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ALGOLOGICAL INVESTIGATIONS IN THE DEAD-TISZA AT LAKITELEK-TŐSERDŐ

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Abstract

In this paper I report on the algal flora of one of the dead arms of the river Tisza, on the basis of investigations performed during the years 1975—1977. The northern part of the dead arm belongs to the National Park of Kiskunság. It was, therefore, examined more intensively than the non-protected southern part. The tabular account on the 286 taxons gives a survey over their appearance in space and, on the basis of an estimate, over their quantitative relations. A nova variation is reported as well, getting its name of the river Tisza. Five algal mass productions with water bloom observed in the protected area lead us to conclude that the eutrophic character intensified.

Introduction

The Dead-Tisza on the S, SE confines of the commune Lakitelek is the orogonal river bed, meandering by and large in V-form W. of the present-day river. It considerably differs from the regional character of the small dead arms at Tiszaalpár, S of it, and at Tiszaug, east of the river Tisza, respectively. The two latter dead arms fall to a plain Holocene area while the medium part of the dead arm at Lakitelek-Tőserdő is connected with the wavy relief of the sand world of the Plain between the Danube and the Tisza rivers. This dead arm preserved the most the former river-bed character, its water is the deepest, only its ends are marshland-like. This geological quality manifests itself in the composition of the flora and the picture of vegetation, as well.

The northern, larger part of the dead arm has been, since 1976, area No. I. of the National Park of Kiskunság. (Fig. 1. The parts under nature conservation are limited with thick dotted lines). The southern part is not protected and will be a part of the large reservoir, planned for the future at Tiszaalpár. The algological investigations performed here are, therefore, justified not only by the points of view of nature conservation but also by the interests of preserving the invironment.

Materials and Methods

In the nineteen-sixties we took a few water samples from here but the samplings in the appointed places only began in 1975. As a first step, we have investigated the western part of the water including the protected section (biotope group "A") and the non-protected southern part (biotope group "B"). The bioseston samples were partly taken by ladling, partly by filtering through a plankton-net. Investigations were made in every season. The taxons were determined as much as possible in living

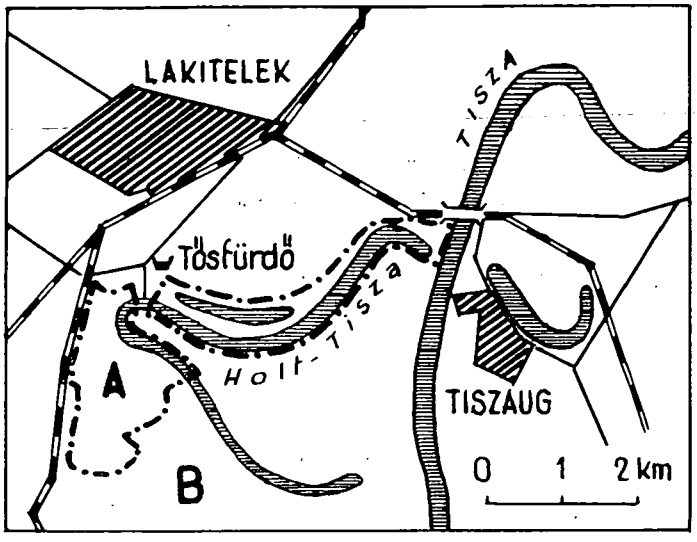


Fig. 1. Dead-Tisza at Lakitelek. The parts limited with the thick dotted line are nature conservation areas.

material. Of the characteristic or rare species microphotographs were made as well (Plates I—III) The material was fixed in formaldehyde. At the sites of the single biotope groups not only the horizontal distribution of the phytoplankton was investigated but, occasionally, some bioseston samples were even taken from the different levels down to 3 m depth.

Results

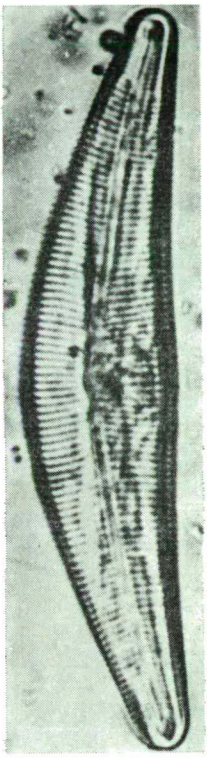
From the Dead-Tisza at Lakitelek-Tőserdő, there have been demonstrated 286 algal taxons so far, divided according the phyla as follows:

Cyanophyta: 43, *Euglenophyta:* 24, *Chrysophyta:* 93, *Pyrrophyta:* 15, *Chlorophyta:* 111. In the respect of the taxon number, the *Chlorophyta* phylum takes a prominent part with the *Chrysophyta* taxons being only smoewhat less. Within the latter, the taxon number of *Diatoma* is particularly high. The enumeration of taxons — in the sequence of phyla — is shown in Table 1. The stretch participating in nature conservation is designated as biotope group "A" and the non-protected part is biotope group "B". The bioseston proofs of biotope group "A" were taken from six sites, the water samples of the biotope group "B" from four sites, taking into consideration

Plate I

1. *Cymbella cymbiformis* (AG.) KÜTZ. — 850:1.
2. *Gomphonema acuminata* EHR. — 850:1.
3. *Caloneis amphisbaena* (BORY) Cleve — 800:1.
4. *Surirella ovalis* BREB. — 600:1-
5. *Gyrosigma acuminatum* (KÜTZ.) RABENH. — 300:1.
6. *Gomphonema acuminatum* (EHR.) var *trigonocephala* (EHR.) GRUN. — 850:1.
7. *Navicula radiosa* KÜTZ. — 850:1.
8. *Synedra capitata* EHR. — 1700:1.
9. *Melosira varians* AG. — 1100:1.
10. *Fragilaria capucina* DEZMAZ. — 250:1.

