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DATA ON THE SUMMER ALGAL FLORA OF DEAD-ARMS IN THE VICINITY OF TISZAFÜRED

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Abstract

The algological composition of the dead-arms being in different states of filling up is different. Their individualization is influenced by the degree of flood of the river.

Introduction

The river stretches — dead-arms — separated from the Tisza in a natural or artificial way are showing a very varied picture. The dead-arms investigated in this paper are in different stages of filling up; but it is common in them that they take place in the flood-plain, without any direct connection with the river. In time of flood — mostly in Spring — they may come under water.

The algological investigation of the Tisza dead-arms was dealt with by several researchers. The results were summarized by Uherkovich (1971: literature *ibid.*). The research of the dead-arms in the vicinity of Tiszafüred became particularly timely because they lie in the area of the future Kisköre Reservoir (Fig. 1).

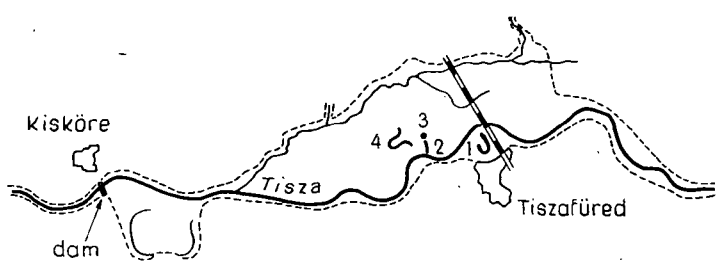

Fig. 1. Localization of dead-arms in the vicinity of Tiszafüred. 1: Tisza dead-arm at Tiszafüred, 2: Long reach, 3: Round reach, 4: Borzanat.

Materials and Methods

Sampling took place on September 18—19, 1969. Algae were investigated from samples drawn. The chemical analysis of water was performed by the laboratory of the Water Management of the Middle Tisza Region. To recognize the water-plant associations, help was rendered by GY. BODROGKÖZY (1965) and K. BÁBA.

The names of dead-arms are mostly popular denominations.

The habitats of species and the characteristics of the biotopes investigated are given in the following enumeration:

At Tiszafüred:	dead-Tisza:	1
	open water	a
	close to the riverside	b
	below Trapa natans	c
Long reach		2
Round reach		3
	open water	a
	close to the riverside	b
"Borzanat"		4
	open water	a
	close to the riverside	b

Results

(1) Dead-Tisza at Tiszafüred

The U-shaped dead-arm is surrounded by a high bank. Between the open water and the riverside some water-vegetation is to be found, formed by the complex of

Table 1. *Chemical investigation into the water of the dead-arms in the vicinity of Tiszafüred*

		Tiszafüred Dead-Tisza		Hosszú-böge	Kerek-böge	Borza-nat
		Open water	River-side			
Weather		sunshine	sunshine	sunshine	sunshine	sunshine
Air temperature	°C	32,0	32,0	30,0	30,0	30,0
Water temperature	°C	24,0	21,0	24,0	21,0	22,0
Colour		greenish	greenish	dark grey	greenish	greenish
Smell		smell-less	smell-less	smell-less	smell-less	smell-less
Transparency	mm	180	180	180	170	180
Oxygen consumption	mg/l	5,12	5,68	6,5	5,68	10,7
BOI 5	mg/l	2,24	2,56	2,72	2,72	3,3
Dissolved oxygen	mg/l	8,65	10,4	10,7	10,72	11,05
Percentage of oxygenation		104,0	118,0	129,0	121,2	127,5
pH		7,3	7,2	7,1	7,2	7,2
Conductivity	10^{-6} $ohm^{-1}cm^{-1}$	510	510	540	450	540
Ca^{2+}	mg/l	30,5	32,1	52,9	42,5	34,5
Mg^{2+}	mg/l	9,7	11,7	12,2	12,6	23,8
Na^{+}	mg/l	32,2	34,2	10,5	11,0	17,0
K^{+}	mg/l	2,4	2,4	3,7	3,6	2,6
Cl^{-}	mg/l	17,7	19,0	19,7	18,3	18,3
SO_4^{2-}	mg/l	24,5	29,8	27,8	26,4	33,6
HCO_3^{-}	mg/l	183,0	183,0	207,4	183,0	207,4
CO_3^{2-}	mg/l	0,00	0,00	0,00	0,00	0,00
Free carbon dioxide	mg/l	1,76	3,52	5,27	5,27	5,27
Fe^{2+}	mg/l	0,01	0,01	0,01	0,01	0,01
Mn^{2+}	mg/l	0,00	0,00	0,00	0,00	0,00
NH_4^{+}	mg/l	0,16	0,35	0,35	0,15	0,36
NO_2^{-}	mg/l	trace	0,03	0,016	trace	trace
NO_3^{-}	mg/l	1,12	3,8	0,47	1,44	2,07
PO_4^{3-}	mg/l	0,05	0,1	0,1	0,12	0,1
Total dissolved matter	mg/l	207	218	228	185	207
Total floating matter	mg/l	189	122	191	88	163
Total dry matter	mg/l	396	122	419	273	370
Cation type		Ca—Na	Ca—Na	Ca—Mg	Ca—Mg	Mg—Ca
Anion type		HCO_3	HCO_3	HCO_3	HCO_3	HCO_3

Nymphaeetum albo-luteae NOWINSKI 28 and *Trapetum natantis* MÜLLER & GÖRS 60, subm. plant: *Ceratophyllum demersum* L. Depth of the open water is 2 to 4 m. The water is of chemically pure Ca—Na—HCO_3 type (Tabl. 1).

