fig.5.)

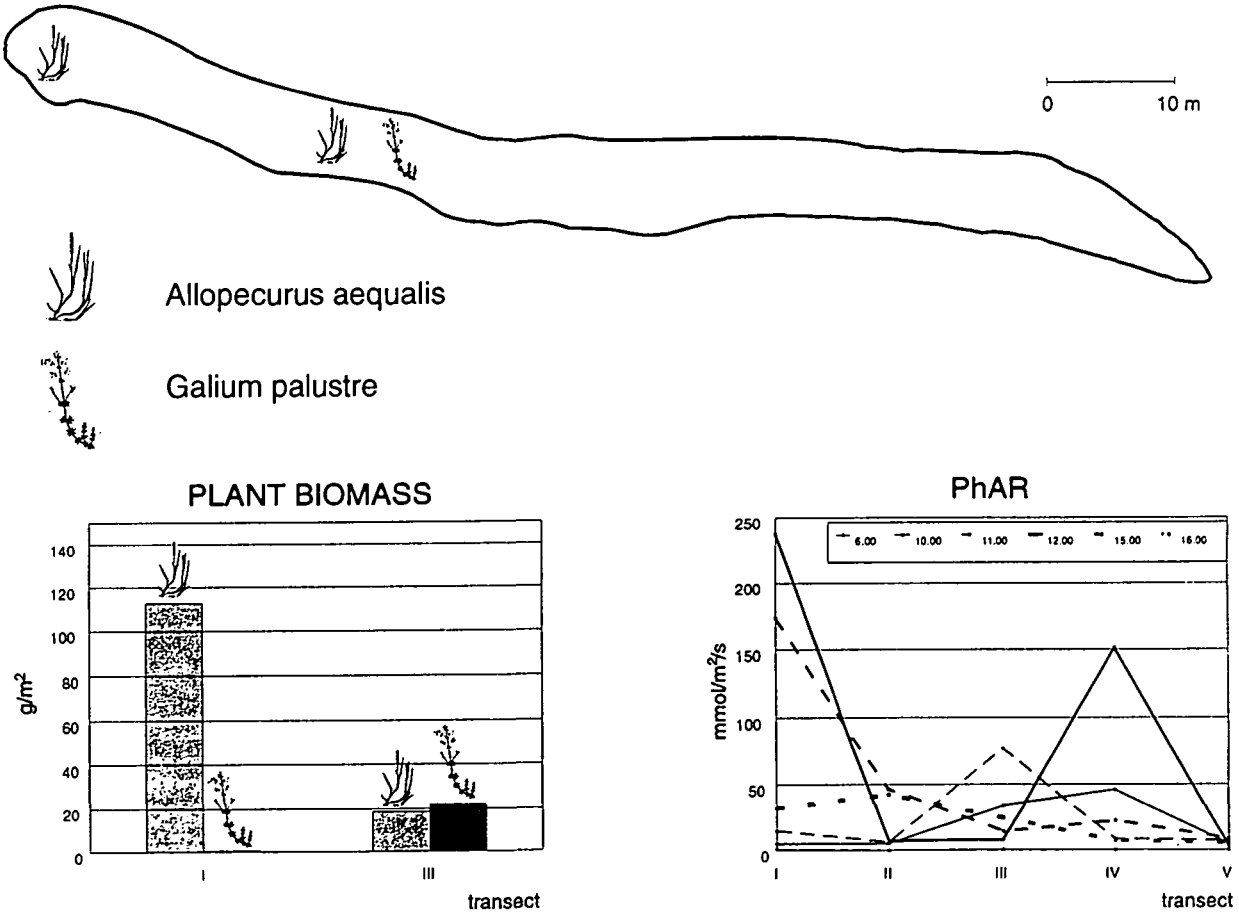

Fig. 4: The occurrence of aquatic macrophytes, their dry biomass and the PhAR intensity in the periodic vernal pool near Mladeč.

