Tiscia (Szeged) Vol. XVII, pp. 67—88 (1982

BIOLOGICAL WATER QUALITY IN THE MÁRTÉLY AND KÖRTVÉLYES BACKWATERS OF THE TISZA FROM 1976 TO 1980, WITH SPECIAL REGARD TO PHYTOPLANKTON CHANGES

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(Received September 30, 1981)

Abstract

Authors report on the biological water quality of Mártély and Körtvélyes backwaters on the basis of investigations performed from 1976 to 1980. The seasonal changes of phytoplankton composition and the effect of flooding of the Tisza river on the phytoplankton of backwaters are discussed in detail. In high-water periods high-velocity river water of great suspended matter content flushes out the channels of the backwaters in the flood-plain. In these periods the phytoseston of the river determines the algal communities in the backwaters. The slowing down of the flow rate of the flooding water and the sedimentation of suspended materials takes place first in the backwaters. These processes, as well as the decomposition of the inundated flood-plain vegetation (organic matter content) create the favourable conditions for the phytoplankton characteristic of the backwaters and the season to develop. With the receding of water, this algal assemblage will be the core of the phytoplankton communities characterizing the backwaters.

Introduction

In our rivers and standing waters, the quantity and quality of phytoplankton exhibits seasonal variations. Uherkovich gives a detailed account of the seasonal changes of phytoseston composition of the Tisza in his work entitled "Phytoplankton of the Tisza" (UHERKOVICH 1971). Seasonal changes of phytoseston were observed also in the lower sections of the Tisza and Danube during studies performed there regularly (DOBLER and SCHMIDT 1980). Concerning the phytoseston composition of our larger rivers, the dominance of diatoms caused by special conditions of turbulence and high suspended matter content was observed except in the low-water period in late summer (BARTALIS 1978, UHERKOVICH 1966, 1968, 1969, 1971, 1972, 1975). Phytoseston composition characteristic of a particular stream, section of stream and season is essentially influenced, changed by the passing flood-waves. In periods of high river stage, the flow rate of the river increases as well as the quantity and size of suspended mineral particles. These latter mechanically affect the phytoseston organisms of the river, resp. unfavourably influence the light climate of the river by decreasing the transparence of water. In addition to the considerable diminution of total algal count, the changes of phytoplankton composition and the transformation to rheon type of the phytoplankton alre also indicative of the passing flood-wave (UHERKOVICH 1971). The backwaters of the Tisza are stagnant waters which self-individualized limnologically, and of which the seasonal changes of phytoplankton composition and quality are also characteristic. The Mártély and Körtvélyes backwaters are located in the flood-plain of the Tisza. Owing to their special connection with the river, these backwaters are flooded even by smaller flood-waves of the Tisza. They can get into temporary connection with the chemical and hydrological conditions of the river more than once in a year. The rushing in river water considerably affects the particular and rich microvegetation of backwaters. As evidenced by examinations performed in the backwaters of Atka and Serházzug never getting connected with the Tisza, the percentual ratio of diatoms in the phytoplankton of the backwaters generally characterizable with high ind./lit values is little except in late winter and early spring (DOBLER and HEGEDÜS: paper presented at the Tisza Research Meeting). During flooding a great mass of water of faster movement, loaded with suspended matter rushes also into the channels of backwaters and produce the aforementioned unfavourable effects on the phytoplankton organisms. The influence of flooding can be well illustrated not only by the diminution of total algal count, but also with the perishing of the phytoplankton community characteristic of the particular backwater and season, resp. the appearance of the special diatom dominance of the river (HORTOBÁGYI 1960, UHERKOVICH 1967, 1971). Subsequent to flooding, the rapid increase in the percentual ratio of diatoms was secured also by rheon type organisms *(Ceratoneis arcus, Diatoma anceps, Diatoma vulgare)* besides *Stephanodiscus* spp. *resistant* to the damaging effects of suspended materials. Species with more fragile silicified skeletons soon appear *(Nitzschia acicularis, Melosira gran.* var. *angustissima)*. After the passing of the flood-wave, phytoplankton density increases and the phytoplankton characteristic of standing waters develops. Later with the decreased share of diatoms in phytoplankton, the dominance of the species belonging to Chlorococcales increases parallel with the increasing in individual numbers of other algal groups. By then the phytoplankton composition of the backwaters is entirelly different from the phytoseston composition of the river. With the decreasing of the river stage, namely, the backwaters loose their connection with the "living water" and start to live their own life (UHERKOVICH 1971).

The papers published in this topic by HORTOBÁGYI and KISS have given us great assistance in these phytoplankton analyses (KISS 1977a, b, 1978a, b, 1979a, b, HORTOBÁGYI 1939a, b, 1941). The seasonal changes of phytoplankton in the Mártély and Körtvélyes backwaters resp. the effect produced by the flooding of the Tisza on the phytoplankton communities of these backwaters will be discussed later in detail.

Materials and Methods

Since the middle of the seventieth a method not used before by us was adopted in our hydrobiological examinations. This new procedure was probed in the stagnant waters located in the grounds of ATIVIZIG, and in this way it could be arranged in agreement with the Board of Tisza Research to perform regular investigations in the backwaters of the nature conservation areas from 1976.

Brief description of method:

1. It was accepted as a basic rule to take the samples necessary for chemical and bacteriological analysis parallel with the samplings for biological examinations. This means that the allocated area of water was studied in a complex way.

2. In the course of the biological examinations the halobity, trophity, saprobity and toxicity of the particular waterarea was determined. Water samples were generally collected monthly for 5 years (Tables 1, 2) in the following places:

1. Mártély backwater: strand of Mártély; open water; at 20 cm below water surface.

2. Körtvélyes backwater: watch-house at Körtvélyes dam; open water; at 20 cm below water surface.

Examinations performed and methods applied:

1. Measurement of conductivity (Measurement of the specific electric conductivity of water).
2. Determination of the total number of algae (Counting on membrane filter)
3. Determination of chlorophyll a content (Chlorophyll determination)
4. Counting of Pantle-Buck saprobity index (Pantle-Buck saprobiological analysis).

The examinations were performed according to the methods described by FELFÖLDY in his book entitled "Biological water qualification" (third revised and enlarged edition) (1980) under the chapters given above in parenthesis. The results are summarized in Tables 1 and 2.

