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# ABOUT THE ALGAE OF THE KISKÖRE RIVER BARRAGE AND ENVIRONS

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## Abstract

The paper is characterizing the alga stand of the River Tisza and the change in it as a result of damming up the water. It is giving the description and depiction of some species that were unknown in the Tisza or are algological rarities.

## Introduction

In order to satisfy the water demand of the people's economy — mainly of irrigation — reservoirs and river barrages have been established in the Tisza. The Kisköre Reservoir and river barrage established in the Middle Tisza Region is already functioning, and in the first phase the river bed is dammed up. In this way, only some rather flat areas got under water in the area of the future reservoir. Both large irrigation cannals are operating. It is worth while to remove the vegetation — containing woods, as well — from the reservoir area. For proving that, and for determining the economical way of removal, we have established an experimental area consisting of open-water parts and those covered with woods. Thus we could observe several interesting algae in the multivarious biotopes of the river barrage and environs.

## Algological conditions of the River Tisza

The water motion of the Tisza is changeable, its water output is very variable (50 to 4700 cc.m/sec). Its current waves that result from rain and melted snow coming from its 157.000 sq.km watershed area have a high suspended matter content (on the average 500 to 600 mg/l). These conditions are determining the planktonic living world decisively. The fresh-water stand (eupotamoplankton), where the diatomaceous forms are predominating, is characteristic of the algological composition (UHERKOVICH 1958, 1959, 1965). In case of a small watter output and low suspended matter content in Summer, the mass multiplication of the stand is to be observed (UHERKOVICH 1968, 1969). As a result of damming up, the speed of the river is reduced, the suspended matter content settles down (5—10 mg/l), and in the water becoming transparent the river-water algal stand is replaced by a backwater stand (ÁDÁMOSI *et al.* 1974). Of the backwater plankton stand the high taxon-number and individual-

number (max. 11 million ind./l) are characteristic. The species *Stephanodiscus tenuis* HUST., *Asterionella formosa* HASS., *Melosira granulata* var. *angustissima* MÜLL., *Fragillaria crotonensis* KITTON are dominant. The *Microcystis aeruginosa* KÜTZ., inducing algal bloom (efflorescence), and *Aphanizomenon flos-aquae* (L.) Ralfs are of not rare occurrence, either.

**Description of some rather interesting species**

1. *Dactylococcopsis raphidioides* HANSGIRG f. *mucicola* FRÉMY (Fig. 10)

The solitary cells are of faint bluish-green colour, spindle-shaped, their ends tapering off and being a little curved. The plasm is strongly granulated. No mucilaginous sheath covering is found. The size of the cell is 107×5.5 μ. It occurred on a single occasion in a navvy-pit in Summer.

2. *Oscillatoria acutissima* KUFF. (Figs. 2—4)

The thin, long trichomes stand alone. The cylindrical cells are 2.5 to 3 μ broad and 5 to 9 μ long. The apical cell is tapering, longer than the other cells, straight or curved. The transverse walls are slightly constricted. The bluish-green plasm is slightly granulated. Sometimes even larger granules may be found at the end of cells (Fig. 2). It occurs in the dammed up water of the Tisza in the summer months. Together with other algae (*Oscillatoria granulata* GARDN.) it forms coating on the trees, inundated by damming, in the vicinity of the river barrage, in the summer months.

3. *Oscillatoria terebriformis* AGH. (Fig. 5)

The trichome is of blush-green colour, slightly curved. The cells are mostly square, the transverse walls are slightly constricted in case of the older cells. The plasm is granulated at the transverse walls. The apical cell is rounded off or leveled out unilaterally. The size of cells is 6.5 to 7.5 μ. It makes coating in the watering zone of river-side stones of the dammed up Tisza, in Summer.