Plate I



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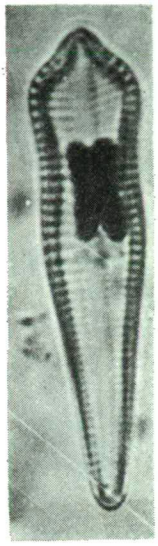

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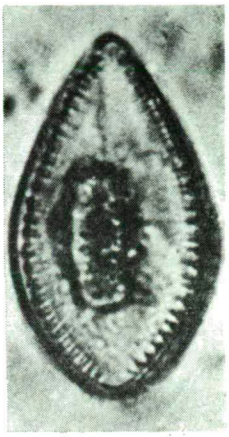

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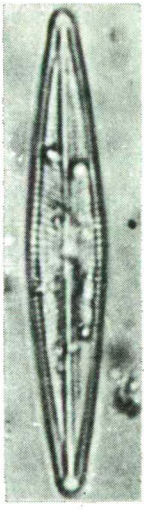

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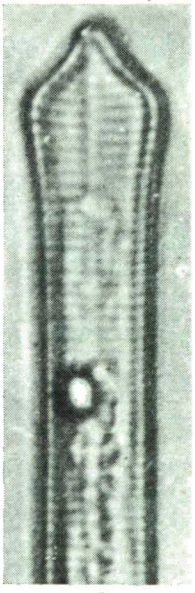

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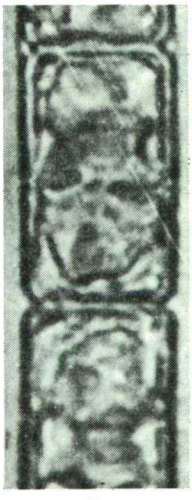

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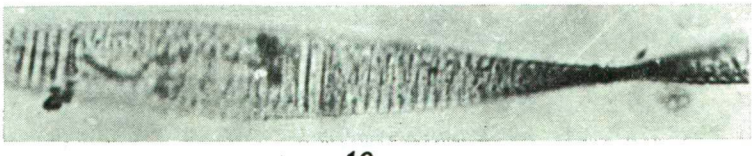

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the ecological conditions. In the bioseston proofs, the quantitative conditions are generally established by estimation, although, in the respect of a few species, Bürker's chamber countings were also performed. The degrees of quantitative abundance established by estimation, are as follows: 1 = rare or sporadic occurence, 2 = frequent, 3 = very frequent occurence, 4 = presence in mass, resp. the formation of mass production.

By surveying the tabulated enumeration, it can immediately be established that the overwhelming majority of taxons occured in both biotope groups. This shows that there are no considerable differences yet in the essential conditions between the two parts of the Tisza Dead Arm, taking or not taking part in nature conservation (A, B). However two differences in the distribution of taxons should be mentioned. One of these is that in the bioseston tests of the non-protected biotope group "B" the taxons of *Euglenophyta* were much more frequent than in the water of the protected biotope group "A". The explanation of this is mainly that biotope group "B" — particularly its southernmost section — is close to the agriculturally cultivates areas from which pollution with farmyard manure may occur from time to time. The other difference in the distribution of taxons is that some of the species were only found in one of the biotope groups.

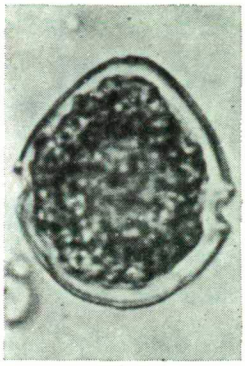
The following taxons appeared exclusively in biotopic group "A": *Microcystis aeruginosa* KÜTZ. f. *aeruginosa* STARMACH, *M. aeruginosa* KÜTZ. f. *flos aqae* (WITTR.) ELENK., *Anabaena affinis* LEMM., *Spirulina corakiana* PLAYF., *Oscillatoria formosa* BORY, *O. lauterbornii* SCHMIDLE, *O. planctonica* WOLOSZ., *O. simplicissima* GOM., *Phormidium tenue* (MENEGH.) GOM., *Lyngbya limnetica* LEMM., *Asterogloea gelatinosa* PASCHER, *Chlorobotrys simplex* PASCHER, *Centritractus africanus* FRITSCH et RICH., *Centritractus belenophorus* LEMM., *Ophiocytium cohleare* A. BRAUN, *Chromulina freiburgensis* DEFL., *Chrysoglena verrucosa* WISL., *Dinobryon tabellariae* (LEMM.) PASCH., *Mallomonas bernardinensis* (CHOD.) CONR., *?Pseudosyncrypta spec., Tessella volvocina* PLAYF., *Cocconeis pediculus* EHR., *Melosira granulata* (EHR.) RALFS, *Melosira varians* AGARDH, *Pleurosigma elongatum* W. SMTH, *Cystodinium bisetosum* (LINDEM.) HUBER-PEST., *Glenodinium edax* SCHILLING, *?Gonyaulax apiculata* (PENARD) ENTZ, *Peridinium volzii* LEMM. var. *cinctiforme* LEF., *Desmatractum bipyramidatum* (CHOD.) PASCH., *Scenedesmus acuminatus* var. *elongatus* W. SMITH, *Schroederia setigera* (SCHRÖD.) LEMM., *Schroederia spiralis* (PRINTZ) KORSCH., *Staurastrum omearii* ARCH. —

On the other hand, the following species may be mentioned exclusively from biotope group "B": *Tetrapedia reinschiana* ARCHER, *Euglena allorgei* DEFL., *Euglena chlamydophora* MAINX, *E. limnophila* LEMM., *E. velata* KELBS, *Lepocinclis ovum* (EHR.) LEMM., *L. steinii* LEMM., em. CONR., *Phacus myersi* SKVORTZ., *Ph. pyrum* (EHR.) STEIN, *Chlorococcum humicolum* (NAEG.) RABENH., *Nephrochlamys allantoidea*

Plate II

1. *Glenodinium edax* SCHMIDLE — 1000:1.
2. *Peridinium cinctum* (O. F. M.) EHR. — 950:1.
3. *Peridinium palatinum* LAUTERB. — 850:1.
4. *Chromulina freiburgensis* DOFL. — 1800:1.
5. *Chrysoglena verrucosa* WISL. — 950:1.
6. *Dictyosphaerium pulchellum* WOOD — 850:1.
7. *Ceratium hirundinella* (O. F. MÜLL.) SCHRANK f. *silesiacum* (SCHROED.) HUB.-PEST. — 600:1
8. *Pseudokephyrion conicum* SCHILLER — 800:1.
9. *Synura uvella* EHR. — 800:1.
10. *Desmatractum indutum* (GEITL.) PASCH. — 950:1.