Phytoplankton communities of lakes and rivers can be analyzed both quantitatively and qualitatively (FELFÖLDY 1980). In both cases the analysis is based on countings on dipped samples. Our further investigations in both backwaters were performed according to the above criteria (HORTOBÁGYI 1962).

For obtaining a better survey of results we used Maucha's star-diagram adapted to algological studies by Hortobágyi (HORTOBÁGYI 1957, 1963). The essence of this method is the following: Similarly to the 8 cations present in greater amounts in our natural waters, the algae of our waters can also be ranged into 8 sectors. Starting from north and proceeding in clockwise direction, the single sectors represent the following groups of algae:

phylum Cyanophyta
phylum Euglenophyta
class Xanthophyceae
class Chrysophyceae
class Bacillariophyceae (diatoms)
class Chlorophyceae
class Conjugatophyceae = Zygophyceae

The star-diagrams illustrating phytoplankton composition in the Mártély and Körtvélyes backwaters are presented among the figures. Time of sampling is indicated with the total algal count (ind./lit), and chlorophyll a concentration is illustrated with histograms.

Pictures deserving special attention from the point of view of high water level were marked with +.

Results

Our results in connection with biological water quality determined by the aforementioned methods were grouped according to the following 4 concepts:

(a) halobity
(b) trophity
(c) saprobity
(d) toxicity

(A) Mártély backwater

(a) The inorganic ion content of the backwater was measured by specific electric conductivity. On the basis of average values this backwater proved to be beta-alpha-oligohalobic, freshwater of medium quality. This condition did not change in the period of examination, which means that the backwater was not polluted, at the same time, however, due to changes of river stage the bed of the backwater was flushed trough each year once, in rainy years even three times (see: the technical description of backwaters), meaning that the ionic environment of the Tisza prevailed for shorter or longer periods. Only in late summer and early autumn vegetation periods developed a higher salt concentration here, which characterized the backwater until the next high water level.

(b) To establish the planktonic trophity of the backwater we determined the chlorophyll a concentration and the number of algae in one liter water. On the basis

Table 1. *Results of the biological examinations in Mártély backwater 1976—1980*

Year	Number of samples	Conductivity $10^{-6}\ \Omega^{-1}cm^{-1}$	Total algal count ind./lit$\times 10^6$	Chlorophyll a mg/m^3	P—B S index
1976	9	min: 230 max: 590 av: 461	min: 2.34 max: 20.73 av: 10.73	min: 2.2 max: 29.4 av: 12.7	min: 1.87 max: 2.22 av: 2.05
1977	12	min: 325 max: 780 av: 480	min: 1.33 max: 35.72 av: 15.18	min: 1.4 max: 71.9 av: 24.5	min: 2.00 max: 2.42 av: 2.17
1978	12	min: 300 max: 540 av: 417	min: 6.99 max: 115.55 av: 21.34	min: 2.2 max: 53.4 av: 20.3	min: 1.83 max: 2.28 av: 2.10
1979	10	min: 335 max: 505 av: 419	min: 4.22 max: 41.52 av: 22.64	min: 2.2 max: 51.0 av: 23.2	min: 1.81 max: 2.43 av: 2.06
1980	8	min: 369 max: 578 av: 455	min: 5.10 max: 39.36 av: 17.66	min: 7.3 max: 198.7 av: 37.6	min: 1.94 max: 2.41 av: 2.08

of the average values of these components the water body proved to be mesoeutrophic resp. eupolytrophic: rich in nutrients, highly productive.

Of the results presented in Table I, the data on trophity are listed in columns 2 and 3. A peak value (198.7 mg/m^3) among the chlorophyll a concentrations occurred only in 1980, which was accompanied by a medium algal count. In 1978, to an algal count of 115.55$\times 10^6$ only a medium pigment concentration belonged. Both results will appear reasonable if we consider the dominating algal strains in the evaluation.

In the first case the high chlorophyll a concentration was due to Cryptomonas spp. (20—50 μ) belonging to phylum Pyrrophyta and (in 1978) the great algal count to the presence of algae of 5—10 μ belonging to Chlorophyta (Fig. 5). It is easy to understand that for the outstanding results the differences in size of the organisms studied were responsible.

(c) The degree of pollution in the backwater was characterized by the average computed by means of the Pantle-Buck saprobity index. On this basis the water body was little polluted and the average values of the S index were not in excess of 2.30 in the period of investigation. By way of explanation it should be noted that the backwater was not loaded with so much organic pollutants that the natural bacterium flora could not decompose in a short time. We believe that the frequent flushing out of the channel also contributed to this favourable condition since in this way the surplus in organic materials (nutrients) originating from the decomposition of organic materials produced in the backwater could not accumulate, though they do in the sediment in every other case. The sediment of the channel — as it could also be established by visual examination — was healthy, and contained only little sapropel.

(d) During the examination period the backwater was not toxic. Charaterization of the backwater on the basis of phytoplankton composition.

In the water samples taken at the end of March 1976 values for algal contenct were average, exhibiting the dominance of euglenophytes. A picture similar to that was found in that year during September, October and November, and in the latter cases that water body was characterized also by the presence of green algae belonging to Chlorophyta, besides the aforementioned phylum. In April, June and July, Pyrrophyta also appeared in greater numbers in the phytoplankton. The elements which originated from the slow decomposition of nutrients in winter were rapidly utilized by the phytoplankton vegetation in spring when the temperature increased and the quantity of light became more favourable.

Species appearing with the decreasing nutrient level are rare (FELFÖLDY 1981), though it is known of Dinobryon divergens (Chrysophyceae) that it can well utilize phosphates of very low concentration. In the water samples taken on April 30, 1976, the species mentioned in the foregoing occurred in greater individual number, and the total dissolved phosphorus content of water was 0.07 mg/lit. In November, this group was represented by Chrysococcus biporus. In this year water level increased two times above the height of the summer dam, i.e. in April and December (Fig. 1).

In both cases, the great percentual ratio of diatoms (34—36%) was evident beside a small total algal count and low chlorophyll a concentration. In months without flood this value did not exceed 5—6%. During the flood in April,the dominance of Nitzschia acicularis, and during the flooding of December the dominance of Stephanodiscus hantzschii were characteristic. Ceratoneis arcus and Diatoma anceps spp. which are rheon type organisms of the river in winter occurred in great numbers.