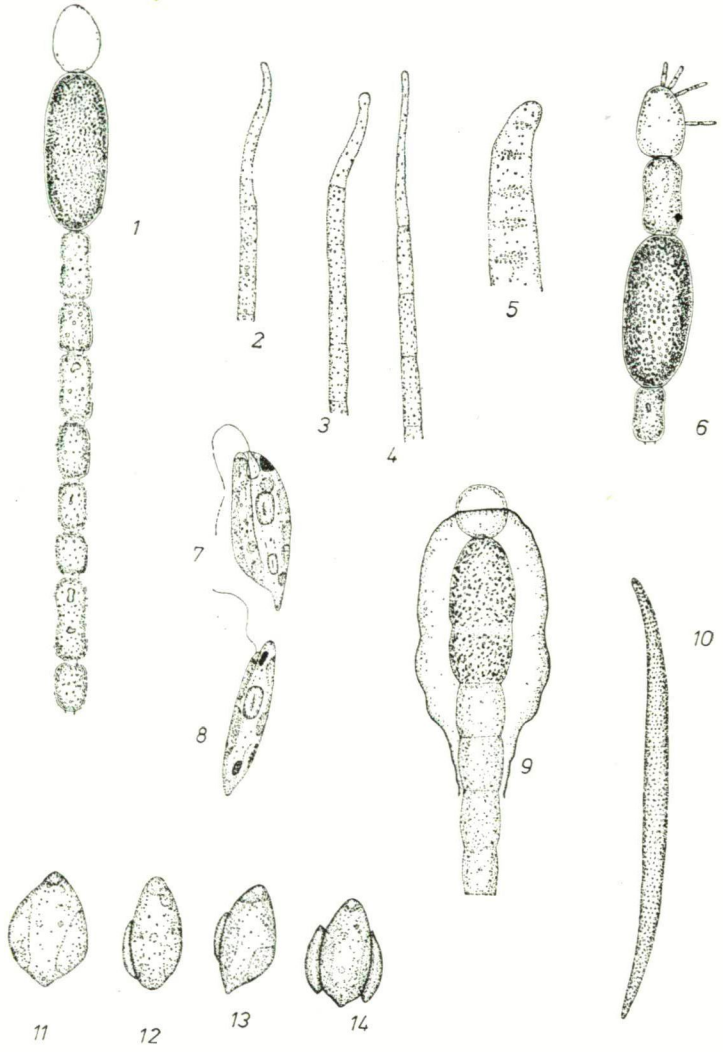
4. *Cylindrospermum stagnale* (KG.) BORN. et FLAH. (Figs. 1, 6)

The algal colony is flating free, it is of bluish-green colour. The heterocyst is transparent, oval, its size is 6 to 8 μ. The spore is cylindrical, rounded off at its ends, its interior is granulated. The cells are cylindrical, their size being 10 to 5, 5×4 to 4.5 μ. In the plasm smaller or larger granules are to be found. The cells are strongly constricted at the transverse walls. At teratological forms, the heterocyst is followed by one cell and then by the spore. It occurred in the summer months, in an area becoming marshy as a result of damming up.

5. *Gloeotrichia natans* (HEDWIG) RABENH. (Fig. 9)

The colonies as big as a fist are of olive-green colour, they are floating on the water surface. The heterocyst is roundish, 11 to 13 μ in diameter. The spores are cylindrical, at their end narrowed, their size being 35 to 70×10 to 15 μ. The cask-shaped and cylindrical cells are slightly granular, in the periphery of spore they are 12 to 15 μ thick. The trichome is gradually tapering. It is surrounded by an undulant

capsule starting from the heterocyst of spore. As going towards the cells, this is tapering and then ceases to be. It occurred in the Autumn, along the marshy river-side of the area filled up with Tisza-water.




6. *Phacus skujae* SKV. (Figs. 7—8)

The cell is thin spindle-shaped or bulged. In its front part it is rounded, in the back part, after tapering, it ends in a blunt apex or blunt point. The pellicula is a little metabolic, finely costate. The flagellum is cell-long or shorter. One or two of the paramylons are ring-shaped. In the lumen, smaller or larger chloroplasts are to be found sporadically. The stigma is well-visible. The size of cells is 20 to 25×5 to 9 μ. In the Autumn, it occurred in the open water of the experimental area filled up with Tisza-water.

7. *Lepocinclis fusiformis* (CARTER) LEMM. var. *podolica* (DREZ.) POPOVA (Figs. 11—14)

The solitary cells are spindle-shaped. In their front part they are rounded, their back part ends in a blunt apex. Their two big paramylons take place on the side, sitting close to the cell-wall. In several cases, the paramylons protrude from the cell. One or two big granules may mostly be found at the cell apex. The chloroplast is tiny, circular, and there were very few of them in the cells investigated. There occurred no stigma. The size of cells is 24 to 27×14 to 17 μ. It occurred in the irrigation canal coming from the sector dammed up.

8. *Chroomonas acuta* UTERMÖHL (Figs. 15—17)

It is a spindle-shaped cell. In its front part it is rounded broadly, sometimes with a recess; in the back part it is curved and ends after tapering in a blunt or sharp point. The lumen is not filled in with plasm in every case. A large olive-coloured chloroplast is adhering close to the cell-wall. Apart from the small granules found scattered in the plasm, a rather big pyrenoid takes place in the front part of the cell. The two flagella are of cell-length or shorter than that. The size of cell is 7 to 10×4 to 5 μ. They often occur in large numbers in the water of the dammed Tisza and in the areas inundated by damming.