Plate II



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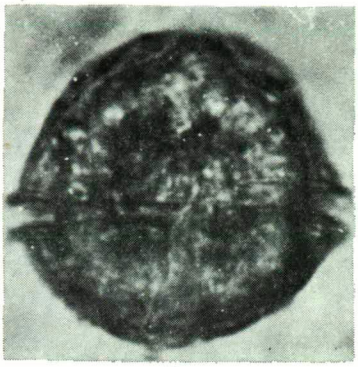

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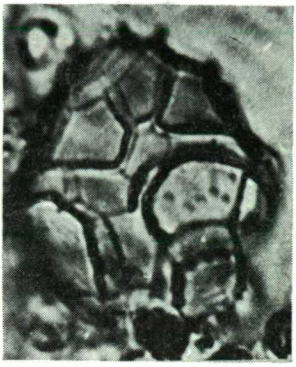

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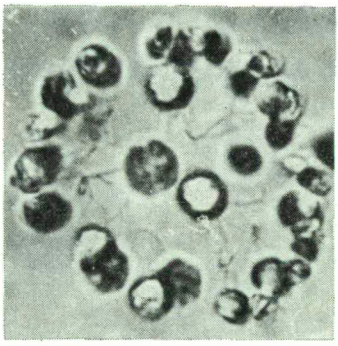

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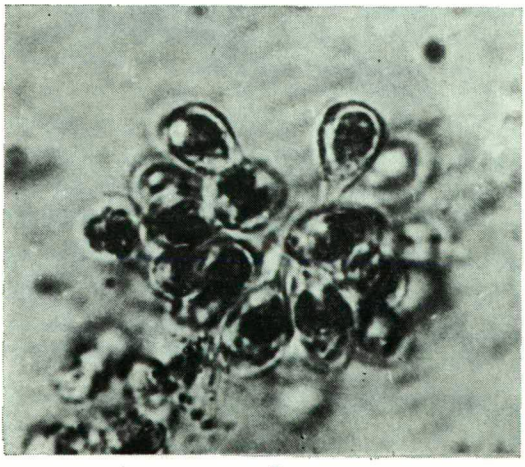

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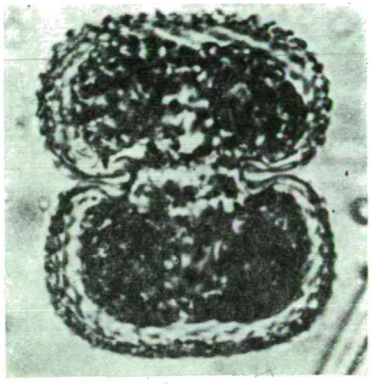

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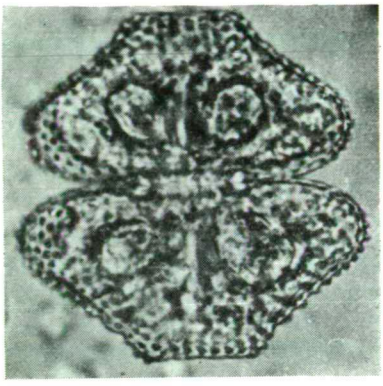

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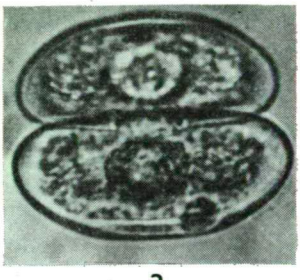

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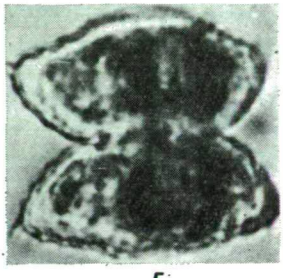

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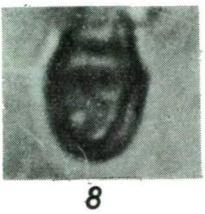

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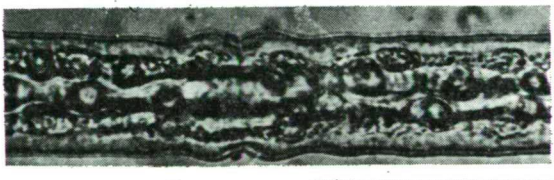

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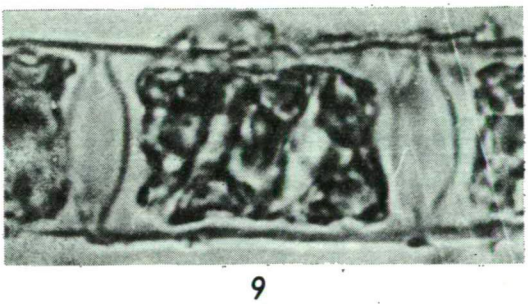

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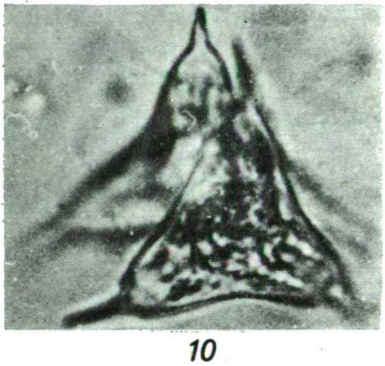

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KORSCH. From the eleven taxons occuoring here eight are members of the *Euglenophyta.* This also shows that the water of the non-protedted area is richer in organic polluting materials.

