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BACTERIOLOGICAL AND ALGOLOGICAL INVESTIGATION OF THE BAY AT ABÁDSZALÓK (KISKÖRE RESERVOIR)

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Abstract

The paper is showing the bacteriological and algological results of the investigations concerning the future Kisköre Reservoir oberflowed by inundations.

Introduction

The major inundations of the Tisza fill up the future Kisköre Reservoir and even after the flood had passed, some larger isolated water spaces are left over. In 1974, we carried out on two occasions the investigation of the — about 12 sq.km large — bay at Abádszalók, filled up from the Reservoir by the summer and autumn floods. Owing to the peculiar situation of the bay, after its being filled, the alluvial Tisza water flowing at one end of it did not mix with the water of the bay. The bay water has clarified in spite of the flooding river and the two water types could be compared with each other. In addition to the bacteriological and algological investigations we performed hydrochemical (VÉGVÁRI *et al.* 1975) and zoological (BANCSI 1975) investigations, as well.

Method

The examination of the total bacterium number was carried out with membrane-filter procedure (FELFÖLDY 1974). At counting *Planctomyces bekefii* GIM. and at the algological investigations we applied Utermöhl's technique. The measuring of chlorophyll content took place with methanol solution (FELFÖLDY 1974). The surface samples were taken from the middle of the bay of about four metre depth. The total bacterium number was carried out by I. BANCSI, the determination of chlorophyll content by MÁRIA B. TÓTH, and placed at our disposal. I wish to express my thanks to them for their generous help.

Results

The investigation of the summer flood, and the period following that, lasted from July the 2nd till August the 27th. In spite of the intensive biological life, the total bacterium number (9 to 28 million ind./ml) was lower in the bay than in the flooding Tisza (17—80 million ind./ml) because the suspended matter of the flooding Tisza comes from soil erosion and has, therefore, a high organic-matter content.

Planctomyces bekefii GIM., that indicates eutrophic water (HAMAR 1975), was missing from the flooding Tisza during the two mounths investigated; at the same time, it often occurred in the bay in an order of magnitude of several millions. At the inundation of the bay the individual number of *Planctomyces* is high (2.5 million ind./l), later it decreases, increasing again only at the subsequent isolation of the water space (4.8 million ind./l).

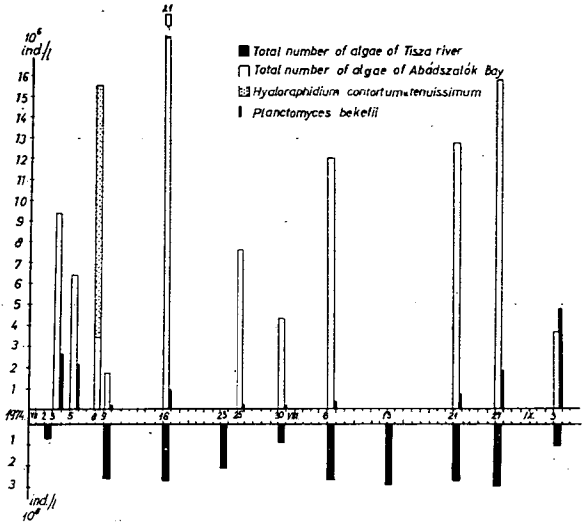

Fig. 1. Dynamism of the algae of the Tisza and of the bay at Abádszalók
Total alga count of the Tisza
Total alga count of the bay at Abádszalók

In the bay filled in with the water of the flooding Tisza, a quick change in the algal stand of river water took place as a result of the slower water motion and the silting of the suspended matter (VÉGVÁRI 1975). The summer limnoplanktonical stand is similar to that found in the impounded Tisza at the Kisköre River Barrage in the time of summer damming (HAMAR 1975). At the same time, in the water of the flooding Tisza, flowing at one end of the bay, a potamoplanktical stand of low species and individual number was found (Fig. 1, Table 1).