9. *Cryptomonas pusilla* BACH. (Figs. 18—19)

The egg-shaped cell is rounded and cut one-sidedly in front, in its back part, after tapering, it ends in a blunt apex. One large parietal chloroplast is to be found. In addition to more tiny granules there occurs a larger pyrenoid, as well. The large leukosin body in the back part is very characteristic. The cell is metabolic, its size is 10 to 13×6 to 8 μ. It is a frequent organism of the river reaches dammed up and of the areas inundated by damming. Sometimes it occurs in large numbers.

10. *Cryptomonas platyuris* SKUJA (Fig. 21)

They are oval, large cells, rounded in front and ending in a short rostrum, at the back they are a little curved and rounded. Two large brownish-green chloroplasts are sitting close to the colourless periplast. In the plasm several starch granules of smaller or larger size take place. The contractile vacuole is to be found under the rostrum. Two flagella originate beside the rostrum, the shorter ones at the cell. The size of the cell is 40 to 52×19 to 23 μ. In the dammed Tisza and environs it is a very frequent organization.

11. *Cryptomonas rufescens* SKUJA (Fig. 22)

It is an oval cell, rounded in front and ending in a small blunt rostrum. Tapering at the back, it is rounded broadly. Two olive-cholored large chloroplasts are sitting close to the periplast. The nucleus is to be found in the back part of the cell. Pyrenoid is missing, several small starch granules are to be found sporadically in the plasm. In the front part of the cell there is one contractile vacuole. The size of the cell is 20 to 25×9 to 11 μ. It is frequent in the dammed Tisza and environs.

12. *Chilomonas acuta* SCHILLER (Fig. 25)

It is a spindle-shaped cell, in front rounded broadly, at the back, after tapering, it ends in a curved apex. Its two flagella are shorter than the cell itself. In the plasm one to three rather big starch granules and several small granules take place. The size of the cell is 22 to 28×9 to 10 μ. It occurred in an area inundated with dammed water. It is rare.

13. *Glenodinium* sp. (oculatum STEIN?) (Figs. 23, 26)

The cell is oval or spheroid, the valvae are of similar size and semicircular. The nucleus is central, in the plasm there are tiny chloroplasts. The cell is 20 to 23 μ long and a little shorter. The structure of valva is somewhat changing. It occurred in the marshy water inundated by damming. It is rare.

14. *Peridiniopsis quadridens* (STEIN) Bourrelly (Fig. 24)

The epivalva of the oval cell is cone-shaped, the hypovalva is rounded broadly. On both sides of the hypovalva two smaller spines and in its low part two bigger ones are to be found. The size of the cell is 34 to 35×30 to 32 μ. It is a frequent organization in the summer plankton of the experimental area inundated with Tisza water.

15. *Peridinium bipes* STEIN (Fig. 20)

It is a more of less oval cell of 65 to 63 μ size. In the low part of the hypovalva two strong spines are to be found. It occurs sporadically in the plankton of the experimental area inundated with Tisza water.

16. *Ochromonas pallida* KORSCH. (Fig. 29)

The cell is heart-shaped, very metabolic. It has one chromatophore taking place in its front part. One vacuole can be found in the middle of the cell. The plasm is granular, having a longer and a shorter flagellum. The size of the cell is 6×4 μ. It is to be found in the eutrophic water of the dead channel inundated with Tisza water, at algal bloom. It is rare.

17. *Chrysococcus biporus* SKUJA (Fig. 27)