(1a) The high individual number and low species number are characteristic of the algal stock of open water (Fig. 2). The high individual number was induced by *Ceratium hirundinella* f. *furcoides* (SCHOERED) HUBER-PEST. and *Peridinium volzii* LEMM. The majority of the stock are pelagic organisms.

(1b) The algological composition of the area overgrown by water-plants between the riverside and open water differs from that of open water. High species number and low individual number are characteristic of it (Fig. 3). The plankton is enriched mainly by Conjugata and Diatoma.

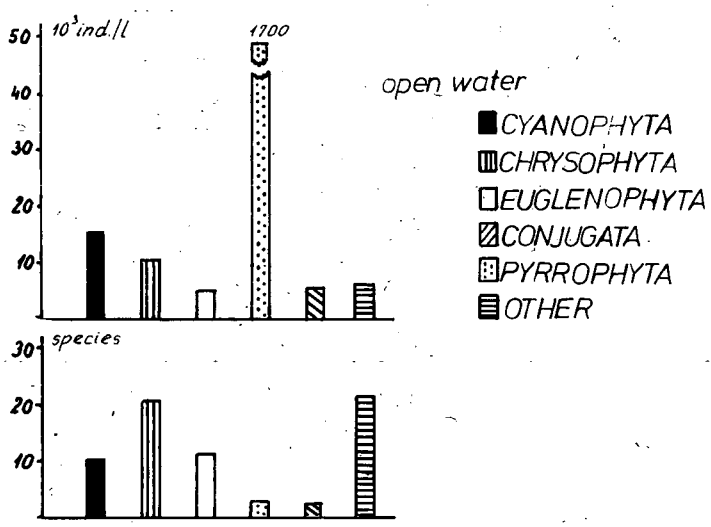

Fig. 2. Algological conditions in the open water of the Tisza dead-arm at Tiszafüred.

(1c) The chemical composition of water in the region close to the riverside is similar to that of the open water but, *e.g.*, its CO_2 content is higher (Table 1). The vegetation close to the riverside, in a narrow stripe, is formed by the complex of *Hydrochari-Stariotetum* (LANGENDONCK 35) WESTHOFF 42 stratiotetosum and *Nymphaeetum albo-lutae* NOVINSKI 28, here and there *Phragmites communies* L. also occur. Of its algological composition the high species number and low individual number are characteristic (Fig. 3). Similarly to the former biotope, the Conjugata and Diatoma predominate.

(2) Long reach

It is a narrow, 2 m deep dead-arm, its riverside is densely overgrown with birch-trees. It contains no water-vegetation. Chemically its water is pure, of Ca—Mg—HCO_3 type (Table 1). The low species- and individual numbers are characteristic of its algological composition, with the dominance of Diatoma (Fig. 4). There were found some rare diatoms as *Surirella ovata* var. *pinnata* (W. SM.) HUST., *Synedra arcuatus* var. *subrecta* CLEVE, *Navicula cuspidata* var. *hankae* f. *craticularis* SKV.

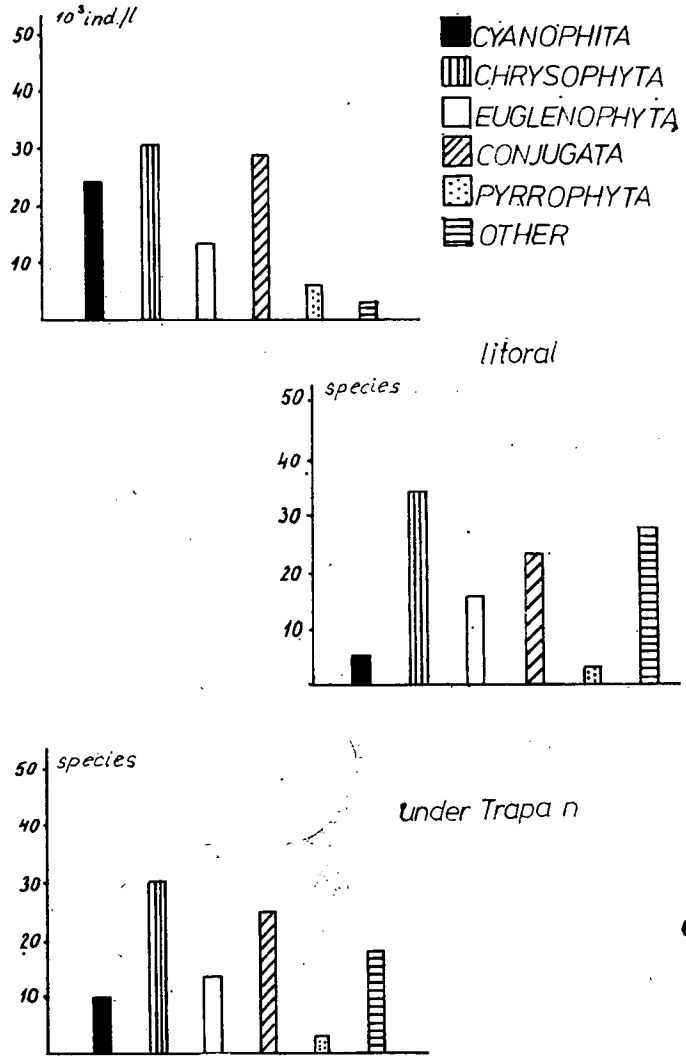

Fig. 3. Algological conditions in the Tisza dead-arm at Tiszafüred close to the riverside and below *Trapa natans*.