The number of alga taxons is of the following distribution:

	Bay at Abádszalók	Tisza
Cyanophyta	6	2
Euglenophyta	9	3
Pyrrophyta	8	4
Chrysophyceae	10	3
Bacillariophyceae	14	10
Chlorophyta	31	17
Total	78	43

The most characteristic species are: *Nitzschia acicularis* WW. SMITH, *Stephano-*

discus tenuis HUST., *Chrysococcus biporus* SKUJA, *Ankistrodesmus falcatus* (CORDA) RALFS, *Ankistrodesmus acicularis* (A. BR.) KORSCH. In the initial period also the species inducing algal bloom were present, as *Aphanizomenon flos-aquae* (L.) RELFS, *Microcystis aeruginosa* KÜTZ., *Euglena proxima* DANG. (Table 1). There occurred some rare species, as well: *Achronema articulatum* SKUJA, living in strongly polluted waters (HAMAR 1970—1971), *Chroomonas acuta* GEIT., *Cryptomonas marssonii* SKUJA, *Cryptomonas platyuris* SKUJA, *Cryptomonas pusilla* BACH., *Chrysidalis peritaphrena* SCHILLER, *Dinobryon elegantissimum* (KORSCH.) BOURR., *Dinobryon suecicum* LEMM., *Kephyrion tubiforme* FOTT, *Rhizosolenia longiseta* ZACH.

In the dammed bay, the suspended matter settled, the food content of the Tisza water became available and together with the food dissolved from the soil it assured the quick development of phytoplankton. In this way, the initial total alga number of the bay (July 3) is 9.3 million ind./l, with the dominance of green algae (62.1 p. c.) and diatoma (26.3 p. c.). Later on, the decrease in alga number was broken by the high individual number (12 million ind./1) of a colourless green alga: *Hyaloraphidium contortum* var. *tenuispinum* KORSCH., showing thus the heterotrophic way of feeding pushing forward (78 per cent of the total alga number). The decrease in algal number (July 9) is followed by an explosion-like invasion (July 16), the total alga number is 21.6 million ind./1, with the dominance of *Ankistrodesmus facatus* (CORDA) RALFS, *Chrysococcus biporus* SKUJA, and *Nitzschia acicularis* W. SMITH. Later on, in the course of the investigation period, the algal number was varying high (3.7 to 15.7 million ind. /l)invariaby with the dominance of green algae and diatoma.

After the flood the water of bay was isolated and the considerable sinking of the water level induced food-concentration and algal bloom. We have observed the algal bloom of the blue algae *Anabaena flos-aquae* BRÉB. On the bottom dried, we have found *Cladophora* and *Spirogyra* fields among the dense stands of *Schoenoplectus lacustris* (L.) PALLA that developed in the meantime explosion-like.

The change in the chlorophyll content is similar in its tendency to the dynamism of algae. The initial high value (67 mg/cc.m) quickly declines (16—18 mg/cc.m), then it shows permanently a high value (47—154 mg/cc.m). At the same time, the values of the Tisza measured simultaneously reach maximum 20 mg/cc.m, but generally they are lower (4—10 mg/cc.m).

In Autumn, the bay was inundated again. The investigation of the autumn flood and of the winter period following that lasted from October the 23rd till December the 17th. The total bacterium number of the flooding Tisza and flooded bay was high (120 million ind./ml or so). After the sedimentation following the flood, the values are lower (70—40 million ind./ml). In the winter water of the isolated bay (December 17) the bacterium number was unusually high (294 million ind./ml). *Planctomyces bekefii* GIM. did not occur in the period investigated.

In the flooded bay and the flooding Tisza, as well, the total algal count is low (Table 2).

After the sedimentation of the suspended matter, in spite of the winter period, there developed an algal stand of high number (on December 17th: 5.3 million ind./l). The limnoplanktonical elements dominated. The individual count of *Chrysococcus biporus* SKUJA, *Cryptomonas pusilla* BACH., and *Stephanodiscus tenuis* HUST. is considerable. The tendency of the total algal count is followed by the changes in the chlorophyll content.

It is shown by the investigation of the flood-induced alluvial deposit in the area of the future reservoir that, after the actual sedimentation, the eutrophic state will be materialized to all probability.