From the 286 taxons there were thirty-seven that occurred in any bioseston tests both of the protected and the non-protected areas. *Ceratium hirundinella* (O. F. MÜLL.) Schrank appeared with a great variety of forms among which *Ceratium hirundinella* f. *furcoides* (SCHROED.) H. P., *C. hirundinella* f. *silesiacum* (SCHROED.) H. P., and *C. hirundinella* f. *robustum* (BACHM.) H. P. could definitely be distinguished. These are probably characteristic of the majority of the dead arms of the Tisza. *Cosmarium turpini* BRÉB. was similarly found in any water sample but only rerely, and it showed, in spite of the low individual number, a considerable variability in form. Its presence in the dead arms may hardly be general (Plate III, 2). *Desmatractum indutum* (GEITL.) PASCH. represented a very considerable variability in form and size (Plate II. 10). *Synura uvella* EHR. var. *tiszaensis* KISS I. was found as a nova variation. It will be described in a separate paper (KISS, I. 1978).

Water bloom-like mass productions were brought about by five taxons. *Microcystis aeruginosa* f. *aeruginosa* STARMACH, and *M. aeruginosa* f. *flos aquae* (WITTR.) ELENK. caused on September 29, 1976, simultaneously and together, a bluish-grey vegetative colouration in the northern bend of the protected part. *Aphanizomenon flos aquae* (L.) RALFS, about 300 m east from the former one, similarly on September 29, 1976 coloured the water surface dirty bluish-grey. The colouration of mass production could also be observed here on November 3, 1976. On May 28, 1977, similarly in the northern part of the protected area, *Dinobryon sertularia* EHR. drew the attention to itself with a yellowish-greenish water bloom. At the same time, in the neighbourhood of the bend in the protected area, the water surface was spottily vivid green in an extension of several hundred square metres. The vegetative colouration was almost exclusively induced by *Eudorina elegans* EHR. In the southern section of the dead arm in the non-protected area, even rowing was impeded by the masses of *Spirogyra insignis* (HASS.) CZURDA, floating of the surface of the water, on May 18, 1976. The filose parts of this *Spirogyra* brought about a voluminous network under the water as well.

The pH of the water varied both in the protected and non-protected areas between 7,3 and 7,6. Water pollution was, however, very different from place to place. From the water-bloom mass productions which occurred particularly in the northern part belonging to the nature conversation area, we may draw the conclusion that the eutrophic character is more and more increasing.

Plate III

1. *Cosmarium quadrum* var. *sublatum* W. et G. S. WEST — 600:1.
2. *Cosmarium turpini* BRÉB. 650:1.
3. *Cosmarium depressum* (NAEG.) LUND. — 750:1.
4. *Cosmarium wembaerense* SCHMIDLE — 1000:1.
5. *Staurastrum paxilliferum* G. S. WEST — 1000:1.
6. *Pleurotaenium trabecula* (EHR.) NAEG. — 200:1.
7. *Pleurotaenium trabecula* (EHR.) NAEG. — 500:1.
8. *Kephyriopsis ovum* PASCH. et RUTTN. — 2000:1.
9. *Spirogyra varians* (KÜTZ.) CZURDA — 800:1.
10. *Staurastrum omearii* ARCH. — 1400:1.

Tabular 1

No	Species (taxon)	Biotop group „A"							Biotop g. „B"		
		22 VI	16 V	1 VIII	29 IX	3 XI	16 II	28 V	22 VI	18 V	30 XI
		1975	1976				1977		1975	1976	
1.	Phylum: *Cyanophyta* *Microcystis aeruginosa* KÜTZ. *f. aeruginosa* STARMACH (=*f. typica* ELENKIN)	2	2	3	4	3	1	2			
2.	*M. aeruginosa* KÜTZ. f. *flos aquae* (WITTR.) E. (=*M. flos aqae* (WITTR.) KIRCHNER)	2	2	3	4	3	1	2			
3.	*Gomphosphaeria aponina* KÜTZ.	2	1				1		2	2	
4.	*G. lacustris* CHOD.		2	2					2	1	3
5.	*G. naegeliana* (UNGER) LEMM.	1	2	1					2		
6.	*Coelosphaerium naegelianum* UNGER	2	3		2				2		
7.	*Merismopedia punctata* MEYEN			2			1	2	1	2	
8.	*M. tenuissima* LEMM.		2			3	3	2	2	2	
9.	*Aphanocapsa grevillei* (HASS.) RABH.			2					1	2	
10.	*A. sideroderma* NAUMANN	2			1				2	1	
11.	*Dactylococcopsis acicularis* LEMM.		2	2			2			1	
12.	*D. raphidiodides* HANSG.	1	2	2	2	1	1	2	1	3	3
13.	*Tetrapedia gothica* REINSCH	2							2	1	
14.	*T. reinschiana* ARCHER								1	1	
15.	*Anabaena affinis* LEMM.			2	2	1	1	2			
16.	*A. spiroides* KLEBAHN			2	1				3		
17.	*Aphanizomenon flos aquae. (L.)* RALFS		2	3	4	4			3		
18.	*Spirulina corakiana* PLAYFAIR		2	1							
19.	*Sp. laxissima* KÜTZ.		2	2	2		2		1	2	2
20.	*Sp. maior* KÜTZ.	2	1	1	1	1	2	2	1	2	2
21.	*Oscillatoria animalis* AGARDH		2	2	2				2	1	
22.	*O. boryana* (AGARDH) BORY		2		2	1				2	
23.	*O. chalybea* MERTENS			3	2	1			1	1	1
24.	*O. formosa* BORY	1			2	2	2	1			

