I. A. D.

Internationale Arbeitsgemeinschaft Donauforschung
der Societas Internationalis Limnologiae
S.I.L.

Limnologische Berichte
Donau 1997

Band I

WISSENSCHAFTLICHE REFERATE

Wien 1997

32. Konferenz der IAD, Wien – Österreich 1997
Wissenschaftliche Referate

Preliminary algological investigations in Soroksár-arm of River Danube

Barreto, S., Ács, É., Makk, J., Bugyi, G., Böddi, B.

INTRODUCTION

The Soroksár-arm of the River Danube is a frequented recreation region, due to the vicinity to the capital of Hungary. Moreover it plays an important role in providing the appropriate amount of water for the agriculture and industry of the region, also by diverting diverting excess water and admitting the 50 % of cleaned sewage of Budapest (Gráczer 1995). The Central-Danube Region Water Authority, afterwards the Environmental Protection Inspectorate has examined the Soroksár-arm for more than 20 years, in two weeks frequency. Their algological studies concerned only the phytoplankton. Periphyton investigations in this side-arm were done in the 60s. Cholnoky (1922) was the first who examined the algae here, though his reasarches concerned only diatoms. Halász (1935, 1937) collected 57 samples at 10 different places of a 9 km reach of the arm. She studied the psammon, epilithon, reed-periphyton and phytoplankton. She found altogether 223 taxa (from these 141 were diatoms). Palik (1961) investigated the algal vegetation of concrete elements of Soroksár-Danube. Phytoplankton investigations were carried out by Kiss (1993), too.
In this side-arm we started to study the vertical distribution of reed-periphyton in November 1996, completed with phytoplankton investigations and the chemical analysis of water.

MATERIAL AND METHODS

Study site: The Soroksár-Danube is the second largest branch of the Hungarian reach of the river. Its catchment area is 1800 km^2, largely flatland character, the water surface is 14 km^2, length 58 km, the falling of its water level is 10-30 cm, the current velocity is 0,1 m s^{-1}, so practically, it is standing water. In still water the suspended matter (coming from main arm) settles, the transparency of the water is high, the side-arm is transparent generally to the

bottom. The water level of the side-arm is regulated, independent from the water level of the main arm. The Soroksár-arm is closed down with locks at its lower and upper end. The water supply (maximum 50 m^3 s^{-1}) from the main arm is continuous and happens through lock Kvassay (Gráczek 1995). The water exchange is 1.5-2.5 weeks in the irrigation season and 3-5 weeks in the other part of the year.

Our sampling point is located at Taksony, the middle part of the side-arm, at the 38th river km, where there is an extensive reed-belt (Map 1).

Methods: The samples were collected on 19 November 1996 and 23 January 1997. In January the side-arm was covered with 15 cm thick ice, so a hole was cut in the ice to obtain the samples. For periphyton investigations stems were cut just above the river bottom and at the water surface (0 cm), in five replicates. The stems were sliced into 5 cm long pieces and periphyton was washed into water of known volume, which was subsequently split into two parts. One half of them was used for chl-a measurement (Goodwin 1976), the other half was used for taxonomic determination, using the Utermöhl (1958) method, taking the statistical errors (Lund et al. 1958). Samples were also taken for water chemical analysis and phytoplankton investigations.

Scanning electron microscope (SEM) has been used for definite descriptions of the three-dimensional organization of microcommunities on the surfaces of reed samples. The reed-stems were cut into 0,5 cm^2 pieces and prepared according to Gilmour et al. 1993.

RESULTS AND DISCUSSION

According to phytoplankton investigations and chemical analysis, the water of the Soroksár-arm was eutrophic in both sampling times. Due to the higher organic matter concentration and the inhibited oxigen-diffusion caused by the ice-covered surface, the COD, the ammonia, the nitrite and nitrate concentrations had considerably higher values in January than in November (Table 1).