Table 1. *Summer and early-autumn*

Species	July 3		July 5		July 8		July 9	
	ind./l	%	ind./l	%	ind./l	%	ind./l	%
Achronema articulatum SKUJA	30							
Aphanocapsa elachista W. et G. S. WEST			6				60	
Aphanizomenon flos-aquae (L.)RALFS	60		60		60		12	
Lyngbia limnetica LEMM.			30					
Microcystis aeruginosa KÜTZ.	30							
Oscillatoria spp.							30	
Cyanophyta total	120	1,3	96	1,5	60	0,4	102	6,0
Euglena acus EHR.								
E. proxima DANG.	60		30		6			
Lepocinclis fusiformis (CARTER)LEMM.								
L. texta v. *salina* (FIRTSCH)POPOVA								
Phacus parvulus KLEBS								
Phacus spp.								
Strombomonas fluviatilis (LEMM)DEFL.								
Trachaelomona hispida v. *marcopunctata* SV.	6		60				6	
Tr. hispida v. *punctata* LEMM.	6		24					
Tr. volvocina EHR.	60		60				30	
Trachaelomonas spp.								
Euglenophyta total	132	1,4	174	2,7	6	0,04	36	2,2
Chroomonas acuta UTERM.								
Cryptomonas erosa EHR.	270							
Cr. marssonii SKUJA	60							
Cr. ovata EHR.	300						6	
Cr. platyuris SKUJA								
Cr. pusilla BACH.			6					
Ceratium hirundinella(O. F. MÜLLER)BERGH								
Gymnodinium sp.	6				12			
Periidinium aciculiferum LEMM.			6					
Pyrrophyta total	636	6,8	12	0,2	12	0,1	6	0,4
Chrysidalis peritaphrena SCHILLER	90		6					
Chrysococcus biporus SKUJA			30				30	
Dinobryon bavaricum IMHOF								
D. elegantissimum (KORSCH.)BOURR.	30		6		6			
D. divergens IMHOF	30							
D. suecicum LEMM.	30							
Kephyrion tubiforme FOTT			30					
Mallomonas caudata IVANOFF	6		30		60			
Synura uvella EHR.	6		30					
Chrysophyceae total	192	2,1	132	2,0	66	0,4	30	1,8
Asterionella formosa HASSAL	30		6		6			
Atteya zachariaschii BRUN					6			
Cyclotella compta (EHR.)KÜTZ.	30		30				12	
C. meneghiniana KÜTZ.	150		120		60		90	
Melosira distans (EHR.)KÜTZ.	30		6					
M. granulata v. *angustissima* MÜLL.	150							
Nitzschia acicularis W. SMITH	1200		930		300		180	
N. actinastroides (LEMM.)GOOR	180		120		90			
N. palea (KÜTZ.)SMITH	30		12					
Nitzschia spp.	210		210		180		30	

phytoplankton in the bay at Abádszalók (10^3ind./l)

July 16		July 25		July 30		August 6		August 21		August 27		September 3	
ind./l	%	ind./l	%	ind./l	%	ind./l	%	ind./l	%	ind./l	%	ind./l	%
						60				30			
						60		180		180		90	
										30			
120		30				120		30		90			
				30						36		6	
120	0,6	30	0,4	30	0,7	240	2,0	210	1,7	366	2,3	96	2,6
						30				390		60	
90		60		12		330		240		510		30	
										240			
60				120		90				120		30	
						120		210				90	
						90				270			
60										120			
				12		30		60		30			
6				30									
220				120		840		1350		1440		390	
120		30		120		30		150		510			
1056	4,9	90	1,2	414	9,6	1560	13,0	2010	15,8	3620	23,0	600	16,1
		60		60									
30		60				60							
120		390				150						150	
90		540		120		180		90				30	
		30										6	
						90							
												6	
6				30		30						30	
												30	
246	1,1	1080	14,2	200	4,6	510	4,3	90	0,7	—		252	6,8
								30					
3450		570		330		1380		1620		2100		540	
										180			
				30		30				180			
				30						240			
				30						30			
3450	16,0	570	7,5	420	9,7	1380	11,4	1650	13,2	2730	17,4	540	14,5
				60								6	
				30									
60				120				30					
										30		270	
		6				30		30					
3000		1320		480		300		450		120		60	
				60				90					
		30		30		30							
180		570		120		540		420					

Table 1.