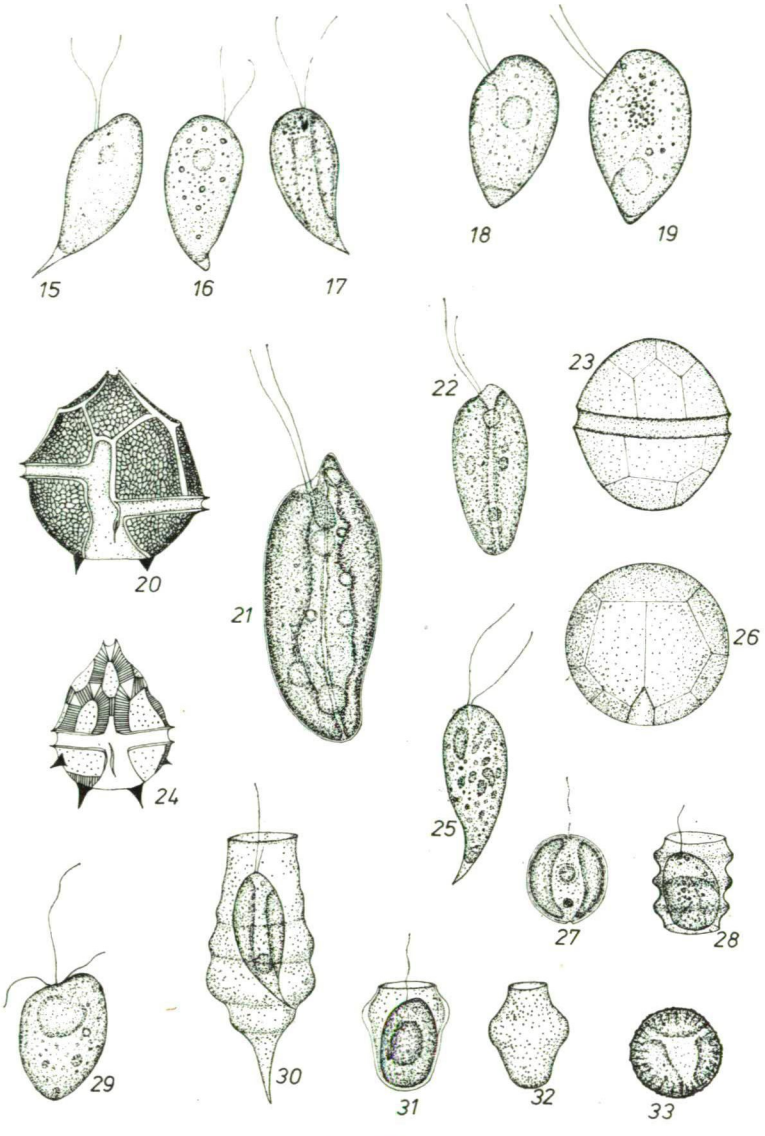
The lorica a spherical, of greenish of red-brown colour. At both poles a pore can be found each whose position is not always symmetrical. The size of the lorica is 6.5 to 9 μ, it is but rarely granular. The lumen is filled in by the plasm. It has two parietal chromatophores. The nucleus is central. Sometimes one contractile vacuole can be observed under the flagellum protruding through the anterior pore. It is very frequent in the water of the dammed up Tisza and in the areas inundated by damming.

18. *Kephyrion tubiforme* FOTT (syn. *Stenocalyx tubiforme)* (Fig. 28)

The lorica is cylindrical, its wall is a little thick. At the margin of the lorica three-four spirals are running down. The spiral is mostly deep and rounded. The size of the shell is 9 to 10×5 to 6 μ. The cell lying in the shell is oval, it contains one chromatophore and one flagellum. It occurred in the water of the irrigating canal filled up by damming, in the winter months. It is rare.

19. *Kephyrion rubri-claustri* CONRAD (Fig. 31)

The oval lorica is cut above, in the front part there is a broadening ring, below it is rounded broadly. The size of the lorica is 6 to 7×5 to 6 μ. The cell is oval, it has a chromatophore and a flagellum. It occurred in the summer plankton of the irrigation canal filled up by damming. It is a frequent species.




20. *Kephyrion rubri-claustri* var. *amphora* (LACKEY) CONRAD Fig. 32)

The lorica is strongly bulging in the middle, in the front part it is narrowing, in the back part it is rounded broadly. The size of the lorica is 10×7.5 μ. It occurred on a single occasion in the water of the experimental area.

21. *Monas cylindrica* SKUJA (Figs. 34—37)

The cell is cylindrical, strongly metabolic, rarely amoeboid. Beside the peristom lying in the front part there are originating two flagella of different length. The longer one is about double the cell, the shorter one is half a cell in length. The plasm is strongly granular, with several food vacuoles. The nucleus is central, one contractile vacuole takes place in the front part. The size of the cell is 10 to 15×3 to 6 μ. It is frequent in the marshy water of the area inundated by damming.

22. *Monas uniguttata* SKUJA (Figs. 38, 44—45, 51)

The solitary cell is oval, above a lip-shaped process can be seen, below it is rounded and fixed to the lower part with a thin thread. The periplast is thin and metabolic. The plasm is granular, the nucleus is central. The contractile vacuole can be found in various parts of the plasm. Beside the peristom we can notice two flagella of unequal length. The longer one is the treble of cell-length, the shorter one does not reach the size of the cell. The size of the cell is 6 to 7×4.5 to 6 μ. The stem is 7 to 15 μ long. It is living in the water of the marshy area inundated by damming.