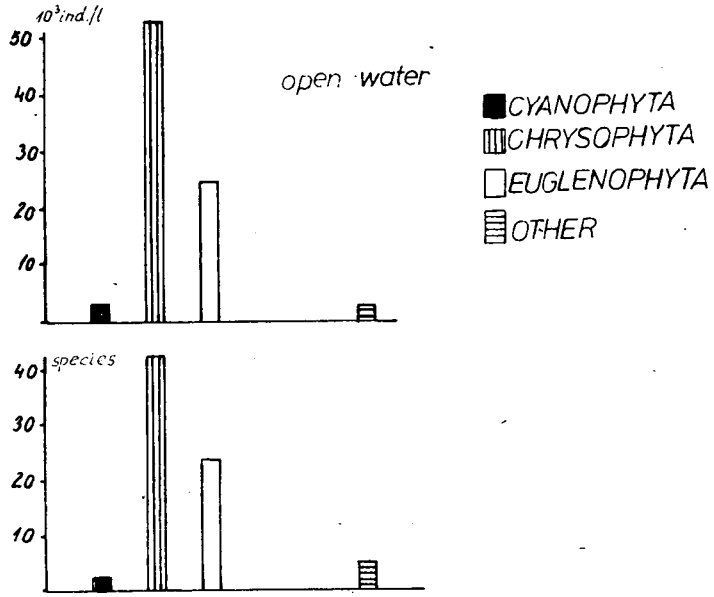

Fig. 4. Algological combination in the water of Long reach.

(3) Round reach

Its water is chemically pure, of Ca—Mg—HCO_3 type (Table 1). In the open water, in spots, *Nymphaea alba* L. and *Trapa natans* L. can be found, at the riverside *Myriophyllo-Potametum* Soó 34 myriophylletosum spicati subassociation occurs. Water-depth is small, maximum 1—1,5 m.

(3a) In its open water, an algal stock is to be found that is characteristic of shallow waters, with the dominance of Diatoma (Fig. 5).

(3b) The species number of the zone at the riverside is very low (Fig. 5), its individual number similarly. *Trachaelomonas-taxons* are the most frequent.

(4) "Borzanat"

It is a dead-arm in a far-advanced state of being filled-up. Its water-vegetation in the open water: *Nymphoidetum peltatae* (Allorge 22) Oberd. & Müller 60, form an association. At the riverside, *Scirpo-Phragmitetum* W. Koch 26 *schoenoplectetosum lacustris* (Allorge) Chouard 24 are to be found. Its water is shallow, maximum 1—1,5 m deep. In its chemical composition Ca^{++}, Mg^{++}, and HCO_3^- ions dominate (Tabl 1).

(4a) Species- and individual numbers in the open water are low (primarily Diatoma), the stock is formed by shallow-water organisms.

(4b) In the stirred water of the region at the riverside there were found several periphytic organisms. The number of species belonging to the Conjugatophyceae was also considerable.