Tabular 1

No	Species (taxon)	Biotop group „A"							Biot. g. „B"		
		22 VI	16 V	1 VIII	29 IX	3 XI	16 II	28 V	22 VI	18 V	30 IX
		1975	1976				1977		1975	1976	
25.	*O. laetevirens* (CROUAN) GOM.		2	1	2					2	
26.	*O. lauterbornii* SCHMIDLE		3		2	2	1				
27.	*O. nigra* VAUCHER		2	2					2	1	
28.	*O. planctonica* WOLOSZ.	1	1	2	2	1	1				
29.	*O. simplicissima* GOM.			2	2	3	2				
30.	*O. tenuis* AGARDH		2	3	3	2	1	1	1	1	1
31.	*O. tenuis f. rivularis* (HANSG.) ELENK.			1	2		2			1	
32.	*Phormidium ambiguum* GOM.		2	2	1				2		
33.	*Ph. corium* (AGH.) GOM.			2	3		2	1		2	
34.	*Ph. favosum* (BORY) GOM.		1	1	2				1		
35.	*Ph. papyraceum* (AGH.) GOM.	2				3	2	2	2		
36.	*Ph. purpurascens* (KÜTZ.) GOM.	3	2		1				2	2	2
37.	*Ph. tenue* (MENEGH.) GOM.		2	2							
38.	*Lyngbya contorta* LEMM.		2						2	3	
39.	*L. cryptovaginata* SCHKORB.		2	2	3				2		
40.	*L. limnetica* LEMM.	1	1	2	2	1	1	2			
41.	*L. martensiana* MENEGH.		1	2	2	2			2	2	
42.	*L. stagnina* KÜTZ.	3	2	1					2	2	
43.	*Schizothrix polytrichoides* FRITSCH Phylum: *Euglenophyta*		1		2				2	1	
44.	*Colacium simplex* HUBER-PEST.	2	3	3	3	3	3	3	2	2	2
45.	*Euglena acus* EHR.	2	1	1	2	2		2	2	3	3
46.	*E. allorgei* DEFL.								2	2	
47.	*E. gasterosteus* SKUJA			2	2				2	3	
48.	*E. chlamydophora* MAINX								2	2	2
49.	*E. gracilis* KELBS	1	2		2				1	1	
50.	*E. limnophila* LEMM.								2	2	2
51.	*E. proxima* DANG.		2	2	2				3	2	

Tabular 1

No	Species (taxon)	Biotop group „A"							Biot. g. „B"		
		22 VI	16 V	1 VIII	29 IX	3 XI	16 II	28 V	22 VI	18 V	30 IX
		1975	1976				1977		1975	1976	
52.	*E. velata* KLEBS								3	2	
53.	*Lepocinclis ovum* (EHR.) LEMM.								2	2	
54.	*L. steinii* LEMM. em. CONRAD								2	1	
55.	*Phacus acuminatus* STOKES		2		1					2	2
56.	*Ph. caudatus* HÜBNER	2		2						2	2
57.	*Ph. longicauda* (EHR.) DUJ.		1			1		1		1	1
58.	*Ph. myersi* SKVORTZ.								2	2	
59.	*Ph. pyrum* (EHR.) STEIN								2	1	2
60.	*Trachelomonas volvocina* EHR.	1		2				1	1	1	
61.	*Tr. intermedia* DANG.				2				2	1	
62.	*T. crebea* KELLICOTT emend. DEFL.	1	1	2	2	1	1	2	2	3	1
63.	*T. granulata* SWIRENKO	2	2	1	2	2	2	1	1	1	2
64.	*T. planctonica* SWIR.	3		2	2	3	3			2	
65.	*T. similis* STOKES					2	1		1	1	
66.	*Strombomonas fluviatilis* (LEMM.)DEFL.		2		2		1			2	
67.	*S. verrucosa* (DADAY) DEFL. Phylum: *Chrysophyta* *Xanthophyceae*	1		2		2			1	2	
68.	*Asterogloca gelatinosa* PASCHER	1						2			
69.	*Chlorobotrys simplex* PASCHER		2	1							
70.	*Centritractus africanus* FRITSCH et RICH			2	3	2					
71.	*C. belonophorus* LEMM.	2		2	2	2					
72.	*C. dubius* PRINTZ			1					2	1	
73.	*Ophiocytium capitatum* WOLLE			2	2	1				1	2
74.	*O. cohleare* A. BRAUN			1	1						
75.	*O. Lagerheimii* LEMM.					2	1		1		2
76.	*Tribonema affine* G. S. WEST		1	2	1	2	1		2	2	
77.	*T. elegans* PASCHER	3	2	1	2	2					2

Tabular 1

No	Species (taxon)	Biotop group „A"							Biot. g. „B"		
		22 VI	16 V	1 VIII	29 IX	3 XI	16 II	28 V	22 VI	18 V	30 IX
		1975	1976				1977		1975	1976	
78.	*T. minus* G. S. WEST	1	2	2	2	2	2	2	1		1
79.	*T. regulare* PASCHER *Chrysophyceae*		2	3	1					2	
80.	*Chromulina freiburgensis* DOFL.			2	3	2					
81.	*Ch. ovalis* KLEBS			2	2	3				3	
82.	*Chrysococcus biporus* SKUJA	2	3	1	3	2	1		1	1	2
83.	*C. rufescens* KLEBS			2	2	1		2		3	
84.	*Chrysoglena verrucosa* WISL.	1	2	2	2	2	1				
85.	*Dinobryon sertularia* EHR.	2	3	3	3	2	2	4	2	2	2
86.	*D. cylindricum* IMHOF.		1	2	2	2	1	3	2	1	1
87.	*D. divergens* IMHOF.	2	2	3	3	2	3	1	1	1	1
88.	*D. tabellariae* (LEMM.) PASCHER	1	1	1	2	1					
89.	*Kephyrion cylindricum* (LACK.) CONR.	1	2	2	3	3	2	1	1	1	1
90.	*K. rubri-claustri* CONR.			2	2	2					2
91.	*Pseudokephyrion conicum* SCHILLER		1	2	2	1	1		3		
92.	*Kephyriopsis ovum* PASCH. et RUTTN.				2	2				1	
93.	*Mallomonas bernardinensis* (CHOD.) CONR.			1	2	1					
94.	*M. caudata* IWANOFF	1	2	2	3	2	2	1	1	1	1
95.	*M. hirsuta* CONRAD			1	2	1			1		
96.	*Ochromonas nasuta* SKVORTZOW	1	1	1	1	2	1			2	
97.	? *Pseudosyncrypta spec.*			1	2	2					
98.	*Synura uvella* EHR.	1	1	2	3	3	2		1	2	
99.	*Synura uvella* EHR. var. *tiszaensis* KISS I.		2	1	3	2	1				2
100.	? *Tessella volvocina* PLAYFAIR *Bacillariophyceae*			1	2						
101.	*Achnanthes affinis* GRUN.		2	1	1	1			1	2	
102.	*A. linearis* W. SMITH		1		1	1			2		
103.	*Amphora commutata* GRUN.			1	2	2	1	2	1	1	1
104.	*A. veneta* KÜTZ.	1	2	2	2	1	2	2	3	3	2