23. *Oicomonas termo* (EHR.) KENT (Figs. 39—43)

The cell is oval, very metabolic. The rostrum lying beside the origination of the flagellum, the front part is characteristic of it. The plasm is strongly granular, containing several food vacuoles. The nucleus is central. Sometimes a contractile vacuole is to be found, too, in the front part. It may occasionally be very large. It feeds, first of all on algae, by opening the peristom quickly. The flagellum is of double cell length. The size of the cell is 12 to 17 μ. It often occurs in the water of the marsh established by damming.

24. *Chrysochromulina parva* LACKEY (Fig. 46)

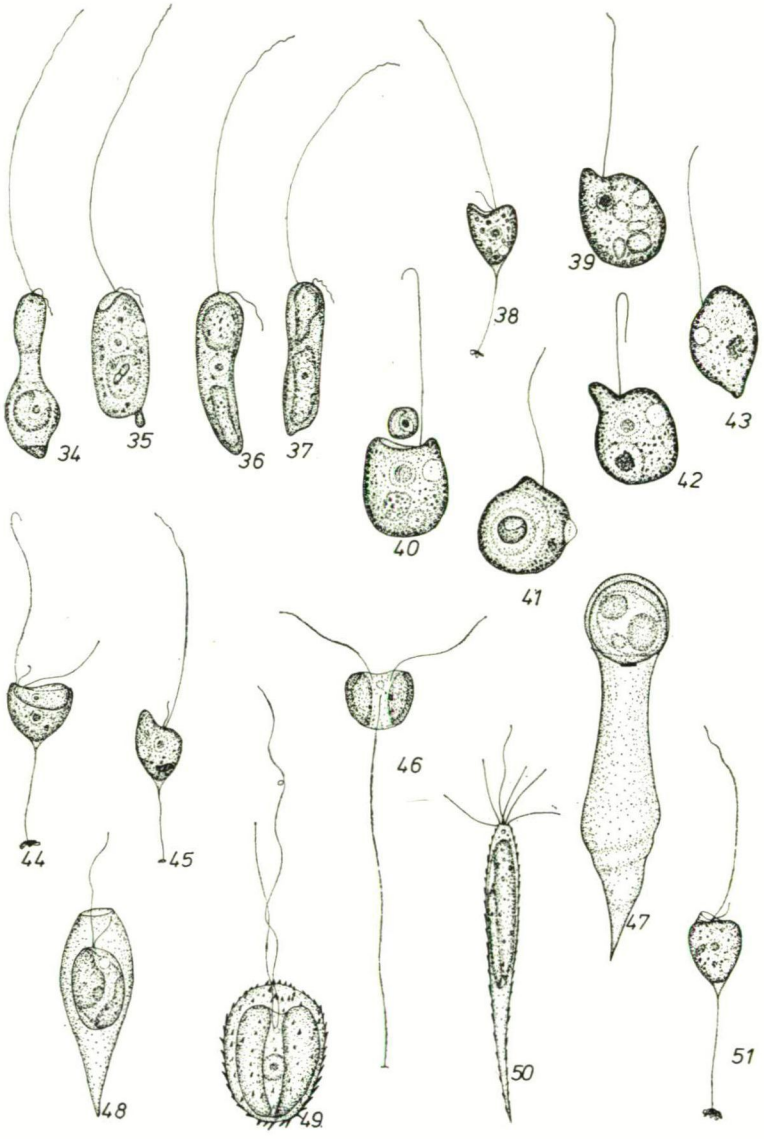
The cell is spherical in front-view, a little metabolic. In the front part with a small recess, in the back part it is rounded broadly. It has two parietal periplasts, the plasm is finely granular, the contractile vacuole is to be found in the front part. In front, two equal flagella of double cell length obtrude. The cell is 5 to 7 μ in diameter. From the middle of the cell a thin, long fibril reaches back and fixes the cell. It can often reach even the twentyfold length of the cell. It was found in the plankton of the experimental area in Summer.

25. *Dinobryon elegantissimum* (KORSCH.) BOURR. (Fig. 30)

The spindle-shaped shell is cut off above, in the middle it is broadening and wavy, below it is ending constricted in a thin point, its size being 30 to 35×9 to 10 μ. The cell lying in the shell is thin spindle—shaped, above rounded, below it adheres to the wall of shell, tapering away. It has two chromatophores, the contractile vacuole is to be found in the front part. Its flagella of different length do not surpass the length of the cell. The size of the cells is 16 to 18×6 to 7 μ. The species is solitary, floating free. If often occurs in the areas becoming backwaters by being dammed up.