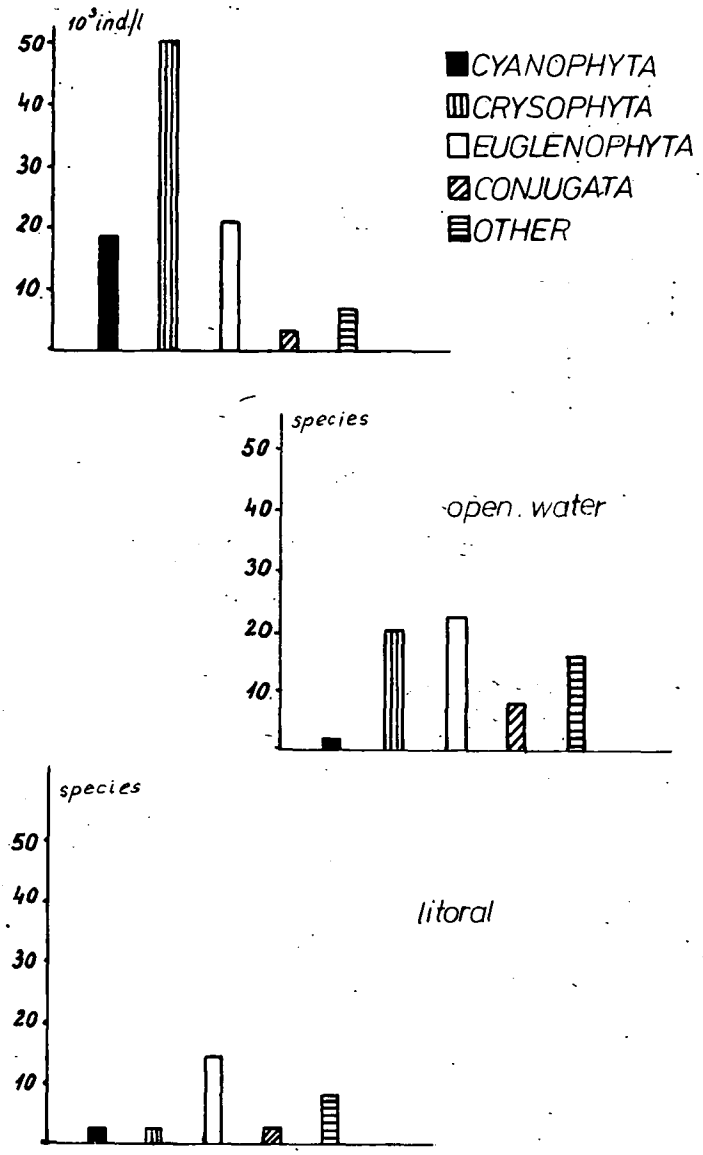

Fig. 5. Algological combination in the open water and riverside region of Round reach.

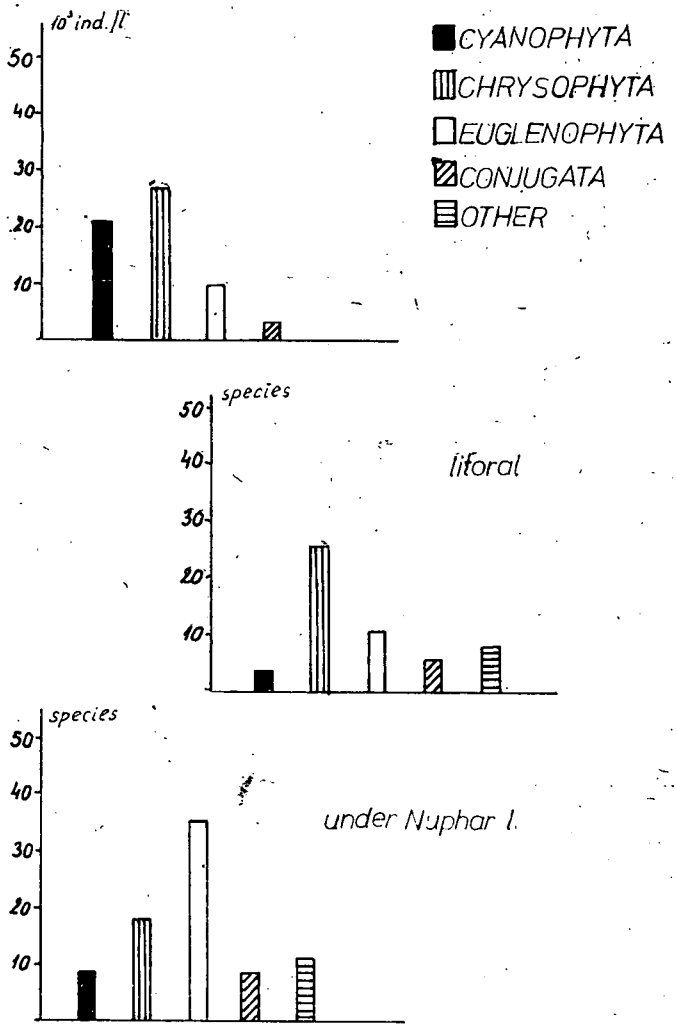

Fig. 6. Algological combination in the riverside region of Borzanat and of its part below *Nuphar luteum.*

Enumeration

Cyanophyta
Achronema articulatum SKUJA (4b)
Anabaena affinis LEMM. (1abc, 4ab)
A. affinis f. *viguieri* (DENIS & FRÉMY) KOM. (1a)
A. spiroides KLEBS (1a)
Anabaena sp. (1b)
Aphanizomenon flos aquae f. *gracile* (LEMM.) ELENK. (1a)
Aulosira laxa KIRCH. (Tab. 2. 1)
The trichomata are straight or a little curved. The colourless capsule is tight, 8 μ thick. The greenish-blue cells are 7 μ broad, the size of the heterocyst is 7×8—10 μ. No spore occurred. (4a)
Lyngbya birgei G. M. SMITH (Tabl. 2.2.)
The trichoma is straight, in the 18—23 μ thick capsule there are cells of 2,5—3×17—22 μ to be found. The lumen is almost filled in by gas-vacuoles. (1abc)
Mycrocystis aeruginosa KG. (1abc)
Oscillatoria acutissima KUFF. (Tab. 2. 3—4)
The end of the trichoma is curved, the size of cells is 8—10×2,5 μ. (1bc, 3a, 4ab)
O. granulata GARD. (2, 4a)
O. lauterbornii SCHMIDLE form? (Tab. 2. 6)
The trichoma is straight or a little curved, the size of cells is 6×2,5—3 μ. The transversal constrictions are well-marked. Within the cells there are large gas-vacuoles. (1b)
O. limnetica LEMM. (1b)
O. limosa AGH. (4a)
O. ornata (KÜTZ.) GOM. (Tab. 2. 5)
The size of the granule-cells is 9×2,5 μ. (1b)
O. princeps VAUCH. (4a)
Oscillatoria sp. (1b)
Pseudanabaena catanea LAUT. (1b)
P. constricta (SZAF.) GEITL. (1a)
P. papillaterminata (KISS.) KUKK (1b)
The size of cells is 3—4,5 μ.
Euglenophyta
Colacium arbscula STEIN (Tab. 2. 13)
The size of cells is 16—15×9—7 μ. (1b)
C. cyclopicola (GICKL.) WORONICH. & POPOVA (3a, 4ab)
Euglena allorgei DEFL. (Tab. 3. 12)
The size of cells is 90×12 μ. (3a)
E. acus EHR. (2, 3a, 4a)
E. acus var. *angularis* JOHN. (4a)
E. ehrenbergii KLEBS (1b)
E. oxyuris f. *minor* DEFL. (2, 4a)
E. pisciformis KLEBS (2)
E. proxima DANG. (Tab. 3. 10) (1c, 2, 3a, 4a)
E. spathirhyncha SKUJA (4a)
E. tripteris (DUJ.) KLEBS (1b)
E. tripteris var. *crassa* SWIR. (2)
Lapociclis ovum (EHR.) LEMM. (2, 3a, 4a)