In 1977, despite the high water level we could collect the water samples necessary for the analyses in each month. Thus, we were able to follow the seasonal changes, too. In March, April the picture was characteristic of the period of flooding, moreover, the influence of the high water level could be observed even during May and June.

From February to June, the dominance of diatoms was evident *(Nitzschia subtilis, Stephanodiscus hantzschii, Stephanodiscus dubius, Stephanodiscus astrea)*. The

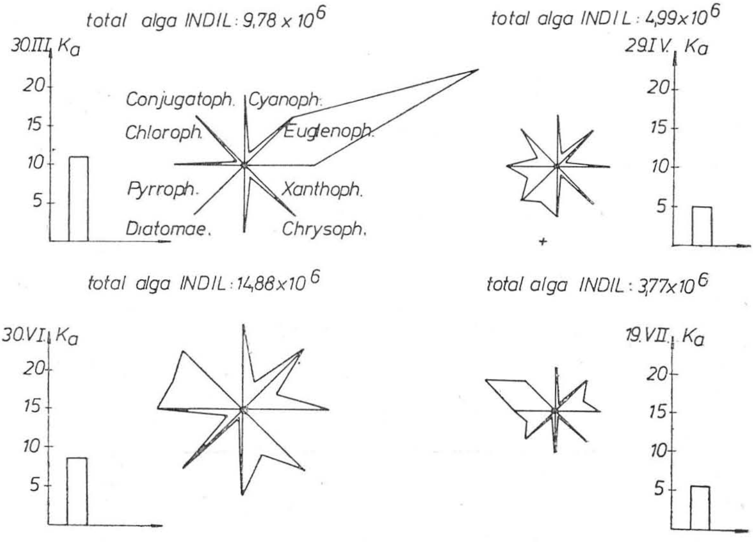


Fig. 1/a

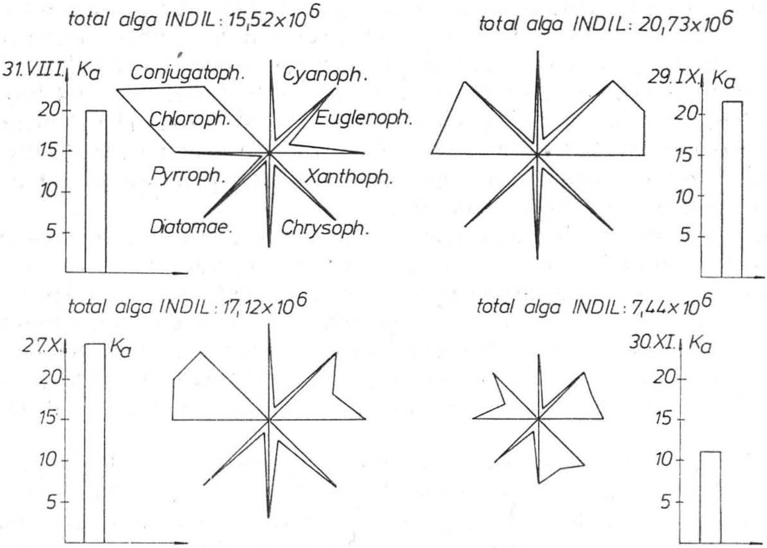


Fig. 1/b. Mártély backwater, 1976

37% ratio of diatoms found during the sampling period without flood in May had increased again to 70% in the stagnant water developed by the end of June. The effect of recurrent floodings could be observed for a long time, and the phytoplankton communities characteristic of the backwater could only develop by late summer.

During autumn, the backwater was characterized by a lastingly developed total algal content which showed a good correlation with chlorophyll a concentrations. Phytoplankton composition was characterized by the dominance of Chlorophyta.

Unusually great algal count was found also in December for which the ice conditions must have been responsible, namely the water was sampled from under

