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ALGOLOGICAL INVESTIGATIONS IN THE WATERS OF THE TISZA BASIN AT ALPÁR

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Abstract

The algological investigations of the waters at the Alpár basin were continued further in 1982 since the area will be a part of the Tisza—III River Barrage water-basin. During the course of the year a total of 174 species or taxon within this could be determined. Four algal blooms also occurred, and mainly through these, the role of the factors influencing the algal associations could be studied. The one-sidedly antagonistic effect of the blue algae, *Aphanizomenon flos aquae* and *Microcystis aeruginosa,* was particularly striking. The mass production of these could be manifested in every biotop. The algal blooming of *Euglena sanguinea* and *E. polymorpha* repeatedly proved that the *Euglenophyton* species are able to produce enormous mass productions in the dung-polluted waters. According to our physiological studies the cell division of *E. sanguinea* was greatly promoted by pea brew fostering soil enriched with a low amount of ascorbic acid. In the green mass production of this organism, in the region of the cell centre, 3—4 deep-red haematochrome clods were detectable in 10—15% of the individuals. These disappeared within 2—3 hours upon illumination, and reappeared on the occasion of darkening. The author of this paper as well as others have observed the occurrence of this organism in Hungary several times.

Introduction

As a part of the complex investigations started in 1982, studies on the waters of the Tisza basin at Alpár were continued further from algological point of view. Earlier, between 1975—1978, only the algal wordl at the Northern section of the backwater near the village Tiszaalpár was analysed. This was compared to the algal world of the backwater near the village Tiszaug by means of simultaneous studies (KISS 1979), since the complex evaluation can only become complete if the earlier results are also complemented with the algological studying of the other waters at this area. These circumspect studies are mainly reasoned by the fact that this area will become part of the Tisza—III River Barrage water-basin, and the management as well as rational utilization of the water-basin also require the knowledge of the former natural aspect.

In connection with the building of the water-basin the circumstance is noteworthy that certain parts of this area appear to be of sodificating nature. This was also observable by the outstanding biologist REZSŐ FRANCÉ (ROUL H. FRANCÉ), therefore, apart from the sodic waters of the pusztas of Kecskemét and Szikra, he also studied the waters of Alpár from algological viewpoint (FRANCÉ 1896). The author of this paper had also gone through these regions in 1934, and had collected water and soil samples. This was when he first heard that the people of the village Bokros used the term "cow-track" or "cattle-track" when speaking of the sodic grazing lands located near the village.

Now, an analysis will be given of two parts of the Alpár basin from algological point of view. One is the holiday resort bathing section situated around the centre of the backwater near Alpár, the other is the area of grazing land named as "cow-track", located near the village Bokros. Two water dips extend over the "cow-track" area. One is the long dip range, roughly having a strike direction towards north-east — southwest, which area is mentioned by those living there as "longplain". The other joins to the north-western end of the former, partly crossing it, therefore in the foregoing this will be referred to as "crossing dip range". The "long-plain" is of brook character, rarely drying out completely, the other, the "crossing dip range" is preferably marshy. Their labelling in the Table is: "long-plain"=L-l, "Crossing dip range"=C-l. The bathing section of the backwater is labelled "B".

The "cow-track" is made profitable by the regular grazing of cattle, and the precipitation washes in a large amount of dung matter from the grazing land, mainly into the dip of the "long-plain" (L-l). Accordingly, the water here is significantly eutrophic. Mostly only hogs rove the marshy dip (C-l). The bathing area of the backwater is becoming eutrophic gradually, first of all in the Summer period.

Water-chemical analysis manifested the monthly measured pH value of the water at the Alpár backwater to be mostly above 8,0, and the holiday resort's water on the 15. 7. 1982 proved to be of Na-Mg type according to cation, and of CO_3 — HCO_3 type according to anion. All these show a slight degree of alkalization, in which the Mg-cation may also play role. The water-chemical data were provided by Mrs. KLÁRA FÜGEDI (Tisza-Research co-worker), to whom author should like to express his sincere thanks. The pH value of the waters at the "cow-track" region was found to be 8,0 or somewhat higher, and pH values of 9,0—9,5 were even measured at two points of the marshy dip. It seemed that the alkalization appears in patches, having mosaic heterogeneous character, as is customary to say: "vari-coloured". There was also need for the chemical analysis of the waters and soil of the "cow-track" region at several points.