Tabular 1

No	Species (taxon)	Biotop group „A"							Biot. g. „B"		
		22 VI	16 V	1 VIII	29 IX	3 XI	16 II	28 V	22 VI	18 V	30 IX
		1975	1976				1977		1975	1976	
105.	*Anomoconeis sphaerophora* (KG.) PFITZ.	2	2	1	1				2	2	
106.	*Asterionella formosa* HASS.	1	1	2	2	2		2	2		
107.	*A. zasuminensis* (CABEJSZ.) LUNH-ALM.			2	3	3	1		2		1
108.	*Bacillaria paradoxa* GMELIN	1	2	2	2	2	1	1		2	
109.	*Caloneis amphisbaena* (BORY) CL.	2	2	2	3	3	2	2	3	3	2
110.	*Cocconeis pediculus* EHR.	1	2	2	2		1	2			
111.	*C. placentula* EHR.	1	2	3	3	1	2	1		2	
112.	*Cyclotella comta* (EHR.) KÜTZ.	2	1	2	2	2	1	2	1		1
113.	*C. meneghiniana* KÜTZ.	3	2	2	3	3			2	2	2
114.	*Cymatopleura elliptica* (BREB.) W. SMITH		2	1					1		1
115.	*C. elliptica var. hibernica* (W. SMITH) HUST.	1	1		2		1		1	2	1
116.	*C. solea* (BRÉB.) W. SMITH	1	1	1	1	1	1	1	2	3	2
117.	*Cymbella affinis* KÜTZ.	1	1	2	2	1	1	2	1	1	1
118.	*C. austriaca* GRUNOW	2		2		2		1	2	2	
119.	*C. lanceolata* (EHR.) VAN HEURCK	1	1	1	1	2	2	1	2	2	1
120.	*C. cymbiformis* (KÜTZ.) VAN HEURCK	1	1	2	2	2	1	1	2	2	2
121.	*C. ventricosa* KÜTZ.			2	2		2			2	
122.	*Diatoma elongatum* (LYNGB.) AG.		1	2	2	2			1		1
123.	*D. hiemale* (LYNGB.) HEIBERG	2		2			1		2	2	
124.	*D. vulgare* BORY	1	2	2				1	2	1	1
125.	*Epithemia turgida* (EHR.) KÜTZ.				2		2		1	2	2
126.	*Eunotia lunaris* (EHR.) GRUN.		2			2			2	2	
127.	*Fragilaria capucina* (DESM.)	1	1	1	2	2	2	1		1	
128.	*F. virescens* RALFS				2	1	1		2		
129.	*F. virescens var. mesolepta* SCHÖRF.			2						1	
130.	*Gomphonema acuminatum* EHR.		1	1	3	2	1		2		2
131.	*G. acuminatum var. trigonocephalum* (EHR.) GRUNOW	1	1	1	2	1				2	
132.	*G. augur* EHR.			1	2	2	1		1		

Tabular 1

No	Species (taxon)	Biotrop group „A"							Biot. g.„ B"		
		22 VI	16 V	1 VIII	29 IX	3 XI	16 II	28 V	22 VI	18 V	30 IX
		1975	1976				1977		1975	1976	
133.	*Gyrosigma acuminatum* (KÜTZ.) (RABENH.)		2	2				1	2	3	
134.	*G. kützingii* (GRUN.) CL.	2	2	2	1	1					1
135.	*Hantzschia amphioxys* (EHR.) GRUN.		2		1			1	2	2	
136.	*Melosira granulata* (EHR.) RALFS		1	1	2	1					
137.	*M. varians* AGARDH			2	2	2	2	2			
138.	*Navicula cryptocephala* KÜTZ.	2	2		1				2	1	
139.	*N. exigua* (GREG.) O. MÜLL.		2				1		2	2	
140.	*N. gregaria* DONK.	1	1		2			2	2	3	3
141.	*N. radiosa* KÜTZ.	1	1	2	1	1	2	1	2	1	
142.	*N. rhynchocephala* KÜTZ.		1	2					2	2	3
143.	*N. ventralis* KRASSKE	2				2			3	3	1
144.	*Neidium productum* (W. SMITH) CLEVE		2	2	2	2				3	
144.	*Nitzschia apiculata* (GREG.) GRUN.		2				1		2	2	
146.	*N. gracilis* HANTZSCH.	1	1	2	2	2	2	2	2	1	1
147.	*N. hantzschiana* RABH.			3	2					1	
148.	*N. hungarica* GRUN.	2	2	2	3	2		2		1	
149.	*N. kützingiana* HILSE				2	2			2	2	
150.	*N. linearis* W. SMITH	1	1	2	3	2	2		2		
151.	*N. palea* (KÜTZ.) W. SMITH		2	2	2	1		2		2	1
152.	*N. sigmoidea* (EHR.) W. SM.	1	1	1	2	2	2		1		1
153.	*Pleurosigma elongatum* W. SMITH		2	2							
154.	*Rhoicosphaenia curvata* (KÜTZ.) GRUN.		2	1					2		
155.	*Rhopalodia gibba* (EHR.) O. MÜLL.		2	3					2	2	
156.	*Stauroneis anceps* EHR.					1		1	2	2	
157.	*Surirella biseriata* var. *bifrons* (EHR.) HUST.		2	2						1	
158.	*S. linearis* var. *constricta* (EHR.) GRUN.	1	1	1	1	2					1
159.	*S. ovalis* BRÉB.			2	2	2	1	2		2	
160.	*S. ovalis* KÜTZ.	2	1	2					1		