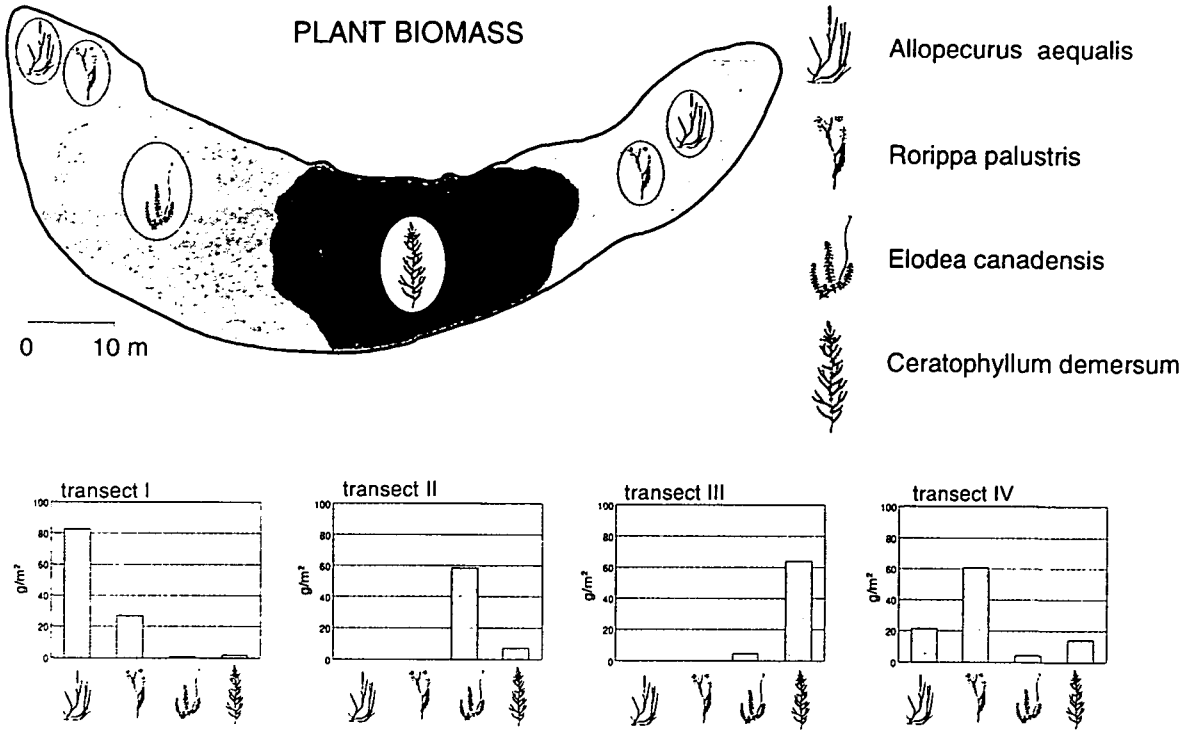

Fig. 5: The occurrence of aquatic macrophytes and their dry biomass in the pool near Horka.

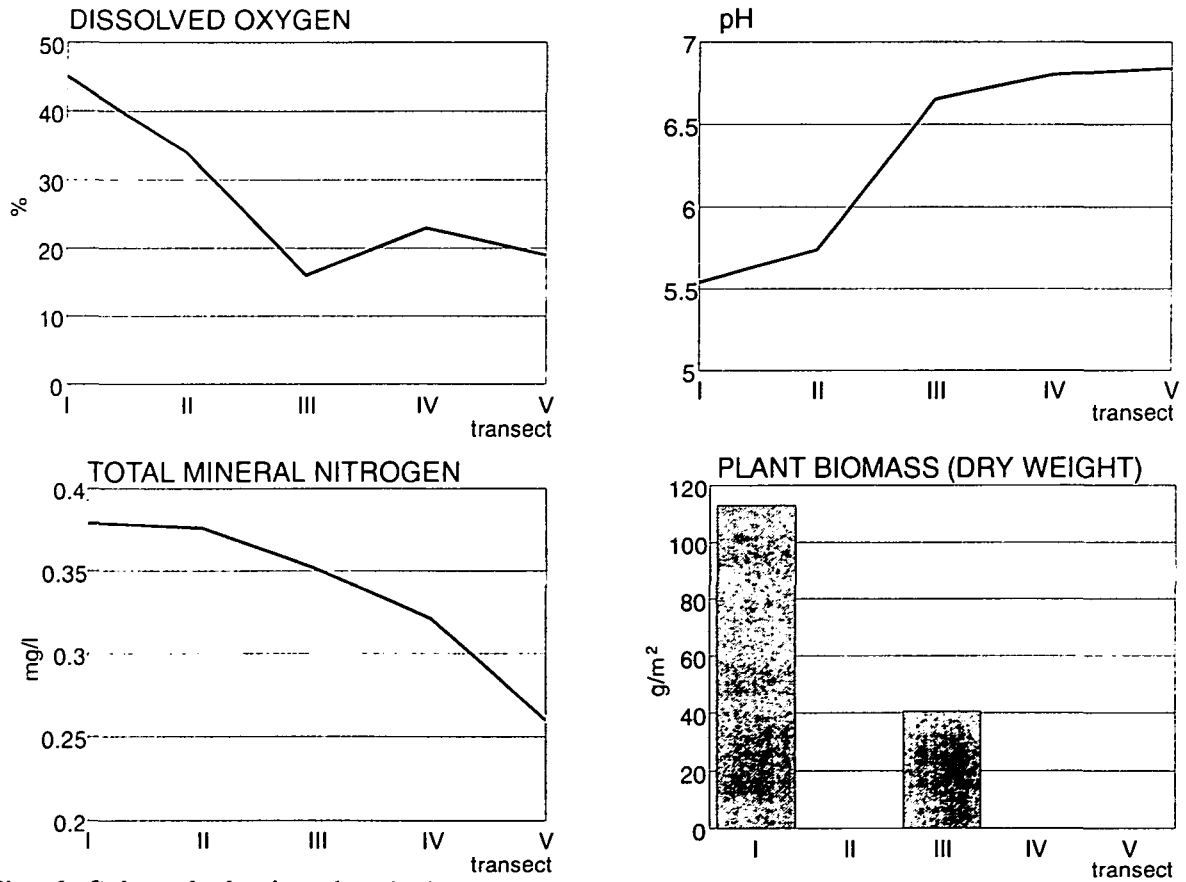

Fig. 6: Selected physico-chemical parameters and changes in their values in a longitudinal profile of the periodic vernal pool near Mladec.