Species	July 3		July 5		July 8		July 9	
	ind./l	%	ind./l	%	ind./l	%	ind./l	%
Rhizosolenia eriensis H. L. SMITH								
Stephanodiscus tenuis HUST.	330		900		240		90	
Synedra acus KÜTZ.	90		90		60			
S. ulna (NITZSCH.)EHR.			6					
Bacillariophyceae total	2460	26,3	2460	38,3	942	6,0	402	23,8
Actinastrum hantzschii v. *gracile* ROLL			90		30			
Ankistrodesmus acicularis (A. BR.) KORSCH.	60				60		30	
A. falcatus (CORDA)RALFS	2280		2100		1380		660	
A. falcatus v. *setiforme* NYG.	60		30		30		30	
A. longissimus f. *septatum* CHOD.	6		6					
Chodatella quadriseta LEMM.					60			
Coelastrum microporum NAEG.			6				30	
Crucigenia apiculata SCHMIDLE	6		6					
Cr. tetrapedia (KIRCH.)W. et G. S. WEST			60		30			
Dictyosphaerium pulchellum WOOD	840		330		240		120	
Didymocystis planctonica KORSCH.					30			
Elakatothrix lacistris KORSCH.								
Hyaloraphidium contortum v. *tenuispinum* KORSCH.					12000			
Kirschneriella arcuata G. M. SMITH	270		150					
Micractinium pusillum FR.	6		90		6			
Oocystis borgei SNOW			30		30		30	
Pediastrum boryanum (TUPR.)MENEGH.			6					
P. duplex MEYEN								
Scenedesmus acuminatus (LAGERH.)CHOD.	30		6		30		30	
Sc. brevispina v. *bicaudatus* HORTOB.	30				60			
Sc. denticulatus v. *linealis* HANGS.								
Sc. ecornis (RALFS)CHOD.	30							
Sc. intermedius CHOD.			30					
Sc. quadricauda (TRUP.)BRÉB.	60		60					
Selenastrum minutum (NAEG.)COLLINS	210		60					
Tetraedron minimum (A. BR.)HANGS.			30					
Tetrastrum glabrum (ROLL)AHL. et TIFF.	30		90		150			
Chlorococcales spp.	840		300		300		120	
Carteria cordiformis (CARTER)DILL	90							
Chlamydomonas globosa SNOW	240							
Ch. reinhardii DANG.	690		60		120		60	
Closterium acutum BRÉB.	6							
Volvox aureus Ehr.	6							
Chlorophyta total	5814	62,1	3540	55,3	14556	93,06	1110	65,8
Total number of algae	9354	100	6414	100	15642	100	1686	100
Planctomyces bekefii GIM.	2640		2103		120		90	

July 16		July 25		July 30		August 6		August 21		August 27		September 3	
ind./1	%	ind./1	%	ind./1	%	ind./1	%	ind./1	%	ind./1	%	ind./1	%
										30			
300		240		480		360		150		300		270	
										30			
		6		12		30							
60		30						90		60		30	
3600	16,7	2202	28,9	1392	32,3	1290	10,8	1260	9,9	570	3,6	696	18,7
								330		930			
210		30		120		540		810		150		30	
9600		1980		600		2290		810		810		540	
		240		60		150		210		390		30	
		30		30				30		60			
60								90		540		30	
180						60		30		300			
450		30		120		450		180		60		6	
30		120						90		180		180	
30		120				90		180		180		120	
390		120		60		480		900		1890		120	
330		60		120		750		120		180		60	
120						30							
				30						90			
360				120		180		1800		210		60	
				30		30				60			
		30		30		30		30					
30						30		60					
150		120		60		120		180		90			
30				60		150		60					
		6											
210		60		60		240		150		180			
180		30				120		270		150		90	
120						90		90		30		90	
120				120		90		180		30			
30		120		30		150		90					
390		540		120		870		690		1800		330	
		30								6		30	
60		60		60		60		180		240			
										60			
13140	60,7	3636	47,8	1860	43,1	7020	58,5	7470	58,7	8436	53,7	1536	41,3
21612	100	7608	100	4313	100	12000	100	12690	100	15732	100	3720	100
900		90		30		330		690		1860		4800	

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