The number of individuals and the chl-a concentration were the highest on the 10-20 cm section of the reed-stem in November and the 20-25 cm section in January and decreased more or less evenly toward the bottom (Fig. 1). The deviation in January is caused by the ice-

covering. Considering the samples of November, the low density of algae and chl-a concentration on the uppermost 10 cm section of reed-stems are in relationship with the average fluctuation of the water-level of the side-arm (Table 2). The proportion of dead-cells in the samples was 10% on an average, except the uppermost 5 cm of the stems, where this value was extremely high (52%), which refers to the extreme circumstances for algae. Buczkó & Ács (in press) found similarly high values to these on the 0-5 cm section of reed-stems in lake Fertő. In the periphyton samples taken in November and January the diatoms were strongly dominant in all dephts (Fig. 1). Similary, the 64% and 77% of total density in phytoplankton samples (2070 ind ml^{-1} in November and 11700 ind ml^{-1} in January) were diatoms which is connected to the season (Kiss & Genkal 1993, Ács & Kiss 1991).

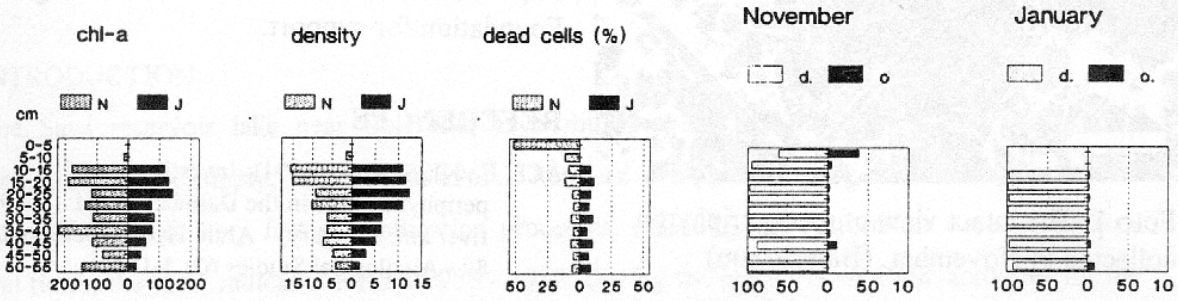
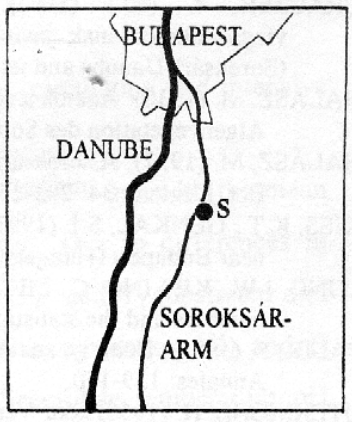


Fig. 1. The distribution of chlorophyll-a content (μg cm^{-2}), density (10^5 cells cm^{-2}), the proportion of dead cells (%), diatoms (%) and other algae (%) in reed periphyton samples (Abbreviations: N=November, J=January, d.=diatoms, o.=others).

Table 1. Some chemical and physical parameters of water.

	19.11.1996	23.01.1997
Conductivity (mS cm^{-1})	0.51	0.79
COD_P (mg l^{-1})	3.84	5.28
NO_2^- (mg l^{-1})	0.22	1.1
NO_3^- (mg l^{-1})	11.4	16.6
NH_4^+ (mg l^{-1})	1.4	4
pH	7.95	7.26
Secchi transparency (cm)	>63	15 cm ice
water temperature C°	10.4	1
water depth (cm)	63	56+15



Map 1. S= Sampling point

The SEM investigation of the three-dimensional organization of microcommunities on the surfaces of reed samples revealed the presence also of many *Vorticella sp.* species in periphyton (Foto 1.)