L. sphagnophila LEMM. (1a)
L. steinii var. *suecica* LEMM. (4a)
L. texta (DUJ.) LEMM. (1ac, 2, 3a, 4a)
Phacus acuminatus STOKES (1c)
Ph. aenigmaticus DREZ. (3a)
Ph. caudatus HÜBNER (2, 4b)
Ph. caudatus var. *minor* DREZ. (Tab. 2. 16)
The size of cells is 29—23×14—12 μ. (2, 3a)
Ph. curvivauda SWIR. (3a)
Ph. longicauda (EHR.) DUJ. (1a, 2, 3a)
Ph. moniliatus var. *suecicus* LEMM. (3b, 4b)
Ph. orbicularis HÜBNER (3a, 4a)
Ph. orbicularis f. *communis* POPOVA?
The difference is induced by paramylon divided in four (?). The size of the cell is 47×38 μ. (1c)
Ph. pleuronectes (O.F.M.) DUJ. (1b, 4b)
Ph. pseudonordstedtii (DEFL.) POCH. (3a)
Phacus pyrum (EHR.) STEIN (1c, 3a)
Ph. raciborskii DREZ. (3a)
Strombomonas sp. (4a)
Trachaelomonas abrupta f. *minor* DEFL. (2)
Tr. acanthostoma STOKES (3b)
Tr. acanthostoma var. *minor* DREZ. (4ab)
Tr. acuminata var. *verrucosa* TEOD. (2)
Tr. armata (EHR.) STEIN (4a)
Tr. armata var. *steinii* LEMM. em. DEFL. (1b)
Tr. bacillifera PLAYF. (1a, 4ab)
Tr. conica PLAYF.
The size of cells is 24—26×14 μ. (3b, 4a)
Tr. cordata ROLL (4a)
Tr. crebea KELL. emend. GEITL. (1a)
Tr. crebea var. *obesa* BAL. (2)
Tr. granulata SWIR. (2, 4a)
Tr. granulosa PLAYF. (1bc)
Tr. hispida (PERTY) STEIN emend. DEFL. (1a, c, 2, 3b)
Tr. hispida var. *coronata* LEMM. (1b)
Tr. hispida var. *crenulatocollis* (MASK.) LEMM. (2)
Tr. hispida var. *macropunctata* SWIR. (3a)
Tr. intemedia DEFL. (4b)
Tr. pulcherima PLAYF. (2, 3b)
Tr. raciborskii WOLOSZ. (1cb)
Tr. rugulosa STEIN (1c)
Tr. similis STOKES (1a, 4a)
Tr. stokesiana PALMER (2)
Tr. superba SWIR. emend. DEFL. (4a)
Tr. superba var. *achinata* (ROLL) POPOVA (4a)
Tr. urceolata STOKES (4a)
Tr. verrucosa STOKES (1bc, 3a, 4b)
Tr. volvocina EHR. (1abc, 2, 3ab, 4ab)
Tr. volvocina var. *conpressa* DREZ. (3b)

Tr. volvocina var. *derephora* CONRAD (3b)
Tr. volvocina var. *granulosa* PLAYF. (1bc, 2, 3b)
Tr. volvocina var. *punctata* PLAYF. (1a, 2, 3ab)
Tr. volvocina var. *subglobosa* LEMM. (3b, 4a)
Tr. volvocina f. *umbiliciphora* DEFL. (3b)
Tr. wislousii SKV. (1b)
Tr. zorensis DEFL. (4a)
Tr. zmiewica SWIR. (4a)
Tr. zuberi v. *nepos* DREZ. (4a)
Urceolus cyclostomus (STEIN) MERESCH. Tab. 2. 9)
The size of the micro organism is 27,7×20 µ. It is a little metabolic. (4b)

Pyrrophyta
Ceratium hirundinella f. *furcoides* (SCHROERED.) HUBER-PEST. (1abc, 3a)
Gymnodinium sp. (3a, 4a)
Peridinium volzii LEMM. (Tab. 2. 7—8, 10—12)
The diameter of cells is 41—51 µ; at the rim of valvae the ornament of the lamina running round is not regular. (1abc, 3a, 4a)

Chrysophyta
Chrysophyceae
Dinobryon bavaricum IMHOF (1abc, 2, 4a)
D. divergens IMHOF (1abc, 2, 3a)
D. sertularia EHR. (4a)
Kephyrion haemisphaericum (LACKEY) CONRAD (2, 3a, 4a)