Materials and Methods

The taxonomic determination was carried out on living matter, therefore, when taking the bioseston-probes, at least one litre of water always remained unfixed, and one litre was fixed in formaldehyde for the purpose of quantitative studying. The drop method also applied earlier served for this (KISS 1982). As far as possible, a concentrate of 10 ml was prepared from every litre of the fixed water samples. After thorough shaking, one drop was taken with standard pipette for wet preparation (the volume being an average of 50 mm^3). The incidence of occurrence is shown in the Table using grades 1 to 5: 1=rare occurrence, 2=sporadic occurrence, 3=frequent occurrence, 4=very frequent occurrence, 5=mass production (algal bloom colouring the water). In the two biotops of the "cow-track" samplings were accomplished simultaneously on the following four occasions (Table 1): −1=16.3. 1982, −2=19. V. 1982, −3=1. 6. 1982, −4=25. 10. 1982. Water samples were taken from the bathing area of the backwater (B) on two occasions, shown on the Table as: −5=12. 6. 1982, −6=25. 10. 1982.

Physiological experiments were also carried out on the living bioseston substances of the *Euglena sanguinea* Ehr., and the *Microcystis aeruginosa* KÜTZ, as well as the *Aphanizomenon flos aquae* (L.) RALFS.

Results and Discussion

From the reviewed three biotops of the Alpár basin a total of 174 taxa could be determined in 1982. Their taxonomic distribution is as follows: Cyanophyta=30, Euglenophyta=47, Chrysophyta=45, Chlorophyta=52. It can be seen that the

Chlorophyta phylum leads in regard to taxon number, the Euglenophyta stands in the second place, the Chrysophyta in the third, and lagging behind, the Cyanophyta is in the fourth place. However, the image differs if the distribution is studied separately according to biotops.

L-l-biotop: Cyanophyta=15, Euglenophyta=45, Chrysophyta=37, Chlorophyta=45. Here the Euglenophyta and Chlorophyta taxon numbers are identical.

C-l biotop: Cyanophyta=20, Euglenophyta=24, Chrysophyta=36, Chlorophyta=12. In this case the Chlorophyta stands in the last place regarding taxon number, preceded twofolds by the Euglenophyta, and triply by the Chrysophyta, and even the taxon number of the Cyanophyta is higher.

B-biotop: Cyanophyta=21, Euglenophyta=36, Chrysophyta=37, Chlorophyta=49; according to which at the bathing section of the backwater, the Chlorophyta has prime role.

The total taxon number of the L-l biotop is 142, that of the C-l biotop is 92, and that of the B-biotop (bathing area) is 143. In general it is also noteworthy that two species of the Cyanophyta brought about algal bloom in all three biotops, and the Euglenophyta only in the L-l biotop of the "cow-track". Nevertheless, it established mass production with two species, colouring the water green. Furthermore, the *Phormidium pavlovskoense* ELENK. blue alga can also be mentioned, which is presumably a rare organism in our country.

During the course of the studies on the changes taking place in the algal associations of the three biotops, two main groups of factors influencing or determining the associations appeared, namely: the role of interactions between the algal species as well as the role of edaphic factors. From this point of view particularly the mass productions were rather striking, therefore these should be discussed first of all. The mass production of the two Cyanophyton species was greatly informative from the viewpoint of the interactions, and the algal bloom of *Euglena sanguinea* from that of the edaphic factors.

I. The algal bloom of the *Microcystis aeruginosa* and *Aphanizomenon flos aquae* in all three biotops (L-l, C-l, B) firstly raises the problem of the interaction between the algal species being present. The relating observations and experimental results of the author could be briefly reviewed as follows:

1. Both Cyanophyton species proved to have one-sidedly antagonistic effect in the association. That is: with their increase they inhibited the life functions of — or had direct destroying effect on — the other algal species in their environment, especially those belonging to other phyla. It was striking in case of all three biotops that in the period prior to the mass production of *Microcystis* and *Aphanizomenon,* many algal species belonging to other phyla were present in the association, from which, however, many species completely disappeared parallel with the increasing of the blue algae, and furthermore, even the relatively tolerant species were qualitatively pushed into the background.