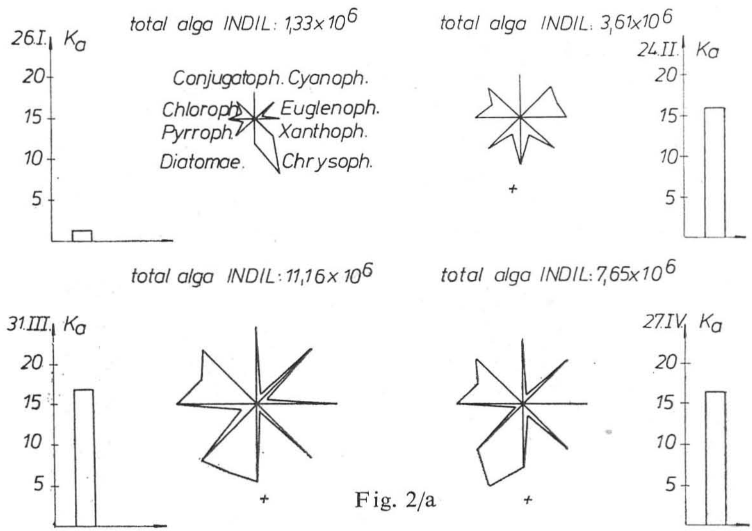


Fig. 2/a

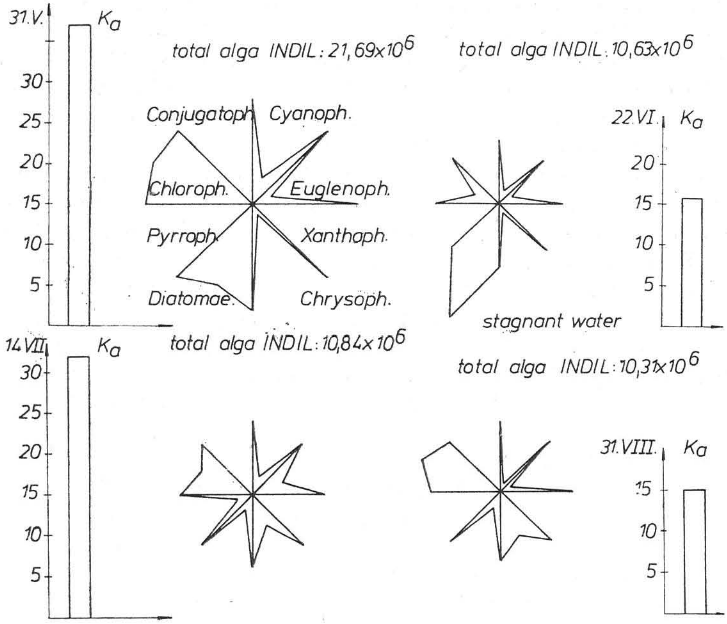
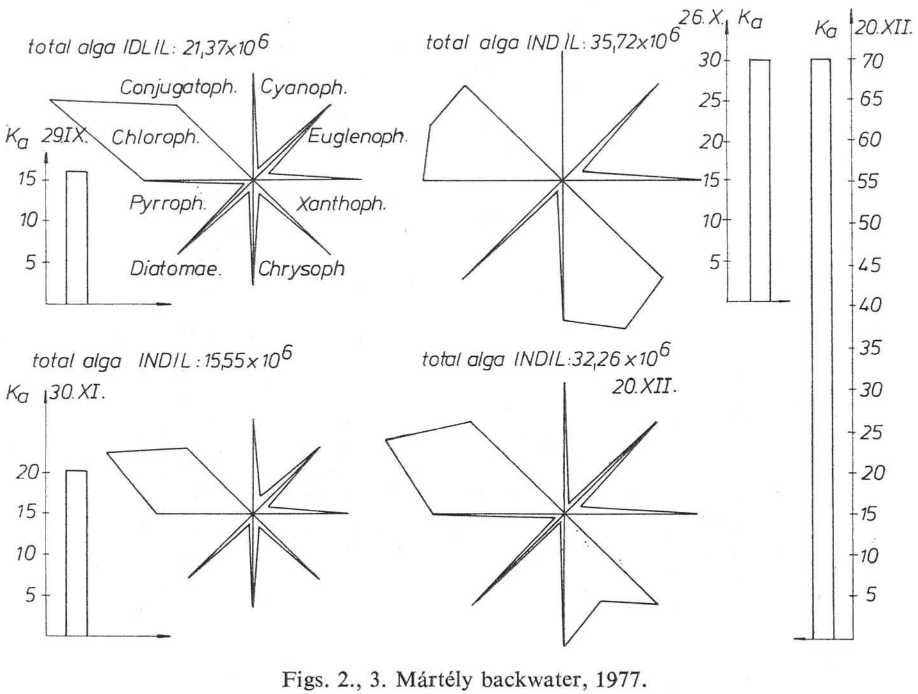


Fig. 2/b

an ice cover of 10 cm, but the snow-blanket did not inhibit at the same time the penetration of light into the water (Figs. 2, 3).



Figs. 2., 3. Mártely backwater, 1977.

In 1978 lastingly high water level occurred, and thus its effect on the phytoplankton composition of the backwaters could be measured in this year.

In periods of flooding, the lasting percentual ratio (25—40%) of diatoms was constituted by *Cyclotella glomerata, Cyclotella pseudostelligera, Nitzschia acicularis, Scelatonema subsalsum, Stephanodiscus hantzschii, S. astrea.* The species of *Cyclotella* had not characterized the backwater earlier.

In August, the effect of the passing of the flood-wave became evident, the numbers of the representats of the class Bacillariophyceae decreased, while the dominance of the phylum Euglenophyta and that of Chlorophyceae increased. At the same time, the algal count and the pigment content pertaining to it were extremely great. Concerning the values obtained it should be mentioned that such a value was not found elsewhere. This is likely to be due to the fact that temperature, illumination, length of day, water movement necessary for phytoplankton growth were optimal since otherwise the harmony of the aforesaid environmental factors could not have manifested themselves in this year during the whole vegetation period. Of the organisms inhabiting open water only Scherffelia deformis became competitive.

In October and November, the phytoplankton composition found in 1976 and thought to be characteristic of the backwater was restored. The water was again characterized by Chlorophyceae — Euglenophyta — Chrysophyceae plankton assemblages (Figs. 4, 5).

In 1979, for the lastingly high water level in spring, samplings were started only in May when the effect of the flood was still observable.

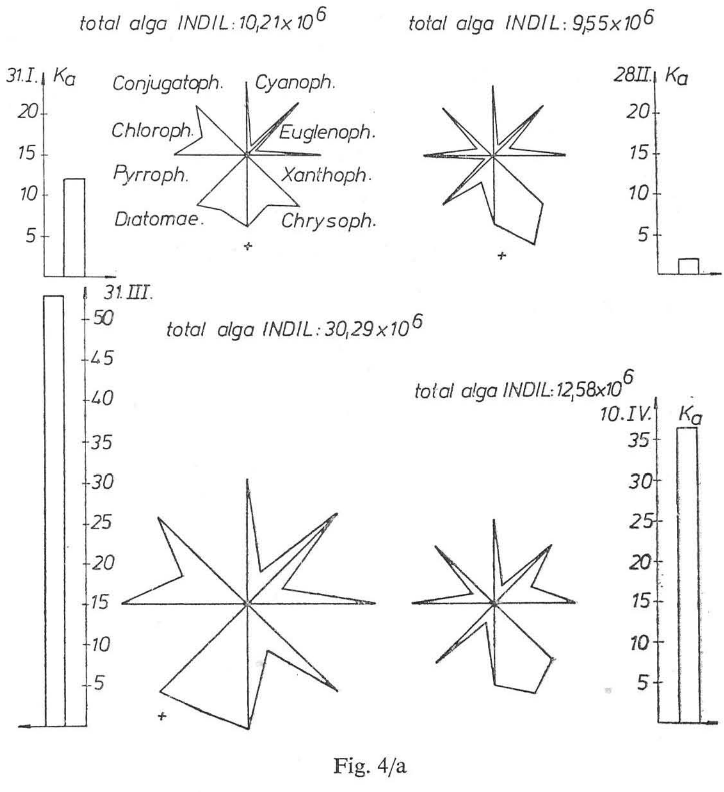
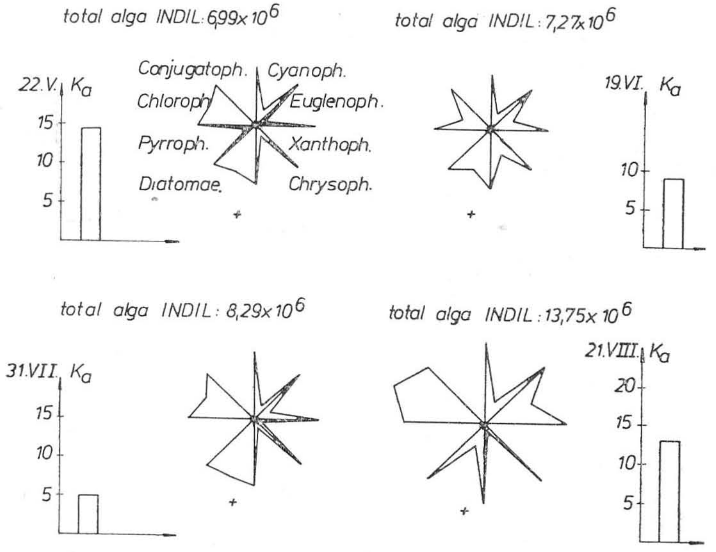