Bacillariophyceae
Achnanthes hauchiana GRUN. (4a)
The size of cells is 10,5—11×5,5 µ, str. 14/10 µ.
A. lanceolata var. *elliptica* CLEVE (3a)
A. microcephala (KÜTZ.) GRUN. (1c)
Amphipleura pellucida KÜTZ. (1c, 2, 3a)
Amphora ovalis KÜTZ. (3a)
Asterionella formosa HASS. (2, 3a)
Attheya zachariaschii BRUN, (1bc)
Caloneis silicula (EHR.) CLEVE (2)
Ceratoneis arcus (EHR.) KÜTZ. (2)
Cocconeis placentula EHR. (1c, 4ab)
C. placentula var. *euglypta* (EHR.) CLEVE (1bc, 2, 4ab)
Cyclotella meneghiniana KÜTZ. (1b, 2)
Cymatopleura solea (BRÉB.) W. SM. (2)
Cymbella helvetica KÜTZ. (1bc, 2, 3a)
C. ventricosa KÜTZ. (1bc, 2, 4b)
Diatoma elongatum (LYNGB.) Ag. (1a)
Epithaemia argus KÜTZ. (4b)
E. ocellata KÜTZ. (1c)
E. sorex KÜTZ. (4b)
E. zebra (EHR.) KÜTZ. (1c, 4a)
E. zebra var. *saxonica* (KÜTZ.) GRÜN. (4b)
Eunotia lunaris var. *subarcuata* (NAEG.) GRUN. (4b)

E. valida HUST. ? (1b)
Eunotia sp. (4a)
Fragilaria capucina DESM. (1bc)
Gomphonema acuminatum AHR. (4ab)
G. acuminatum var. *coronatum* (EHR.) W. SM. (2, 3a)
G. angustatum var. *productum* GRUN. (4b)
G. augur EHR. (1c, 4b)
G. capitatum EHR. (1bc, 4ab)
G. olivaceum (LYNGB.) KÜTZ. (3a, 4ab)
Gyrosigma acuminatum (KÜTZ.) RABEN. (2)
G. attenuatum (KÜTZ.) RABEN. (1bc)
Hantzschia amphioxys (EHR.) GRUN. (2)
Melosira granulata (EHR.) RALFS (1bc, 2, 3b, 4b)
M. granulata var. *angustissima* (O.F.M.) HUST. (1abc, 4a)
Navicula anglica RALFS (2)
The size of the cell is 20×7,5 μ, str. 12/10 μ.
N. cryptocephala KÜTZ. (1bc, 2, 3a)
N. cryptocephala var. *intermedia* Grun. (1bc)
N. cuspidata KÜTZ. (4a)
N. cuspidata var. *hankae* f. *craticularis* SKV. (2)
The size of the cell is 59×15 μ, that of loculamenta 2—3) 10 μ.
N. hungarica GRUN. (2)
N. pygmea KÜTZ. (4a)
N. radiosa KÜTZ (1bc, 3a, 4a)
N. rhynchocephala KÜTZ. (3a)
Neidium affine (EHR.) CLEVE (2)
Nitzschia acicularis W. SM. (1bc, 2, 3a)
N. acuta HANTZSCH. (1c, 2)
N. capitellata HUST.(2)
N. closterium (EHR). W. SM. (2)
N. dissipata (KÜTZ.) GRUN. (1bc, 4b)
N. filiformis (V. SM.) HUST. (1b)
N. hungarica GRUN. (2, 4b)
N. linearis W. SM. (1b, 4b)
N. palea (KÜTZ.) W. SM. (1bc, 4b)
N. sigmoidea (EHR.) W. SM. (2)
The size of the cell is 300×12,5 μ, str. 5/10 μ.
N. triblionella var. *levidensis* (W. SM.) GRUN. (2)
N. vermicularis (KÜTZ.) GRUN. (1c, 2, 3a)
Pinnularia var. *brevirostrata* HUST. (2)
The size of the cell is 32,5×9 μ, str. 5/10 μ.
P. interrupta W. SM. (1b)
P. mesolepta var. *interrupta* CLEVE (Tab. 3. 3.)
Syn.: *P. mesolepta* var. *minuta* f. *interrupta* CLEVE
The size of the cell is 30×6 μ, str. 14/10 μ. (2)
P. microstauron (EHR.) CLEVE (2)
The size of the cell is 42—44×12,5 μ, str. 10—11/10 μ.
P. microstauron var. *biundutala* O.F.M. (4a)
P. microstauron var. *brebissonii* (KÜTZ.) Hust. (4a)
P. nobilis (KÜTZ.) HUST. (1b)

P. viridis (NITZSCH.) EHR. (3a)
Pinnularia sp. (4a)
Rhoicosphaeria curvata (KÜTZ.) GRUN. (1b, 3a, 4b)
Rhopaloida gibba (EHR.) O.F.M. (1ab, 4ab)
Surirella ovata KÜTZ. (1a, 2)
S. ovata var. *pinnata* (W. SM.) HUST. (2)
The size of the cell is 30×10 μ, str. 6/10 μ.
Synedra acus KÜTZ. (1c, 3a)
S. acus var. *radians* (KÜTZ.) HUST. (1b)
S. arcuatus var. *subrecta* CLEVE (Tab. 3. 4)
The size of the cell is 360×10 μ, str. 14/10 μ. The stalks are slightly arcuated, the cell is broader in the middle. The pseudoraphe is narrow in the stalk, in the middle it is spear-like broadened. So far, it was only found in the environment of sea- and brackish water (Cleve 1951—55). (2)
S. capitata EHR. (1c)
S. parasitica (V. SM.) HUST. (2)
The size of cells is 20×5 μ, they can be found in the *Nitzschia sigmoidea.*
S. tabulata (AG.) KÜTZ. (1c)
S. ulna (NITZSCH.) EHR. (1c, 2)