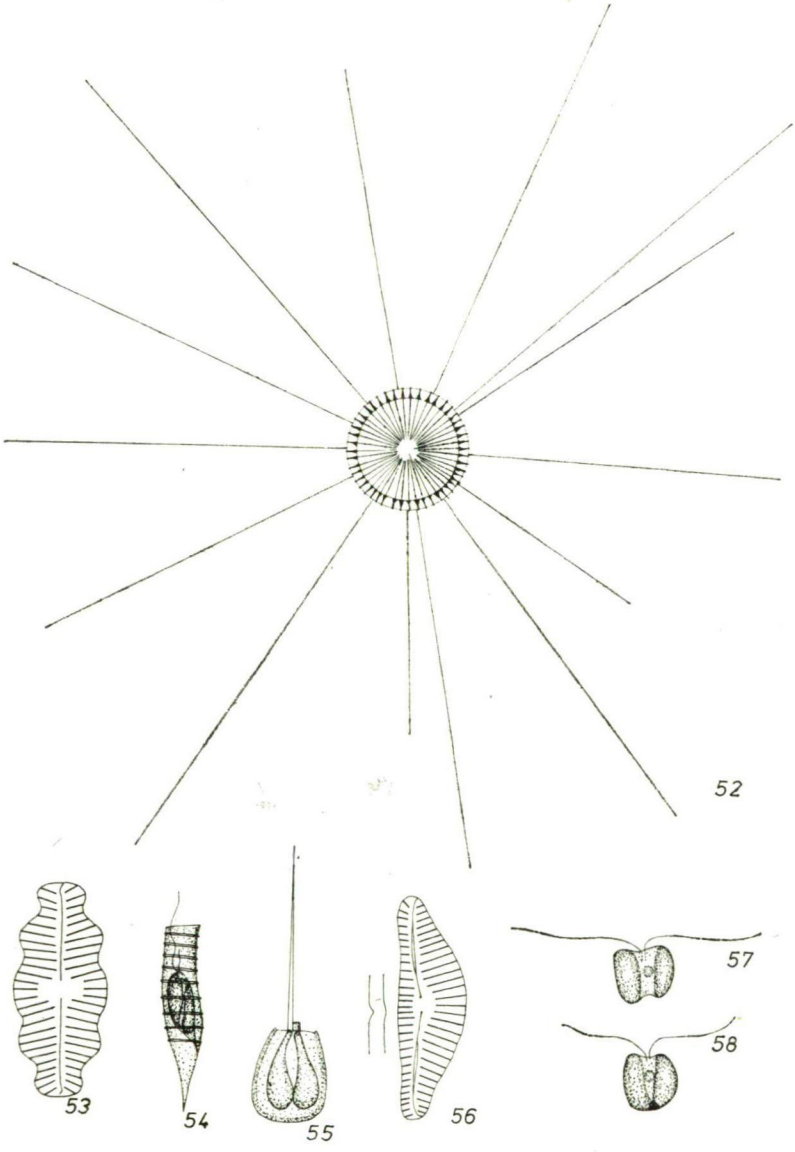
26. *Dinobryon marchicum* LEMM. (Fig. 48)

The thick thalli is spindle-shaped, above cut off, below it adheres to the lower part, tapering away. Its size is 20×9 μ. The cell is oval, it contains one chromatophore and one contractile vacuole. It has two flagella of different length. It occurred in the plankton of the experimental area, fixed to a floating bottom. It is rare.



27. *Dinobryon divergens* IMHOF (Fig. 47)

In the water of the drying dead arm this species induced algal bloom and after that the destruction of the alga mass began. There could be observed a cyst formation at about 5 per cent of the individuals found. The 10 to 13 μ thick cyst was drawn out of the thalli, drawing after itself a membrane that was thinner than the thalli. The membrane, after leaving the shell definitely, took on the shape of the cyst, forming a capsula for protecting the cyst.



28. *Mallomonas akrokomos* RUTTNER? (Fig. 50)

The shell is elongated spindle-shaped, narrowed in the lower part. The spines are thin and curved, protruding from the front end of the shell. The plasm fills in the lumen, two chromatophores and several vacuoles are to be found in it. The flagellum is half-a-cell long. The size of the cell is 25 to 45×4 to 8 μ. It occurred in the summer plankton of the experimental area.

29. *Malomopsis pelophila* (LUND) FOTT (Fig. 49)

The cell is oval, a little metabolic. Round the aperture found in the front part some tiny spines take place. Two chromatophores are parietal, the nucleus is central. It has two flagella of different length. The size of the cell is 17×2 μ. It occurred in the water of the Tisza dammed up. It is of rare occurrence.