Fig. 4/a


total alga INDIL: 6,99x10^6
total alga INDIL: 7,27x10^6
22.V. Ka
15
10
5
Conjugatoph.
Cyanoph.
Chloroph.
Euglenoph.
Pyrroph.
Xanthoph.
Diatomae.
Chrysoph.
19.VI. Ka
10
5
total alga INDIL: 8,29x10^6
total alga INDIL: 13,75x10^6
31.VII. Ka
15
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21.VIII. Ka
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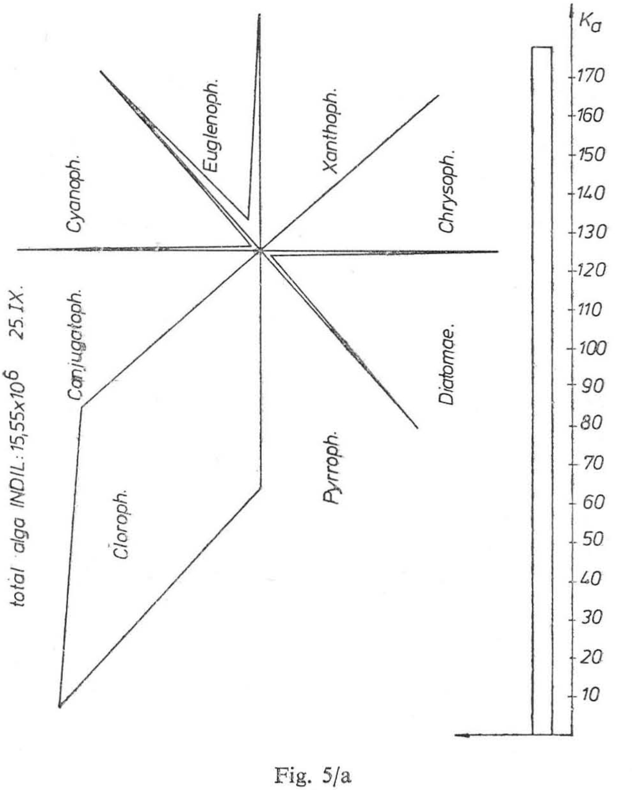
15
10
5

Fig. 4/b


Ka
170
160
150
140
130
120
110
100
90
80
70
60
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40
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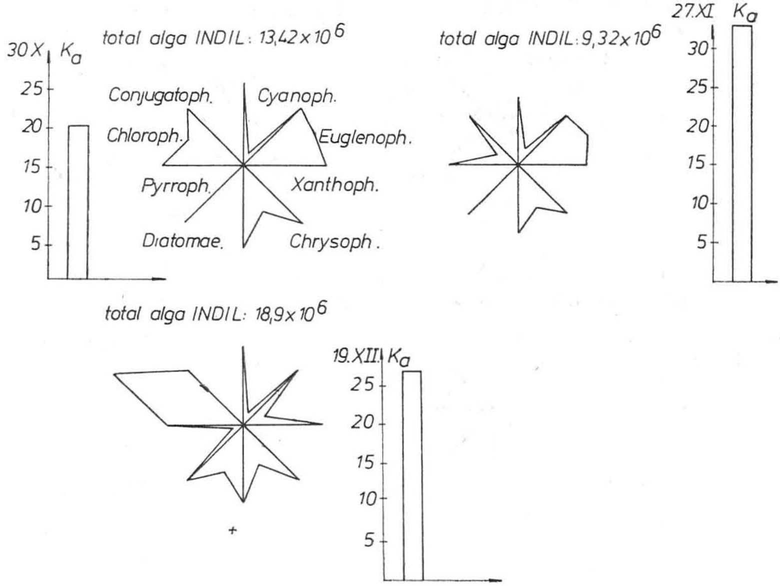
Euglenoph.
Xanthoph.
Cyanoph.
Chrysoph.
25.IX.
Conjugatoph.
Diatomae.
total alga INDIL: 15,55x10^6
Pyrroph.
Cloroph.

Fig. 5/a



Figs. 4., 5. Mártély backwater, 1978.

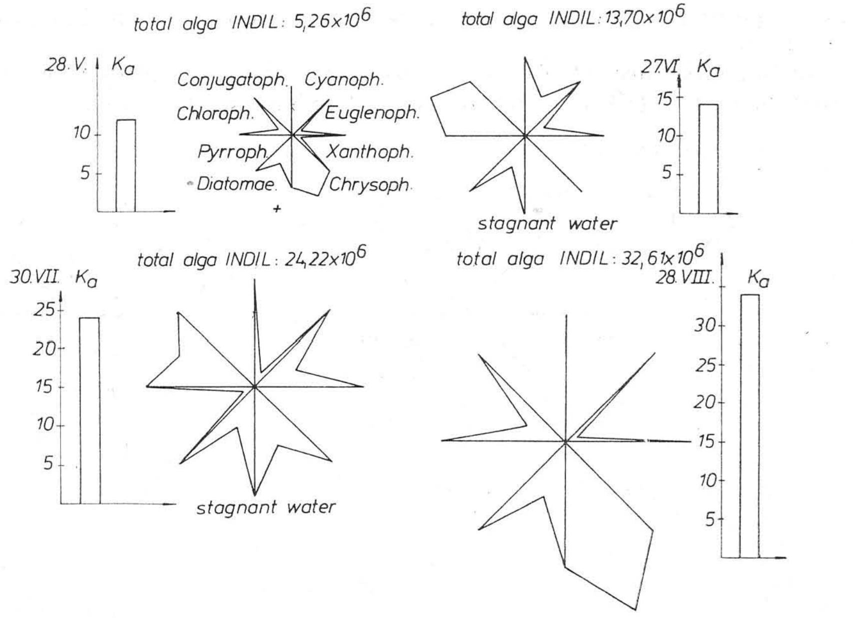
After the passing of the lasting spring flood, the ratio of diatoms decreased from 30%to 10%. *Stephanodiscus hantzschii* was the most characteristic species. In June, in the stagnant water formed after flooding, the diatom Attheya zachariasi was numerous. Its increase in number as in the case of *Nitzschia acicularis* must have started only after the cessation of the damaging mechanical effects. After flood time by the rapid slowing down of water movement and the bettering of light conditions in water, *Chrysococcus rufescens* and *C. biporus* characteristic of the backwater became very numerous, preponderating over the representants of the class Chlorophyceae. In September, the green algae became again typical, and they showed an even greater increase during October, and in November besides a sudden increase of Pyrrophyta, were still present in fairly great individual numbers. In December, species belonging to phylum Cyanophyta also took a considerable share in the composition of phytoplankton (Fig. 6, 7).