Tabular 1

No	Species (taxon)	Biotop group „A"							Biot. g. „B"		
		22 VI	16 V	1 VIII	29 IX	3 XI	16 II	28 V	22 VI	18 V	30 IX
		1975	1976				1977		1975	1976	
	Phylum: *Pyrrophyta*										
161.	*Ceratium hirundinella* (O. F. MÜLL.) SCHRANK	1	2	3	2	2	2	2	1	1	1
162.	*C. hirundinella f. furcoides* (SCHROED.)										
163.	HUBER-PEST. *C. hirundinella* f. *silesiacum* (SCHROED.) H. P.	1	2	3	3	3	1	2	1	2	1
164.	HUBER-PEST. *C. hirundinella* f. *robustum* (BACHM.)										
165.	HUBER-PEST. *Cystodinium bisetosum* (LINDEM.)	1	1	1	3	1	2	2	1	2	1
166.	*Glenodinium edax* SCHILLING				1	2	2	2	2	1	1
167.	*Gonyaulax apiculata* (PENARD) ENTZ			1	2						
168.	*Gymnodinium veris* LINDEM.		1			1	2	1		1	
169.	*Peridinium bipes* f. *globosus* LINDEM.			1	1				1		
170.	*P. cinctum* (MÜLLER) EHR.	1	1	2	3	1	1	1	1	1	1
171.	*P. palatinum* LAUTERB.	1	2	1	3	3	3	1	1	1	2
172.	*P. palatinum* f. *anglicum* (G. S. WEST) LEF.			1	2	2	2	2	1	1	1
173.	*P. volzii* LEMM.	1	2	2	3	3	2	1	1	1	1
174.	*P. volzii* var. *cinctiforme* LEF.			2	2	2	1				
175.	*Peridinium spec.*		1	2	2	2	2	1		1	
	Phylum: *Chlorophyta*										
	Chlorophyceae										
176.	*Actinastrum hantzschii* LEMM.		2		1	1	1		2	2	2
177.	*Ankistrodesmus acicularis* (A. BRAUN) KORSHIKOV	1	2						2	2	1
178.	*A. falcatus* (CORDA) RALFS	1	1	2	2	2	2	1	2	2	3
179.	*A. convolutus* CORDA			2		3			2	2	2
180.	*A. pseudomirabilis* KORSH.	1	1	2	2					1	
181.	*Characium hookeri* (REINSCH) HANSG.	2	2	1	1				1		
182.	*C. sieboldii* A. BRAUN	2				1			2	3	
183.	*Chlorella infusionum* (SCHRANK) MENEGH.		2				2		2	3	

Tabular 1

No	Species (taxon)	Biotop group „A"							Biot. g. „B"		
		22 VI	16 V	1 VIII	29 XI	3 XI	16 II	28 V	22 VI	18 V	30 IX
		1975	1976				1977		1975	1976	
184.	*Chlorococcum humicolum* (NAEG.) RABH.								1	1	1
185.	*Chodatella octoseta* ALTEN			1					2	1	
186.	*Coelastrum cambricum* ARCH.		2	3					2	2	1
187.	*C. microporum* NAEG.	2	2	2	2	2	3	1	1	1	1
188.	*C. sphaericum* NAEG.			1	2	2				1	
189.	*Chodatellopsis elliptica* KORSH.		1				1		2	1	
190.	*Crucigenia rectangularis* (NAEG.) GAY.	1			2	2			3	3	2
191.	*C. quadrata* MORREN		3	2	1					1	
192.	*C. terapedia* (KIRCHN.) W. et G. S. WEST						1	1	2	2	
193.	*Desmatractum indutum* (GEITL) PASCH.	1	2	2	2	1	1		1		
194.	*D. bipyramidatum* (CHOD.) PASCHER			1	2	3	1				
195.	*Dictyosphaerium pulchellum* WOOD	1	1	2	2	3	3	1	1	1	1
196.	*Didymogenes palatina* SCHMIDLE	1		2				1	1	2	
197.	*Dimorphococcus lunatus* A. BR.							1	2	2	
198.	*Elakothrix acuta* PASCHER		1			1			2	2	
199.	*E. lacustris* KORSH.	1							1	2	1
200.	*Eremosphaera gigas* (ARCHER) FOTT et KALINA				1				2	2	
201.	*Eudorina charkowiensis* PASCHER		2	1		2				2	
202.	*E. elegans* EHR.	2	2	3	3	3	2	4	2	2	2
203.	*Franceia ovalis* (FRANCÉ) LEMM.						1		2	2	2
204.	*Fusola viridis* SNOW		1						2	2	
205.	*Gloeoactinium limneticum* G. M. SM.							1		2	1
206.	*Golenkinia radiata* CHODAT		2				2		2	1	
207.	*Kirchneriella contorta* (SCHMIDLE) BOHL.		1	2		1			2	2	2
208.	*K. obesa* (W. SMITH) SCHMIDLE	2	2	2	2	2	2	2	2	3	2
209.	*Lagerheimia genevensis* CHODAT			1	2						1
210.	*Nephrochlamys allantoidea* KORSH.								1	2	1
211.	*N. subsolitaria* (G. S. WEST) KORSH.			1	2	2			2	2	

Tabular 1

No	Species (taxon)	Biotop group „A"							Biot. g.„ B"		
		22 VI	16 V	1 VIII	29 IX	3 XI	16 II	28 V	22 VI	18 V	30 IX
		1975	1976				1977		1975	1976	
212.	*Nephrocytium agardhianum* NAEG.		2				1		1	2	
213.	*N. allantoideum* BOHL.			2	2	2		2	1	1	1
214.	*Oocystis borgei* SNOW	1	2				2				1
215.	*O. elliptica* W. WEST	2	2	1	2	3				1	
216.	*O. natans* (LEMM.) WILLE.		3	2	3	1			1		
217.	*Pediastrum boryanum* (TURP.) MENEGH.	2	1	2	2	2		2	1	2	2
218.	*P. duplex* MEYEN	1	1	3	2	1	1	1	1	1	1
219.	*P. simplex* MEYEN	1	1	2	3	3	2	1	1	1	1
220.	*P. tetras* (EHR.) RALFS	1	1	2	1	2	1	3	2	1	2
221.	*Polyedriopsis spinulosa* SCHMIDLE	2	2	3	3	3		2	2	2	2
222.	*Quadrigula chodatii* (TAN.-FUL.) G. N. SM.		1						2	2	
223.	*Scenedesmus acuminatus* (LAGERH.) CHODAT	1	2	2	2	3	1	1	1	2	1
224.	*Sc. acuminatus* var. *elongatus* G. M. SMITH		2	1							
225.	*Sc. acutus* MEYEN				2	2			1	2	
226.	*Sc. acutus* f. *alternans* HORTOB.					2			2	2	2
227.	*Sc. acutus* f. *costulatus* UHERKOV.	2		2				1	2	2	
228.	*Sc. bicaudatus* (HANSG.) CHODAT		2	3	1			1			1
229.	*Sc. bicaudatus* var. *brevicaudatus* HORTOB.			2	2	1			1		
230.	*Sc. denticulatus* LAGERH.	2				2	2	2			1
231.	*Sc. denticulatus* var. *linearis* HANSG.			2		2	2			1	
232.	*Sc. denticulatus* var. *polydenticulatus* HORTOB.					2	1		2		
233.	*Sc. dispar* BRÉB.	3	2	2				2	2	2	
234.	*Sc. ecornis* (RALFS) CHODAT	1	1	1	2	3	2	1	1	1	1
235.	*Sc. ecornis* var. *disciformis* CHOD.	1	2			1				1	
236.	*Sc. intermedius* CHODAT			2	2					2	
237.	*Sc. opoliensis* P. RICHT.	1	1	1	2		2				2
238.	*Sc. ovalternus* CHODAT		1	1	3	2			2		
239.	*Sc. quadricauda* (TURP.) BRÉB.	1	2	2	2	2	3	2	3	3	1