2. The algal bloom of the *Microcystis* and *Aphanizomenon* developed in a particularly enormous degree in the deeper, less marshy and contiguous water surface parts of the C-l biotop, where the algal mass of the bloom covered the water surface with a greyish-blue, dense, 1—2 mm thick layer. Here the antagonistic effect was particularly striking: even from the Cyanophyton species only the *Lyngbya spiralis* occurred, which is frequent in alkalinized waters. The representatives of the Bacillariophyceae class seemed to be the most tolerant organisms, since here 11 species were detectabel. The Euglenophyta was represented by 7, the Chlorophyton by 4 species. Nevertheless, this relatively "high" number may also be attributable to the fact that

these Bacillariophyceae species are more likely manifested in the marshy areas. This was especially prominent in the cases of *Caloneis amphisbaena, Cymbella cystula, Gomphonema attenuatum* and *Navicula exigua.* The most characteristic was, however, that the blue algae forming the two mass productions showed less combination with each other; segregated from one another, they coloured the water at various areas.

3. In the Autumn of 1982 the *Anabaena affinis* proved to be a rather frequent organism in the L-l biotop. Among the trichomes aggregating at places, these parted into partially or completely detached planococcus-cells. The formation of such microcystoid-like planococcus agglomerations also covered by a thin gallert-envelope, was detected earlier by the author in the case of the *Spirulina platensis* and the *Anabaena spiroides* (KISS 1957, 1983).

4. The L-l biotop of the "cow-track" is divided into two sections by the path leading to the grazing land, but the two parts are connected by a stream. In the Autumn of 1982 the segregated mass productions of the *Euglena sanguinea* were found in the Northern region, and those of the *Aphanizomenon flos aquae* and the *Microcystis aeruginosa* in the Southern region. Despite the connection *Aphanizomenon* or *Microcystis* did not occur in the mass production of the *Euglena sanguinea,* and algae of other species were not observable either. On the other hand, the *Euglena sanguinea* was also entirely missing from the mass productions of the above-mentioned blue algae. Thus the antagonism seemed to be explicitly mutual.

5. Physiological experiments were also accomplished by the author to approach the essentials of this mutual antagonism. In every case the antagonism of the blue algae proved to be stronger. The individuals of *Euglena sanguinea* transferred to the living substances of the *Aphanizomenon* or the *Microcystis* suffered physiological damage within a few hours time. The metabic movement characteristic to the majority of the *Euglena* species ceased, the cells became more stocky, rarely taking a spheroid shape, by next day they became brown in patches and then completely disorganized. The *Aphanizomenon* or *Microcystis* transferred to the mass production of the *Euglena* species — depending on the transferred amount — likewise visibly damaged the cells of *Euglena sanguinea.*

6. Author had noticed centuries ago that with its onesidedly direct antagonism, the *Aphanizomenon flos aquae* var. *Klebahnii* ELENK. inhibited the mass production of the *Trachelomonas crebea* belonging to the Euglenophyta phylum, as well as the *Pteromonas angulosa* and *Eudorina elegans* ranked into the Chlorophyta phylum (KISS 1939). The mass production of *Eudorina elegans* was suppressed by the *Aphanizomenon flos aquae* in the Cibakháza bakcwater of the Tisza, too (KISS 1983a). The inhibitory factor may possibly be the selected material of the *Aphanizomenon* or the *Microcystis.*

II. Euglena algal bloom. The algal blooms of the *Euglena polymorpha* and the *Euglena sanguinea* are significant evidences for the fact that the precipitation washes many dung matter and stimulatory compounds into the water of the "cow-track" long dip range (L-l). The effect of these on the growing of Euglenophyton algal blooms was observed by author on many occasions from 1934—35 (KISS 1939, 1982), and it also encouraged him to carry out investigations in the present case. More earlier relevant data are known from polluted sea backwater, from Helsinki (VÄLIKANGAS 1922).

Other algae also occurred rarely or sporadically in the algal bloom of *Euglena polymorpha* developing in the Summer of 1982, however, the *Euglena sanguinea* established its mass production exclusively alone. (Author should like to express his sincere thanks here to DÁNIEL GÁL, Tisza-Research co-worker, for his help in sampling). The *Euglena sanguinea* not only coloured the shallow water rich in organic matter, but also cased over the surface of the reedy *(Phragmites)* marsh with a yellowish-green, 1—2 mm thick bioseston-layer.