Xanthophyceae
Ophiocytium capitatum WOLLE (2)
O. lagerheimii LEMM. (Tab. 3. 7)
The size of cells is 80—72×3—2,5 μ, str. 8—12 μ. (1c)
O. arbscula (A. BR.) RABENH. (Tab. 3. 1)
The colony is 6—7-armed, the cells are 6—7 μ thick (4b)
Centritractus belenophorus LEMM. (1bc, 3a)

Chlorophyta

Chlorophyceae
Actinastrum hantzschii LAGERH. (1b, 3a)
Ankistrodesmus convolutus CORDA (1b)
A. falcatus (CORDA) RALFS (1c, 4a)
A. falcatus var. *duplex* (KÜTZ.) VEST (1ab, 4a)
A. falcatus var. *mirabilis* W. & V. (1c, 4a)
A. longissimus (LEMM.) WILLE (1ac)
Characium acuminatum A. BR. ? (Tab. 2. 14—15)
The size of cells is 17,5—10×6—4 μ. (1c)
Chlamydomonas pertusa CHOD. (4b)
Coelastrum microporum NAEG. (4b)
Crucigenia quadrata G. M. SMITH (1abc, 3a)
Cr. rectangularis (A. BR.) GAY (1bc)
Cr. tetrapedia (KIRCH.) W. et W. (1bc, 3ab)
Dictyosphaerium pulchellum WOOD (1abc, 3b)
Lagerheimia chodatii BERN. (3b)
L. wratislaviensis SCHROED. (3b)
Lambertia limnetica (LEMM.) KORSCHIK. (1c)
Oocystis borgei SNOW (1a)
Pandorina morum BORY (1b)

Pediastrum duplex MEYEN (3b)
P. tetras (EHR.) RALFS (1bc, 4b)
Planctonema lauterbornii SCHMIDLE (1abc)
Scenedesmus acuminatus (LAGERH.) CHOD. (3a)
Sc. balatonicus HORTOB. (1c)
Sc. bicaudatus (HANGS.) CHOD. (2)
Sc. bicaudatus var. *brevicaudatus* HORTOB. (1b, 4a)
Sc. denticulatus var. *linearis* PASCHER (1c, 4a)
Sc. ecornis (RALFS) CHOD. (1ab, 3a)
Sc. ecornis var. *disciformis* CHOD. (1b, 3a
Sc, protuberans FRITSCH (1a)
Sc. quadricauda (TURP.) BRÉB. (1ab, 2)
Sc. raciborskii f. *granulatus* HORTOB. (1c)
Traubaria triappendiculata BERN. (3a)
Ulothrix sp. (1c)

Conjugatophyceae
Closterium aciculare T. WEST (1b)
Cl. moniliferum EHR. (1c, 3a, 4ab)
Cl. naegelii (BRÉB.) V. et W. (1b)
Cl. parvulum NAEG. (1b, 4b)
Cl. parvulum var. *angustum* W. et W. (1bc)
Cl. praeacerosum GAY (1b)
Cl. praelongum BRÉB. (4a)
Cl. strigosum BRÉB. (1b)
Cosmarium bioculatum BRÉB. (1b)
C. botrytis MENEGH. (1bc)
C. botrytis var. *depressum* W. et W. (1b)
C. contractum BRÉB. (1c)
C. humile (GAY) NORST. (1c)
C. laeve RABENH. (1b, 4ab)
C. meneghinii BRÉB. (1bc)
C. obtusatum SCHMIDLE (1c)
C. quadrum LUND (1bc)
C. regnellii var. *kerguelense* KRIEG. et GERL. (1bc)
C. reniforme (RALFS) ARCH. (1bc)
C. subcucumis SCHMIDLE (1b)
C. subalatum W. et W. (1b)
C. sublateriundulatum W. et W.
C. turpinii BRÉB. (1bc)
C. vexatum WEST (1b)
C. undulatum CORDA (1c)
Desmidium aptogonum BRÉB. (4a)
Euastrum insulare var. *silesiacum* GRÖNBL. (1c)
E. spinulosum DELP.
The size of the cell is 50—52×57—59 μ, ithmus: 12,5 μ (1bc)
Gonatozygon monothaenum DE BARY (1bc)
Microsterias crux-melitensis (EHR.) HASS. (1bc)
Moegotia sp. (1bc, 3a, 4a)
Pleurothaenium trabecula (EHR.) NAEG. (1b)