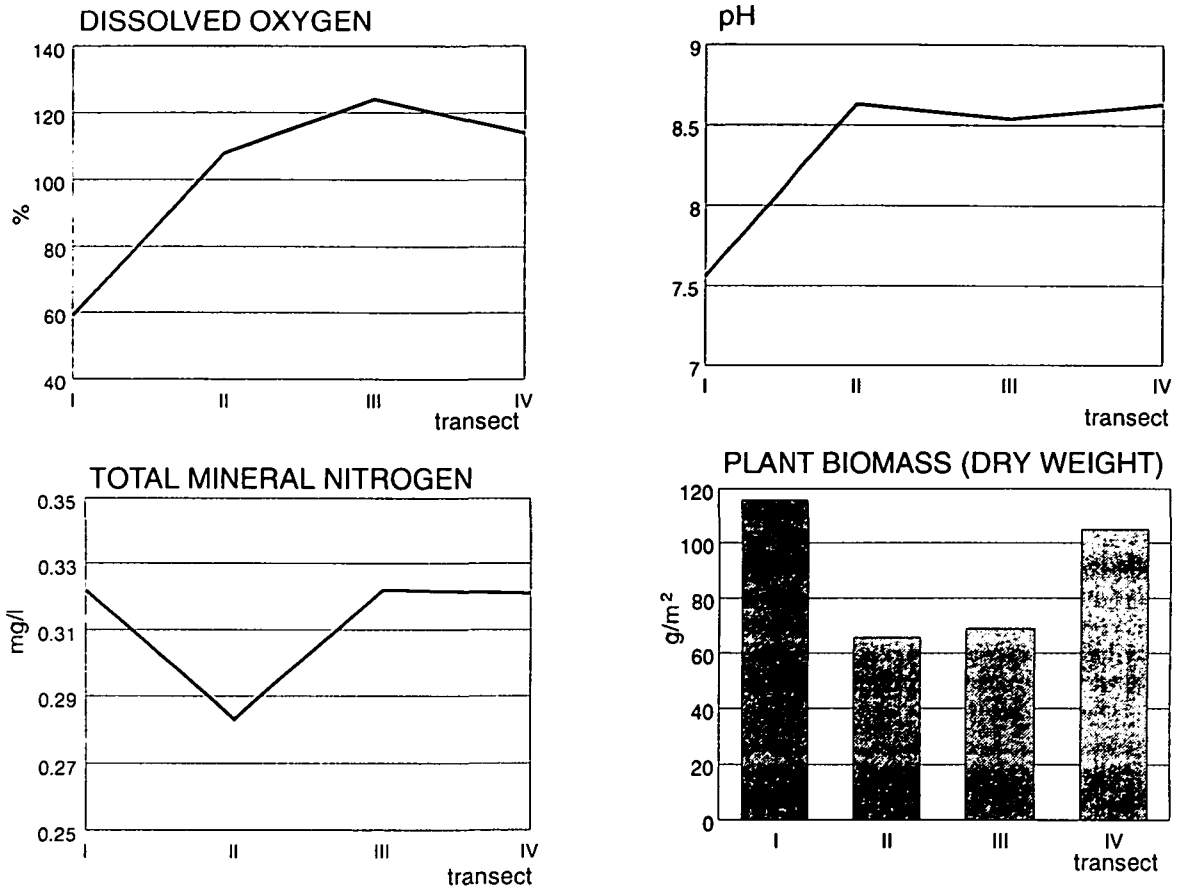

Fig. 7: Selected physico-chemical parameters and changes of their values in a longitudinal profile of the pool near Horka.

The 3 basic physico-chemical parameters, dissolved oxygen, pH and total mineral nitrogen, were selected for a hydrochemical characterization of water in the pools. Changes in their values are shown in longitudinal profile (Figs. 6. and 7). The comparison of oxygen and pH values at both localities demonstrates the importance of submerged vegetation. The chemical parameters of water are much more influenced by the metabolism of submerged vegetation than by the metabolism of emerged vegetation. In the pool near Mladeč, there is an interesting decrease in total mineral nitrogen caused presumably by its uptake by the plants and shown in longitudinal profile (Fig. 6).

These results were obtained in 1993 during the "Saving Czech Wetlands" investigation organized by Earthwatch. The results are preliminary, and are presented to show the basic characteristics and differences of the pools in the study area. To complete the investigation it will be necessary to continue this research both to verify the preliminary results and our hypothesis.

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