30. *Dinobryon suecicum* LEMM. (Fig. 54)

The cylindrical thalli is of asymmetrical construction, above cut off, below narrowing. A thin, spiral ring is running down the thalli. The size of the thalli is 20 to 22×4 to 5 μ. The cell is elongated oval-sized, with two chromatophores. The species is always solitary. It often occurs in the plankton of the experimental area.

31. *Chrysidalis peritaphrena.* SCHILLER (Figs. 57—58)

The solitary cell is in front-view oval or a little cornered. In side-view it is flat, a litle curved. It has two parietal chromatophores, the nucleus is central. Its both flagella of equal length are about double the cell-size. The size of the cells is 10 to 14 μ. It is of frequent occurrence in the plankton of the experimental area.

32. *Hetrolagynion oedogonii* PASCHER (Fig. 55)

The lorica has thick walls, it is below rounded broadly, above cut off. From the plasm a thin, long, pointed rhizopodium protrudes. The size of the cell is 6×7.5 μ. It occurred on a single occasion in the water of the experimental area, on a Tribonema thread.

33. *Stephanodiscus tenuis* HUSTEDT (Figs. 33, 52)

The cells are 7 to 15 μ in diameter. The thin, radial costae are ending at the borders in tiny spines, of which 20 to 22 may be found in 10 μ. It has frequently several spines for making it float. The length of these may be manifold of the cell diameter, as well (Fig. 52). It occurs that the shell of the spineless forms becomes thick (Fig. 33). It often occurs in the areas inundated by being dammed up, and in the water of the dammed Tisza it can sometimes be found in large numbers.

34. *Cymbella affinis* KÜTZING (Fig. 56)

The size of the cells is 22 to 24×9 to 10 μ. In 10 μ 12 to 14 transapical stripes can be found. It is interesting that the central part of the ventral side doesn't widen out in every case but it is often constricted in various degree. It is forming grass in the irrigating area of the river barrage.

35. *Navicula dicephala* (EHR.) W. SM. var *undulata* ÖSTRUP. (Fig. 53)

The size of the cell is 18.5×8 μ. In 10 μ 12 to 13 transapical stripes can be found. The size of the cell is smaller than that given in the literary data. (CLEVE—AULER, 1951—1955). It occurred on a single occasion in the water of the dammed up Tisza, in Summer.

36. *Synura globosa* (SCHILLER) STARMACH (Fig. 64)

The cells live in colonies. They are spherical, on their surface the spines of lamellae are well-visible. They have two big parietal chromatophores and two contractile vacuoles can be seen under the origination of flagella. The two flagella of equal length are one and a half times as long as the cell size. The cells are 11 to 12 μ in diameter. It occurred in the summer plankton of the dammed up Tisza.

37. *Chlamydomonas reinhardii* DANGEARD (Fig. 59)

The elliptical cell is above a little constricted, below broadly rounded. The membrane is thick, without papilla, it often secretes a thick gelatinous matter that bacteria may adhere to. The chromatophore is uniform, a little granular. The nucleus can be found in the front part, below it a large spherical pyrenoid takes place. The conctractile vacuole is seen in the front part, the flagella one and half times as long as the cell are of equal size. The stigma is tiny or not suitable for being observed. The lumen is not in every case filled in with plasm. The size of the cells is 13 to 16 μ. It is of frequent occurrence in the water of the dammed up Tisza.

38. *Carteria cordiformis* (CARTER) DILL (Figs. 64, 67—68)

The form of the cell is multifarious, being spherical or heart-shaped, in front deepened, below rounded. The chromatophore is big, the pyrenoid elliptical. Below the origination of the four flagella — about as long as the length of the cell — one or two contractile vacuoles take place. There is no stigma to be seen. The size of the cell is 13 to 16 μ, smaller than those of the literary data (PASCHER 1927). It often occurs in the spring plankton of the experimental area.

39. *Carteria cordiformis* (CARTER) DILL forma? (Figs. 60—62)