It is characteristic that earlier the opinions were divergent concerning the edaphic environment of this organism. It was characterized by LEMMERMANN (1913) as follows: "Oligosaprob bis katharob". This opinion was also adopted by others. However, according to the great work of HUBER-Pestalozzi (1955) this organism forms intensively red algal bloom in the puddles containing a large amount of dissolved organic matter in the grazing lands of the Alps. Therefore, these biotops are called "Blutalgenseen" or "Blutseen" in these regions. According to author's observations, too, the *Euglena sanguinea* occurred in the alkalinized waters strongly polluted with organic matter (Lake Fehér at the border of Kardoskút, Dead-Körös at Kenderes-kert, Lake Bogárzó, Lake Ródliszék). On this occasion author has observed for the fifth time that it produces algal bloom in alkalinizating water, too. Nevertheless, he did not detect entirely red colouring in either of the occasions.

In connection with the algal bloom of this organism, HUBER-PESTALOZZI (1955) emphasized the role of weather in the following way: "Für das Auftreten und die Entwicklung der Wasserblüte von *E. sanguinea* sind bestimmte meteorologische Faktoren sehr wichtig (eigene Beobachtungen, KLAUSENER, HEIDT); am intensivten ist die Wasserblüte bei anhaltend warmen und klarem Wetter". Nevertheless, the permanent, hot fine weather means that of foehn-nature. Such weather condition in our lowland is the atmospheric subsidence front, or as otherwise called, the "free foehn", which may also have role in the fine weather conditions of Autumn. Weather of foehn-nature is the carrier of the so-called praefrontal physiological effects, which may also be active component in the life of algae. During the course of the last 50 years more than 100 Euglenophyta mass productions were analysed by us, and these were mostly produced in such conditions.

According to HEIDT (1934) the *Euglena sanguinea* loses its red colour on the effect of shading, the haematochrome granules congregate in the cell centre, and the cells change to green colour. This process takes place rapidly, within cc. 20 minutes. On the effect of light the cells change back to red colour in even shorter time. The cells of the *Euglena sanguinea* originating from the L-l biotop of the "cow-track" were mostly green in colour, nevertheless, in a frequency of 10—15% 3—4 dark red clod-like formations could be observed around the cell centres. On the effect of strong illumination these dark red clods disappeared within 2—3 hours and the cells became yellowish-green with slight pink shade. On the effect of darkening, after a few hours the haematochrome granules congregated into larger clods again.

In the collected bioseston author did not observe cell division in case of the *Euglena sanguinea,* therefore he also carried out culture experiments. From the brews of plant-seeds, again the brew of pea seeds *(Pisum sativum)* proved to be the best as nutrient solution, to which some raw lemon juice was also added. In 1935 — with the help of such ascorbic acid-enriched nutrient solution — the cells of *Trachelomonas crebea* not only divided rapidly, but the cells from its generations remained together abnormally, and four-celled pseudothalli developed in several cases (KISS 1939). In such nutrient solution the individuals of *Euglena sanguinea* divided by the following day, assuming spheroid shapes. No pseudothalli developed.

The *Euglena sanguinea* was also detected earlier in Hungary. SZABADOS (1936) made mention of it from 8 biotops, in two cases as the generator of algal bloom. It always occuerrd with a green colour. Mention was made of it from Lake Balaton and also from the Inner-Lake near Tihany. HORTOBÁGYI (1939) mentioned it as a