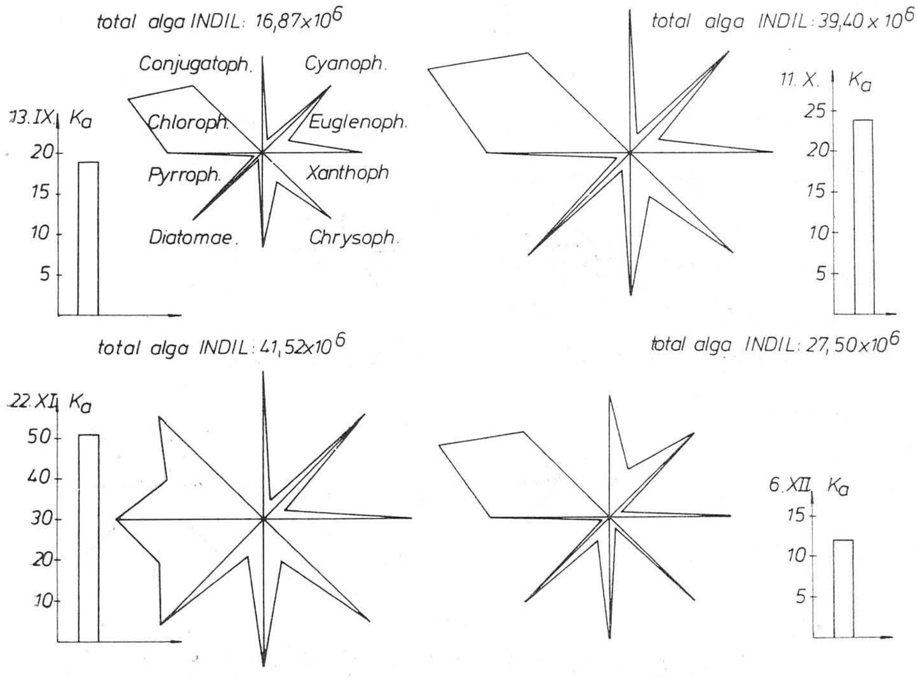
In January 1980 members of Cyanophyta also occurred, exhibiting a great green algal count. In January the samples were taken again from below the ice cover. This condition lasted till the end of March.

The ratio of diatoms in samples taken from under the ice cover without snow-blanket was 10%. *Melosira distans, Nitzschia acicularis* and *Stephanodiscus hantzschii* were present in great numbers. This value which is not connected with flooding is thought to be the consequence of the rapid increase of diatoms occurring usually in late winter and early spring.

For the water level which lasted from the end of June to the onset of autumn, the spring phytoplankton communities could not be replaced by the usual sommer ones.