Tabular 1

No	Species (taxon)	Biotop group „A"							Biot. g. „B"		
		22 VI	16 V	1 VIII	29 IX	3 XI	16 II	28 V	22 VI	18 V	30 IX
		1975	1976				1977		1975	1976	
240.	*Sc. quadricauda* var. *biornata* KISS		1	2	3	2			2	2	
241.	*Sc. quadricauda* var. *quadrispina f. gracillimus* UHERKOV.	1	1	1	2	2			1	2	
242.	*Sc. securiformis* PLAYF.		2	3	2			2			1
243.	*Sc. spinosus* CHODAT			1	1	2	2			1	1
244.	*Schroederia setigera* (SCHRÖD.) LEMM.	3	2								
245.	*Sch. spiralis* (PRINTZ.) KORSH.	1	1	2							
246.	*Siderocelis ornata* FOTT		2	2	2				1	1	
247.	*Sorastrum spinulosum* NAEG.				3	2			2	2	
248.	*Sphaerocystis polycocca* KORSH.	1	1	2		2		2		3	
249.	*Sph. schroeteri* CHODAT		1	2	2	2			2	2	2
250.	*Tetraedron caudatum* (CORDA) HANSG.			2	1					1	
251.	*T. minimum* (A. BRAUN) HANSG.	1	1	1	1	2	2	2		2	1
252.	*T. minimum* var. *apiculatum* REINSCH	1	1	2	2				3	1	
253.	*T. muticum* (A. BRAUN) HANSG.		2				2		2	3	2
254.	*T. regulare* KÜTZ.	1	1			1			1	1	
255.	*T. trigonum* (NAEG.) HANSG.			1	2						2
256.	*T. trilobatum* (REINSCH) HANSG.		1			1	1	1	1	2	
257.	*Tetrallantos lagerheimii* TEIL.	1		2					2	1	
258.	*Tetrastrum staurogeniaeforme* (SCHRÖD.) LEMM.	2	2	1	1	1			3	2	
259.	*T. triacanthum* KORSH.		1		2	1	1		1	2	1
260.	*Treubaria varia* TIFF. et AHLSTR.		2	1				1	2	1	
261.	*Trochiscia granulata* (REINSCH) HANSG.	1				1			1	2	
262.	*? T. aciculifera* (LAGERH.) HANSG.				2	3	2		1		
263.	*Hormidium fluitans* (GAY) HEERING		2					1	2	3	
264.	*Oedogonium capilliforme* KÜTZ. sec. HIRN		2							3	
265.	*Stigeoclonium lubricum* KÜTZ.				3		2		2	2	
266.	*Ulothrix tenuissima* KÜTZ.			2	3	3	2	1	3	3	1

Tabular 1

No.	Species (taxon)	Biotop group „A"							Biot. g. „B"		
		22 VI	16 V	1 VIII	29 IX	3 XI	16 II	28 V	22 VI	18 V	30 IX
		1975	1976				1977		1975	1976	
267.	*Cladophora fracta* KÜTZ. ampl. BRAND							3	2	3	
268.	*Conjugatophyceae* *Closterium acerosum* (SCHRANK) EHR.	1	2	3	3	1			2	2	2
269.	*Cl. aciculare* T. WEST			2	2						1
270.	*Cl. lanceolatum* KÜTZ.	1	2	2	1	1	3	3	2	2	2
271.	*Cl. leibleinii* KÜTZ.			3	2	2	2	2	1	1	1
272.	*Cl. moniliferum* (BORY) EHR.	2	3	1	2	1			2	1	1
273.	*Pleurotaenium trabecula* (EHR.) NAEG.			1	2	2	1			2	
274.	*Cosmarium depressum* (NAEG.) LUND.	1	1	2	3	1	1		1	1	
275.	*C. margaritiferum* MENEGH.	1	1	1	2	1	1	1	1	1	1
276.	*C. quadrum var. sublatum* (NORDST.) W. et G. S. WEST	2	3	2	2	2	2	2	2		
277.	*C. turpini* BRÉB. (var. ?)	1	1	1	2	3	2	1	1	1	1
278.	*C. wembaerense* SCHMIDLE		2	3	1	1			3	3	1
279.	*Staurastrum omearii* ARCH.			1	2			2			
280.	*St. paxilliferum* G. S. WEST		1		1	2	2		2		
281.	*Spirogyra areolata* LAGERHEIM	3	2							3	
282.	*Sp. insignis* (HASS.) CZURDA		3					3		4	
283.	*Sp. varians* (KÜTZ.) CZURDA	3			3				3		
284.	*Mougeotia angusta* HASSAL			3			3			3	
285.	*M. sphaerocarpa* WOLLE	2	3			2					2
286.	*Gonatozygon pilosum* WOLLE				2				3	2	

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