Table 1

No	Species — Taxon	L—1				C—1				B	
		−1	−2	−3	−4	−1	−2	−3	−4	5	6
	Phylum: Cyanophyta										
1.	*Microcystis aeruginosa* Kützing			1	5				5	5	
2.	*Coelosphaerium Kuetzingianum* Näg.	2	3	2			2				2
3.	*Hydrococcus rivularis* (Kütz.) Menegh.									3	3
4.	*Siphononema polonicum* Geitler						2				6
5.	*Stigonema polonicum* Geitler	2				2					2
6.	*Aphanizomenon fios aquae* (L.) Ralfs		2	3	5				5	5	
7.	*Aphan. Issatschenkoi* (Uss.) Prosk.—Lavr.		2								
8.	*Romeria elegans* (Wolosz.) Koczw.	2	1	2			3	2			
9.	*R. gracilis* Koczw.		2	1							2
10.	*R. leopoliensis* (Racib.) Koczw.	1	2	2						1	
11.	*Anabaena affnis* Lemm.		2		4		2				3
12.	*A. solitaria* Klebahn										3
13.	*Spirulina maior* Kützing	3				3					3
14.	*Sp. laxissima* G. S. West	2				2					
15.	*Oscillatoria brevis* (Kütz.) Gom.										4
16.	*O. limnetica* Lemm.					2					2
17.	*O. maior* Vaucher	2									2
18.	*O. chalybea* (Mert.) Gom.						2			2	
19.	*O. lacustris* (Klebahn) Geitler						3				
20.	*O. planctonica* Wolosz.						2			1	1
21.	*O. simplicissima* Gom.						4	2			
22.	*Phormidium luridum* (Kütz.) Gom.						3			2	2
23.	*Ph. mucicola* H. P. *et* Naumann										2
24.	*Ph. pavlovskoense* Elenkin										3
25.	*Lyngbya aestuarii* (Mertens) Liebmann		2			1	2				
26.	*L. Hyeronymusii* Lemm.										2
27.	*L. limnetica* Lemmermann		3	3		3					1
28.	*L. Martensiana* Menegh.					2	2				
29.	*L. spiralis* Geitler						1	2	2		
30.	*L. versicolor* (Wartm.) Gom.	2				2					
	Phylum: Euglenophyta										
31.	*Euglena acus* Ehr.	2	3								3
32.	*E. caudata* var. *minor* Defl	1		1							2
33.	*E. Ehrenbergii* Klebs		2				2				
34.	*E. Klebsii* (Lemm.) Mainx	1	1		2			2			
35.	*E. oxyuris* Schmarda		2							2	3
36.	*E. polymorpha* Dang.		3	5							
37.	*E. proxima* Dang.	2			1		2				2
38.	*E. sanguinea* Ehr.		1	1	5						
39.	*Lepocinclis acuminata* Defl.		2								
40.	*L. constricta* Matv.										1
41.	*L. Lefevrei* Conrad	2					2				2
42.	*L. ovum* (Ehr.) Lemm.		3								3
43.	*L. ovum* var. *globula* (Perty) Lemm.		1								2
44.	*L. ovum* var. *dimidio-minor* Defl.		2								
45.	*L. teres f. parvula* Conrad		1								2
46.	*Phacus acuminatus* Stokes	1	3	3	1	1	2	1	1	1	3
47.	*Ph. acuminatus* var. *indica* (Pochm.) H.P.	2	1				1				
48.	*Ph. acuminatus* var. *triquetra* Skvort.		1			2					1
49.	*Ph. alatus* Klebs	1			2					1	
50.	*Ph. caudatus* Hübner	3	3	3	1	1	1	1	1	2	1
51.	*Ph. helicoides* Pochmann			1							3
52.	*Ph. onyx* Pochmann									1	2
53.	*Ph. platalea* Drez.	2									
54.	*Ph. pyrum* (Ehr.) Stein			3							3