During the period of flooding which lasted from May to early autumn, density

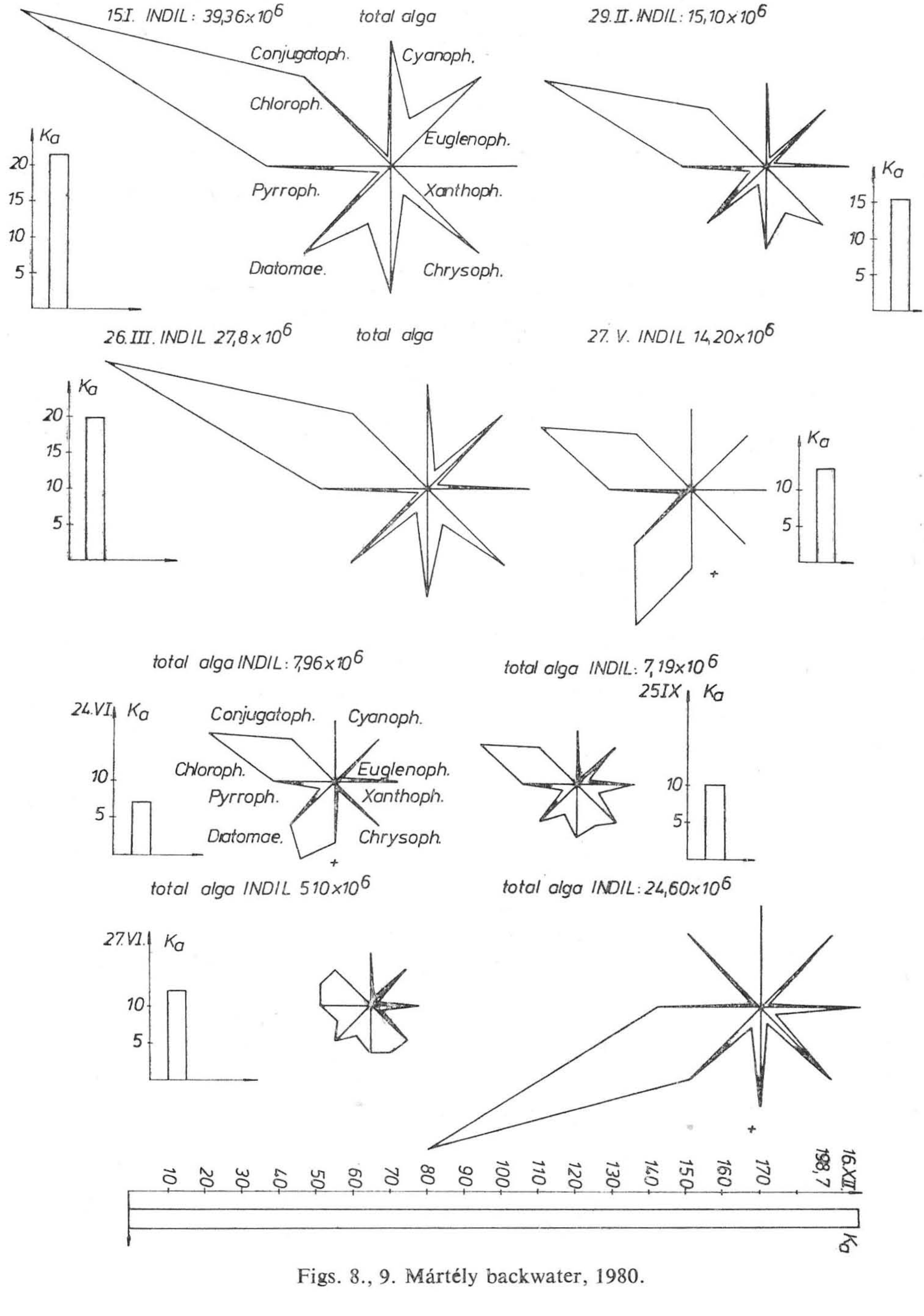




Figs. 6., 7. Mártély backwater, 1979.

and composition of phytoplankton showed a picture conform to our experiences (Figs. 8, 9).

In December, instead of the usual picture, the dominance of Pyrrophyta characterized the backwater (The water was covered with a thin layer of ice).



Figs. 8., 9. Mártély backwater, 1980.

(B) Körtvélyes backwater

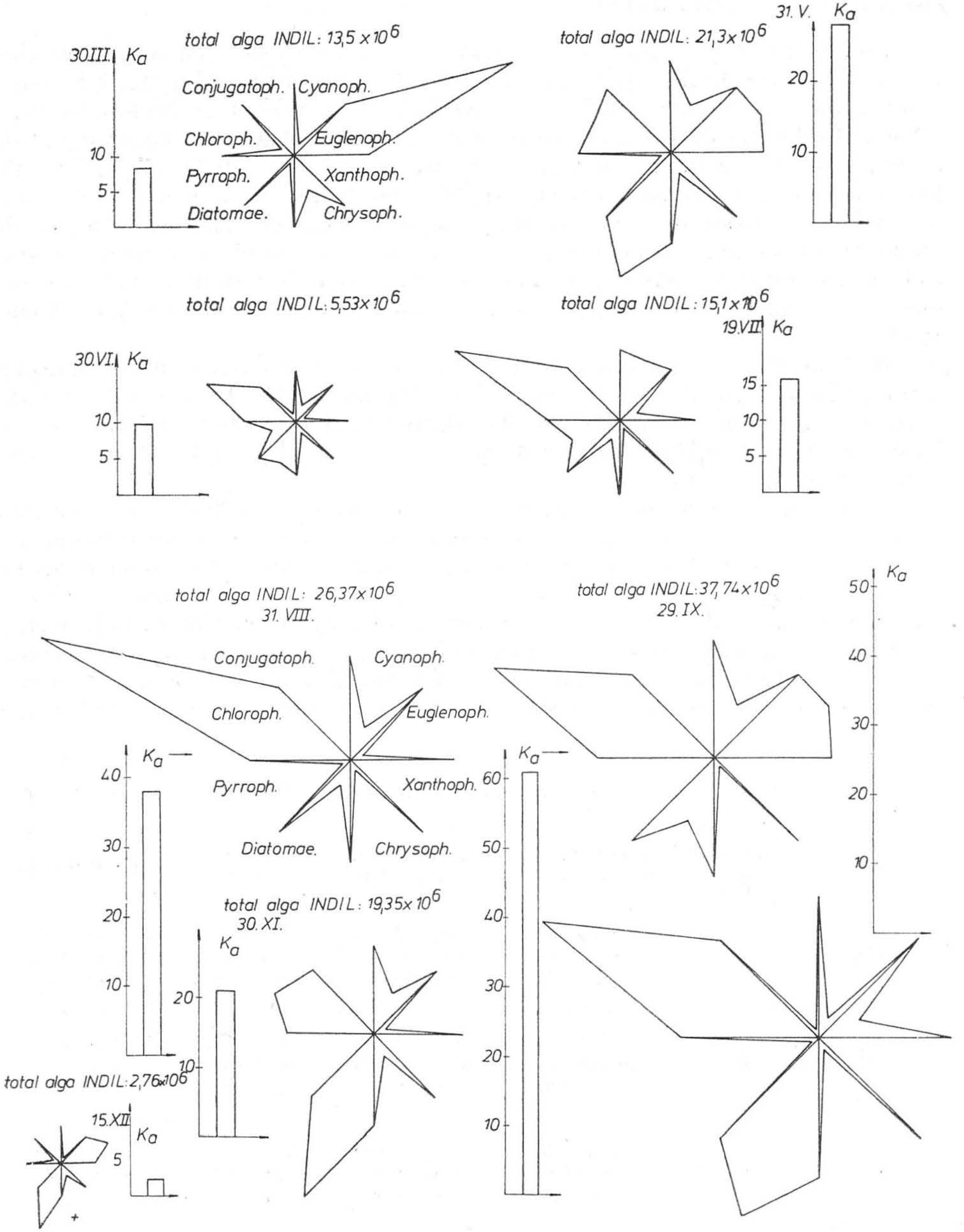
(a) The halobity of Körtvélyes backwater was also measured by specific electric conductivity. On the basis of average values, its water proved to be alpha-oligohalobic, pure freshwater in 1976, 1977, while in 1978, 1979, 1980 beta-alpha-oligohalobic, freshwater of medium quality. It is remarkable that at the beginning of the examination period the anion type of the water body was HCO_3—SO_4, later the SO_4— content diminished and CO_3—HCO_3 came to the prominence. This change was definitely favourable, since generally sulphate accumulation takes place in the sediments of standing waters along the Tisza river. This sulphate content is known to be transformed by reducing microbiological processes into sulphide in very eutrophic lakes, and the released H_sS endangers the biota of the water bodies (VÁMOS 1972).