Table 2. The values of water level of Soroksár-arm at Dunaharaszti (maA=meter above Adria)

	min. (maA)	max. (maA)	change in vater level (cm)
19. oct. - 19. nov.	96.91	96.99	8
23. dec.- 23. jan.	96.75	96.94	26

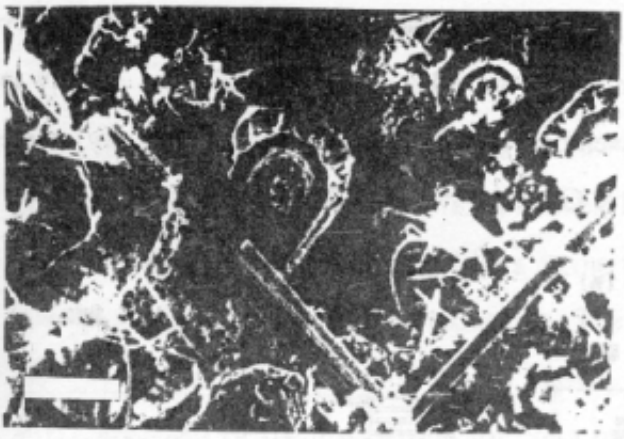


Foto 1. The intact view of reed-periphyton collected in November. (Bar=50 µm)

ACKNOWLEDGEMENT

The authors express their thank to László Papanek for the data on water level and to the Pro Renovanda Culturae Hungariae Foundation for support.

REFERENCES

ÁCS, É., KISS, K. T. (1991): Investigation of periphytic algae in the Danube at Göd. (1669 river km, Hungary) - Arch. Hydrobiol. Suppl. 89 - Algological Studies 62: 5-19.

BUCZKÓ, K., ÁCS, É. (in press): Vertical distribution of periphytic algae in two Hungarian shallow lakes (Lake Fertő and Velencei) - in press: BFB Bericht

GILMOUR, A., WILSON, A.B., FRASER, T.W. (1993): Microbial adherence to food contact surfaces. - In: DENYER, S.P., GORMAN, S.P., SUSSMAN, M. (eds.): Microbial biofilms: formation and control. - Blackwell Scientific Publications. Oxford. pp. 239-313.

GOODWIN, T.W. (ed.) (1976): Chemistry and biochemistry of plant pigments. - London. pp. 235.

GRÁCZER, I. (ed.) (1995): Regionális program a Ráckevei (Soroksári)-Duna és környezete vízgazdálkodásának javítására [Regional program for reparing of water management in Ráckeve (Soroksár)-Danube and its surrounding.] - manuscript pp. 53.

HALÁSZ, M. (1936): Adatok a soroksári Dunaág algavegetációjának ismeretéhez. (Daten zur Kenntnis der Algenvegetation des Soroksárer Donauarmes.) - Bot. Közlem. 33/1: 139-181.

HALÁSZ, M. (1937): A soroksári Dunaág Bacilláriái I. (Die Bacillariaceen der Soroksárer Donauarmes I.) - Bot. Közlem. 34: 202-222.

KISS, K.T., GENKAL, S.I. (1993): Winter blooms of centric diatoms in the River Danube and in its side-arms near Budapest (Hungary). - Hydrobiol. 269/270: 317-325.

LUND, J.W., KIPLING, C., LECREN, E.D. (1958): The inverted microscope method of estimating algal numbers and the statistical basis of estimations by counting. - Hydrobiol. 11:143-170.

PALIK, P. (1961): Beiträge zur Algenvegetation an den Betonbauten in der Donau. - (Danub. Hung. X.) Annales: 139-150.

UTERMÖHL, H. (1958): Zur Vervollkommnung der quantitativen Phytoplankton-Methodik. - Mitteil. Intern. Verein. Theoret. Angewandte Limnol. 9:1-38.

Address: Sára BARRETO, Dr. Éva ÁCS and Judit MAKK Dept. of Microbiology., Dr. Béla BÖDDI Dept. of Plant physiology, Faculty of Natural Sciences, Eötvös Loránd University, H-1088 Budapest, Múzeum krt. 4/a, Gabriella BUGYI Water works of Budapest, H-1044 Budapest, Váci út 121, HUNGARY.