No	Species — Taxon	L—1				C—1				B	
		−1	−2	−3	−4	−1	−2	−3	−4	−5	−6
55.	*Ph. suecicus* LEMM.	1		1							2
56.	*Ph. Wettsteinii* DREŻ.	2			2			3			
57.	*Trachelomonas crebea* KELL. em. DEFL.	1		2				1			3
58.	*Tr. Dybowskii* DREŻ.		3								2
59.	*Tr. granulata* SWIR.	2	2	1							1
60.	*Tr. granulosa* var. *crenulatocollis* (SZAB.) H. P.		2					2			
61.	*Tr. hispida* (PERTY) STEIN em. DEFL.	1		2	1	1			2		3
62.	*Tr. hispida* var. *coronata* LEMM.		3	1							2
63.	*Tr. hispida* var. *crenulatococllis* (MASK.) LEMM.	1	1				1				2
64.	*Tr. hispida* var. *crenulatocollis* f. *recta* DEFL.	2		2							1
65.	*Tr. intermedia* DANG.	2			1		1				2
66.	*Tr. lacustris* DREŻ.	1					3			1	1
67.	*Tr. Lefevrey* DEFL.		2		2						2
68.	*Tr. oblonga* var. *australica* PLAYF.		2	2					1		
69.	*Tr. planctonica* SWIR.	1	3	2		1				1	3
70.	*Tr. planctonica* var. *oblonga* DREZ.		2		1		1				2
71.	*Tr. scabra* PLAYF.	1	2	2	2	1	2	1	1	1	3
72.	*Tr. scabra* var. *coberensis* DEFLANDRE		3					2			2
73.	*Tr. scrabatula* (PLAYF.) DEFL.	1	1								2
74.	*Tr. silvatica* SWIR.	1	1	2				1			2
75.	*Tr. volvocina* EHR.	1	3	2	1	1	3	2	1	1	3
76.	*Strombomonas verrucosa* (DADAY) DEFLANDRE	2	3	1	1	1	1	1	1	1	3
77.	*Str. verrucosa* var. *zmiewika* (SWIR.) DEFL.	2	2	1			1				2
	Phylum: Chrysophyta										
78.	*Tribonema affne* G. S. WEST					3	2				
79.	*Tr. aequale* PASCHER					3	2				
80.	*Tr. vulgare* PASCHER					3	1				
81.	*Dinobryon divergens* IMH.									2	2
82.	*D. sertularia* EHR.									1	3
83.	*Anomoeoneis sphaerophora* (KÜTZ.) PFITZ.		1	1							
84.	*Achnanthes saxonica* KRASSKE						2	1	1		1
85.	*Asterionella formosa* HASS.	3	1								1
86.	*Caloneis amphisbaena* (BORY) CL.	2	3	1	1	1	1	1	2	3	2
87.	*Cyclotella operculata* (AG.) KÜTZ.		2		2				1		3
88.	*Cymbella cistula* (HEMP.) GRUN.		3		3				2		3
89.	*C. prostrata* (BERK.) CL.		3	2		1	2				
90.	*C. tumidula* GRUN.	3		1							
91.	*C. ventricosa* KÜTZ.	2	1	1		1					2
92.	*Fragilaria capucina* DESM.	2	1	2				2			2
93.	*Fr. crotonensis* KITT.	3	2	2			1	3			3
94.	*Fr. virescens* var. *capitata* OSTR.	3	1	1	2	1			2		3
95.	*Gomphonema augur* EHR.	2	1		1		1	2			3
96.	*Gyrosigma acuminatum* (KÜTZ.) RABENH.	3	3	2		2	1			2	
97.	*G. attenuatum* (KÜTZ.) RABENH.	1	1	1	1		2		3		2
98.	*Melosira granulata* var. *muzzanensis* (MEIST.) HUST.										2
99.	*M. varians* AGARDH										2
100.	*Navicula cincta* (EHR.) KÜTZ	2	1	1			2				3
101.	*N. cryptocephala* KÜTZ.	2	2		1	1		1			2
102.	*N. exigua* (GREG.) O. MÜLL.	1	1	1			2	2	2		3
103.	*N. gracilis* EHR.	1	1	3	1	2	1	1	1	1	1
104.	*N. graciloides* MAYER	2	1	2			2			2	
105.	*N. gregaria* DONK.		2	1		2		2			1
106.	*N. Heufleriana* (GRUN.) CL.	2		1	1		1				2
107.	*N. ventralis* KRASSKE	1	2			1			1	1	1
108.	*N. radiosa* KÜTZ.		2	1		2					1
109.	*Nitzschia acicularis* W. SM.	3	2	1		1		1	1		3
110.	*N. capitellata* HUST.	1	2		1	1		3			2