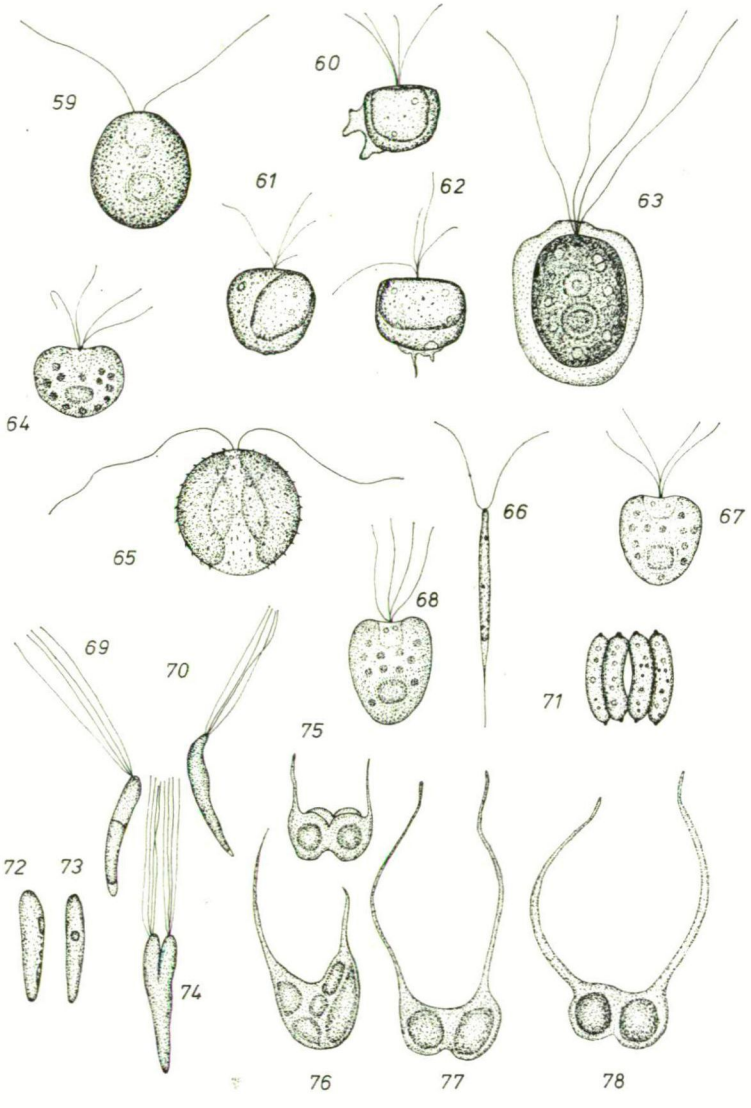
The cells are very tiny, their size being 4.5 to 5.5 μ. The membrane is thin, metabolic, sometimes amoeboid. In the plasm a big pyrenoid and tiny chromatophores are to be seen. It was found on one occasion, in the summer plankton of the dammed up Tisza.

40. *Carteria peterhofiensis* KISS. (Fig. 63)

The cell is elliptical, in the front part a large papilla takes place. The lumen is not filled in entirely by the plasm. It has a big chromatophore. The nucleus is to be found in the front part, just under it with the elliptical pyrenoid. The stigma is to be seen in the anterior part. The four uniform flagella are a little longer than the cell. The size of the cells is 28 to 30×20 to 22.5 μ. It was found in the summer plankton of the experimental area.

41. *Chlorogonium minimum* PLAYFAIR (Fig. 66)

The cell is elongated spindle-shaped, in front ending in a tiny head, while at the back it is tapering and ending in a long point. The two uniform flagella are about as long as half a cell. The lumen is not filled in completely by the plasm. The chromatophore is big, without any pyrenoid. The stigma and nucleus were not to be seen. The size of the cell is $20 \times 1.5$ μ. It occurred on a single occasion, in the summer plankton of the experimental area.



42. *Spermatozopsis exultans* KORSCHIKOV (Figs. 69—70, 74).

The slightly curved cell is spindle-shaped, in the front part it is rounded, in the back part sharp-pointed. The plastis is large, the lumen is nearly completely filled in with it. The size of the cell is 8 to 9 μ. The four uniform flagella oft double the cell-length. The cell division is horizontal. It occurs in the plankton of the experimental area sometimes in masses.

43. *Scenedesmus raciborskii* WOLOSZ f. *granulatus* HORTOB. (Fig. 71)

Its four-cell coenobium cells are cylindrical, arched. In the poles, a papilla can be found each. The size of the cells is 12×2.5 μ. It was found on a single occasion in the summer plankton of the experimental area.

44. *Elakatothrix gracilis* HORTOB. (Figs. 72—73)

One cylindrical half of the cell is straight while the other is slightly curved. The poles are rounded. The chonmatophore is simple, it fills in the lumen. It has a pyrenoid The size of the cells is 5 to 10×1.5 to 2 μ. The cells are always solitary, the cell appears in the water of the flooding river, the spines therefore break and come off.

45. *Chaetopedia crassiseta* SKUJA (Figs. 75—78)

The spherical cells form a coenobium in twos and fours. Its size is 7.3 to 10 μ. From the cells, spines of different length protrude, ending in a curved, thin point. It occurred on a single occasion in the summer plankton of the dammed up Tisza.

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