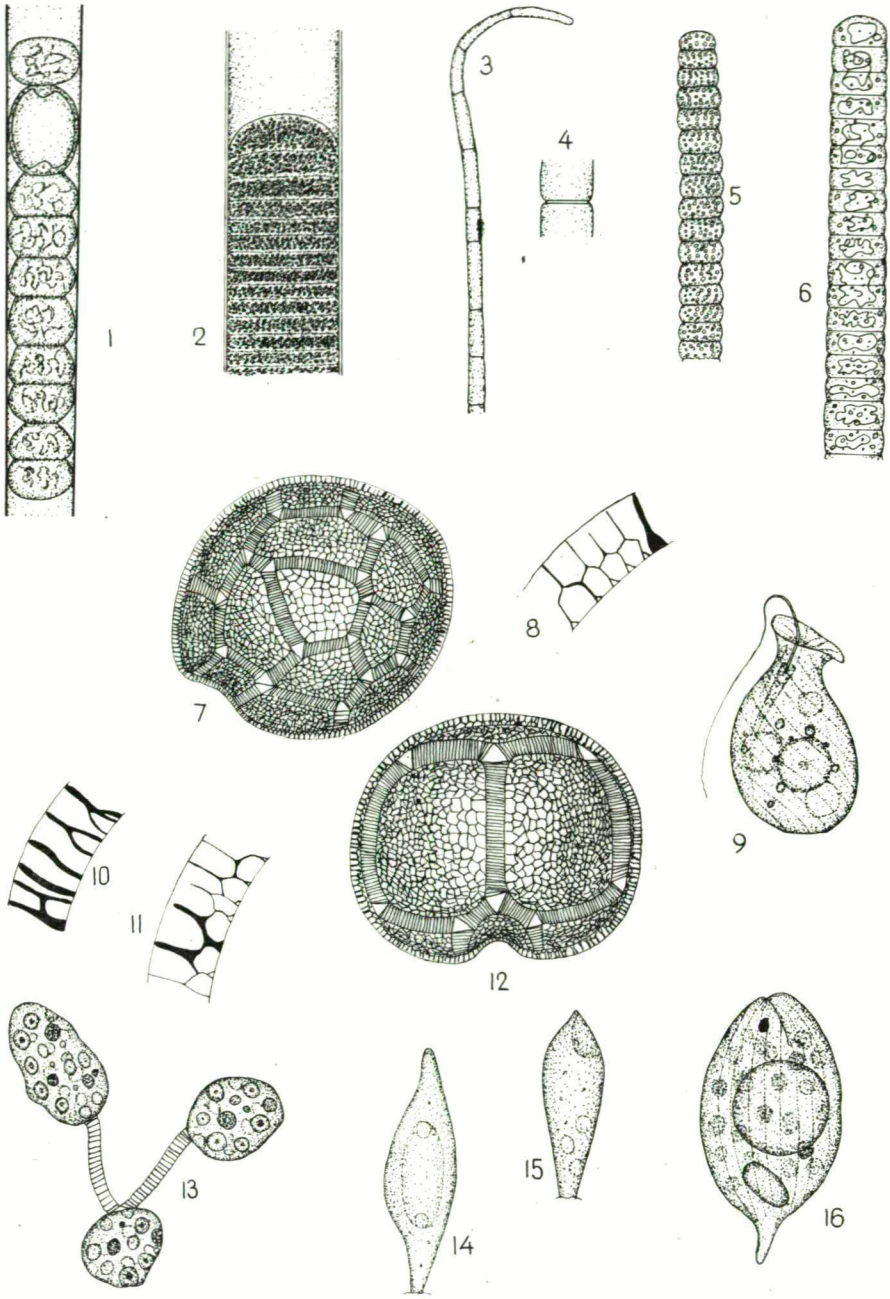

Table 2. (1) *Aulosira laxa*, (2) *Lyngbia birgei*, (3—4) *Oscillatoria acutissima*, (5) *Oscillatoria ornata*, (6) *Oscillatoria lauterbornii* forma ? (7—8, 10—12) *Peridinium volzii*, (9) *Urceolus cyclostomus*, (13) *Colacium arbscula*, (14—15) *Characium acuminatum* ? (16) *Phacus caudatus* var. *minor*.

Staurastrum alternans BREB. (1c)
St. brevispinum BREB. (1bc, 3a)
St. gracile RALFS (1bc, 3a)
St. polymorphum BREB. (1abc, 3a)
St. orbiculare var. *depressum* ROY & BISSET (1b)
St. paradoxum MEYEN (1bc, 3ab)
Staurastrum sp. (1bc, 3a)
Staurodesmus convergens (EHR.) TEIL. (1b)
St. triangularis (LAGERH.) TEIL. (1b)
Xanthidium antilopeum (BREB.) KÜTZ. (1abc)

Discussion of results

The dead-arms investigated are in different stages of filling up. The largest open water is to be found in the dead-arm of the Tisza at Tiszafüred, while the water depth of the others is shallow, and they are considerably covered with water-vegetation. The dead-arms are only inundated at the great spring flood. Thus they are considered as limnologically individualized biotopes (UHERKOVICH 1971). This individualization is increased by that they are filled up and covered with water-vegetation. In this way, the combination of the algal stock is characterized in open water by the planktonical organisms, while in the parts covered with vegetation and in the regions at the river-side it is rather characterized by periphytons. There often appear in marshes large numbers of organisms, being characteristic of bogs (*Phacus monilliatus* var. *suecicus* LEMM, *Rhopalloida gibba* (EHR.) O.F.M., *Trachaelomonas zuberi* var. *nepos* DREZ., etc. The comparative stability of the dead-arms is denotated by the presence of rare species as: *Synedra arcuatus* var. *subrecta* CLEVE, *Synedra parasitica* (W. SM) HUST., *Cosmarium regnellii* var. *kerguelense* KRIEG & GERL., etc.

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