No	Species — Taxon	L—1				C—1				B	
		−1	−2	−3	−4	−1	−2	−3	−4	−5	−6
111.	*N. gracilis* HANTZSCH.	2	1	1		2	2				2
112.	*N. palea* (KÜTZ.) W. SM.	1	1		2			1			1
113.	*N. sigmoidea* (EHR.) W. SM.	2	2	3							
114.	*N. vermicularis* (KÜTZ.) GRUN.	3	1		2	1	1			2	
115.	*Synedra actinastroides* LEMM.	3	1		2	2	2				1
116.	*S. acus* KÜTZING	3	2	1			1				3
117.	*S. acus* var. *angustissima* GRUN.	2	1	2			1				1
118.	*S. affnis* KÜTZ.	3	1	3				1			1
119.	*S. tabulata* (AG.) KÜTZ.	1	2		2		3				3
120.	*S. ulna* (NITZSCH.) EHR.	1		1		2			1		2
121.	*S. ulna* var. *oxyrhynchus* (KÜTZ.) V. H.	1	1		1	1					1
122.	*Stauroneis anceps* EHR.		2	1							
	Phylum: Chlorophyta										
123.	*Chlamydomonas Reinhardi* DANG.										3
124.	*Pandorina morum* (MÜLLER) BORY										3
125.	*Actinastrum Hantzschii* LAGERH.	2	1	1							
126.	*Ankistrodesmus acicularis* (A. BR.) KORS.	2	2		1						1
127.	*A. angustus* BERN.	2	1								1
128.	*A. arcuatus* KORS.		2		2						2
129.	*A. falcatus* (CORDA) RALFS		3		2						2
130.	*A. spiralis* (TURN.) LEMM.										2
131.	*Coelastrum microporum* NÄG.	3	1	1	1					1	2
132.	*Coel. pseudomicroporum* KORS.	1	2							3	2
133.	*Coenocystis planctonica* KORS.	1									
134.	*Coen. reniformis* KORS.	1									
135.	*Crucigenia apiculata* (LEMM.) SCHMIDLE		2	3	1		1			2	1
136.	*Cr. rectangularis* (NÄG.) GAY.	2	1							1	1
137.	*Cr. quadrata* MORREN	1	3							2	
138.	*Cr. tetrapedia* (KIRCHN.) W. et G. S. WEST	1	3	2	1	3				3	3
139.	*Cr. truncata* G. M. SM.	1	1	3	1		2	2	1		2
140.	*Kirchneriella contorta* (SCHMIDLE) BOHL.		1	3	1					3	1
141.	*K. irregularis* (G. M. SM.) KORS.	1		2						1	1
142.	*K. obesa* (W. WEST) SCHMIDLE	1		2	1					3	2
143.	*Radiococcus spec. (? R. Wildemani* SCHMIDL.*)*										2
144.	*Pediastrum Boryanum* (TURP.) MENEGH.	3	3	2	2						2
145.	*P. Boryanum* var. *longicorne* REINSCH	1	1	1	1						1
146.	*P. duplex* MEYEN	2	3							1	
147.	*P. duplex* var. *rugulosum* RACIB.	1	1							1	
148.	*P. simplex* MEYEN	3	1	1	1						1
149.	*P. simplex* var. *radians* LEMM.	1	1								
150.	*P. tetras* (EHR.) RALFS		2								1
151.	*Scenedesmus acuminatus* (LAGERH.) CHOD.	2	3	3	3	1	2	1	1	3	3
152.	*Sc. acutus* MEYEN	2	3	1	1	1	1			2	3
153.	*Sc. arcuatus* LEMM.	1	1	1	3						2
154.	*Sc. bicaudatus* var. *brevicaudatus* HORTOB.	3	2	2	2						3
155.	*Sc. denticulatus* LAGERH.	2	2	1							1
156.	*Sc. ecornis* (RALFS) CHOD.	3	1	3	1					1	2
157.	*Sc. ecornis* var. *disciformis* CHODAT	2			2						1
158.	*Sc. intermedius* CHOD.	1	3	2	1					1	2
159.	*Sc. intermedius* var. *bicaudatus* HORTOB.				1					1	3
160.	*Sc. ovalternus* CHOD.	3	2	1	3		1				3
161.	*Sc. quadricauda* (TURP.) BRÉB	2	2	2	2	1		1		2	3
162.	*Sc. securiformis* PLAYF.	3	1	2	2		1			1	1
163.	*Sc. spinosus* CHODAT	2	1	1							3
164.	*Tetraedron minimum* var. *apiculatum* REINSCH	1	2								2
165.	*T. muticum* (A. BR.) HANSG.	1	3	1	1		2	1		2	3
166.	*T. proteiforme* (TURN.) BRUNNTH.	1	3	1						1	
167.	*T. trilobatum* (REINSCH) HANSG.		2	1					1	1	2

No	Species — Saxon	L—1				C—1				B	
		—1	—2	—3	—4	—1	—2	—3	—4	—5	—6
168.	*Tetrastrum staurogeniaeforme* (SCHRÖD.) LEMM.	1	1	2	3	1	1	2	1	2	1
169.	*Hormidiopsis spec.*									2	2
170.	*Cladophora fracta* KÜTZ. ampl. BRAND									4	3
171.	*Closterium aciculare* TUFFEN WEST		2							1	3
172.	*Cl. gracile* BRÉB.	1	3	1						2	1
173.	*Cl. dianae* EHR.		1		2						3
174.	*Mougeotia scalaris* HASS.									3	1

species occurring rarely — also with green colour — at the Nagyfa backwater of the river Tisza. SZABADOS (1936) writes the following about his culture experiments: "The *Euglena sanguinea*-s multiplied quickly in maize+Detmer+distilled watter+meat brew solution, moreover individuals exposed to temperature of +26—30°C also formed a low amount of haematochrome, which situated in the centre of the body in small patches, in groups". This experiment also proves that the representatives of the Euglenophyta phylum are capable of utilizing organic materials even in a direct manner. The problem of haematochrome formation and migration can only be settled by studies on pure cultures originating from individual cells.

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Algológiai vizsgálatok a Tisza-völgyi Alpári medence vizeiben

Kiss I.

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Kivonat

Az Alpári medence vizeinek algológiai vizsgálata 1982-ben tovább folytatódott. Az év során összesen 174 species vagy azon belüli taxon volt determinálható. A kialakult algatársulásokat befolyásoló környezetbiológiai tényezők főleg a négy alkalommal kialakult „vízvirágzás" során volt tanulmányozható. Különösen feltűnő volt az *Aphanizomenon flos-aquae* és a *Microcystis aeruginosa* kékalgák egyoldalúan antagonista hatása. Ezek tömegprodukciója minden biotópban előfordult. Az *Euglena sanguinea* és az *E. polymorpha* vízvirágzása ismételten bizonyította, hogy az Euglenophyton speciesek a szerves trágyával szennyeződött vizekben hozhatnak létre hatalmas tömegprodukciókat.

Élettani kísérleteink szerint az *Euglena sanguinea* sejtosztódását csekély aszkorbinsavval dúsított borsómagfőzetes táptalaj nagymértékben elősegítette. E szervezet zöld tömegprodukciójában az egyedek 10—15%-ánál a sejt közepe táján 3—4 sötétvörös hämatochrom rög volt észlelhető. Ezek megvilágításra 2—3 óra alatt eltűntek, sötétítésre ismét megjelentek. Szerző és mások e szervezet magyarországi előfordulását többször is észlelték.

Алгологические исследования в водах Алпарийского бассейна долины Тисы

И. Кишш

Рабочая группа по исследованию Тисы, Сегед

Резюме

Алгологическое исследование вод бассейна Алпари продолжалось дальше в 1982 году. За год было определено 174 вида или таксонов внутри видов. Биологические условия внешней среды, влияющие на сформировавшиеся сообщества водорослей, можно было исследовать главным образом в ходе четырёх случаев «цветения воды». Особенно отчётливо наблюдалось одностороннее антагонистическое влияние синих водорослей *Aphanizomenon flos-aquae, Microcystis aeruginosa.* Их вегетативная масса наблюдалась во всех биотопах. Вызванное *Euglena sanguinea* и *E. polymorpha* цветение воды ещё раз подтвердило, что виды *Euglenophyton* в загрязнённой органическим удобрением воде способны создавать огромную вегетативную массу.

Как показывают наши биологические исследования, клеточное деление *Euglena sanguinea* в значительной степени стимулируется на питательной почве, приготовленной из зерна гороха с добавлением небольшого количества аскорбиновой кислоты. У 10—15% особей этого организма в зелёной вегетативной массе посредине клетки наблюдалось 3—4 тёмнокрасных гематохромных комка. Под влиянием освещения в течение 2—3 часов они исчезали, а в темноте снова появлялись. Как автор, так и другие исследователи неоднократно наблюдали появление этого организма в Венгрии.

Algološka ispitivanja u vodama Alpár-kotline reke Tise

Kiss I.

Istraživačka grupa r. Tise, Szeged

Abstrakt

U 1982. godini nastavljen je rad na algološkim istaživanjima u vodama Alpár kotline. Izvršena je determinacija 174 vrste odnosno taksona. Uticaj ekoloških faktora na obrazovanje zajednica algi praćen je prilikom „cvetanja vode" u četiri navrata. Izrazit je bio jednostrani antagonistički uticaj *Aphanizomenon flos-aquae* i mrkih algi *Microcystis aeruginosa.* Njihova masovna produkcija se javljala u svakom biotopu. „Cvetanje vode" prouzrokovano *Euglena sanguinea* i *E. polymorpha* ponovo je potvrdilo, da Euglenophyton mogu postići visoku organsku produkciju samo u vodama zagadjenim organskim djubrivima.

Naši pokusi su pokazali da deobu *Euglena sanguinea* u velikoj meri pospešuje podloga od buljona graška obogaćena izvesnom količinom askorbinske kiseline. U masovnoj produkciji kod 10—15% jedinki uočava se u sredini ćelije tri do četiri tamno crvene granulacije hematohroma, koje pri osvetljavanju u roku od 2—3 sata nestaju, a pri zamračivanju ponovo se pojavljuju. Autor i drugi istraživači su ovu pojavu u Madjarskoj viša puta registrovali.