It seems, that we should not yet be affraid of that. The decrease of sulphate content is obviously due also here to the lasting water level of the Tisza, which characterized the late seventies. Similarly to the Mártély backwater, this backwater is also located in the flood-plain, and thus the flushing out of both backwaters occurs practically in the same time.

(b) For the establishing of the planktonic trophity of the backwater, the chlorophyll a concentration of the water was measured and the algal content in one liter water was determined. On the basis of the average values of the components the backwater proved to be mesoeutrophic — except in 1977 — resp. eupolytrophic on the basis of the algal count; rich in nutrients and highly productive. In 1977 average chlorophyll a concentration was higher and therefore this backwater was qualified as eutrophic (Table II). Peak values were not obtained in this case either, differences of order not existing between the phytoplankton communities of the two backwaters.

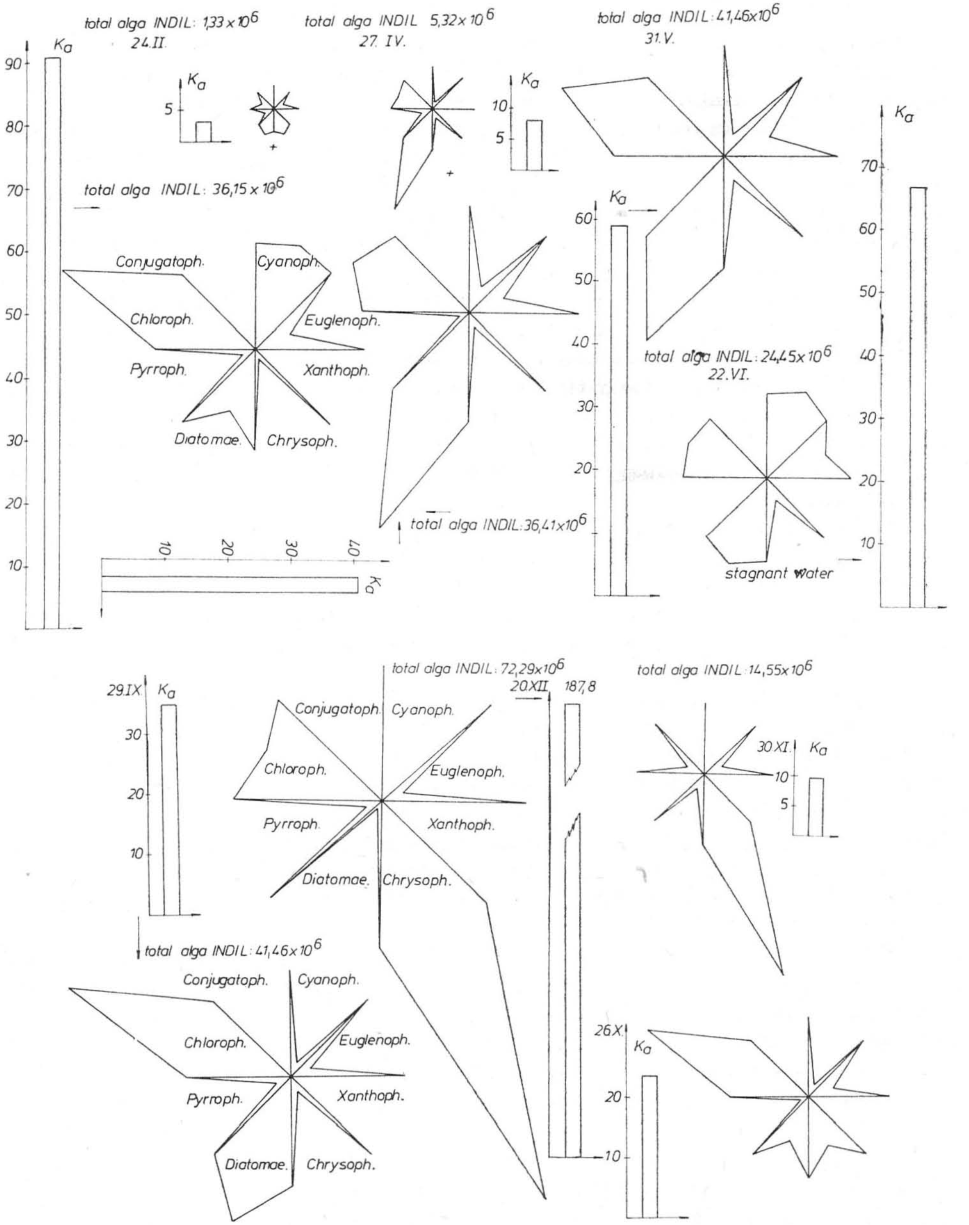
Table 2. *Results of the biological examinations in Körtvélyes backwater 1976—1980*

Year	Number of samples	Conductivity $10^{-6}\ \Omega^{-1}cm^{-1}$	Total algal count ind./lit $\times 10^6$	Chlorophyll a mg/m³	P—B S index
1976	9	min: 365 max: 802 av: 661	min: 5.528 max: 51.028 av: 21.40	min: 2.5 max: 61.5 av: 25.9	min: 1.86 max: 2.24 av: 2.07
1977	10	min: 330 max: 745 av: 570	min: 1.329 max: 72.289 av: 29.36	min: 3.3 max: 187.8 av: 52.59	m n: 1.75 max: 3.10 av: 2.27
1978	10	min: 320 max: 660 av: 529	min: 3.075 max: 68.04 av: 26.69	min: 3.5 max: 95.1 av: 43.13	min: 1.83 max: 2.42 av: 2.15
1979	9	min: 300 max: 780 av: 524	min: 9.36 max: 55.8 av: 23.93	min: 5.8 max: 45.9 av: 25.62	min: 1.94 max: 2.72 av: 2.27
1980	6	min: 240 max: 560 av: 413	min: 1.53 max: 48.4 av: 17.36	min: 7.2 max: 70.7 av: 29.73	min: 1.91 max: 2.22 av: 2.01



Figs. 10., 11. Körtvélyes backwater, 1976.

(c) The pollution of the Körtvélyes backwater was also characterized with the avearge computed on the basis of Pantle-Buck saprobity index. This water body was little polluted, and in the period of examination the average values for S index did not increase above 2.30. Organic load was not essential, and the water could be



Figs. 12., 13. Körtvélyes backwater, 1977.

characterized with saprobity in early spring and winter, trophity being the same in both backwaters during the vegetation periods. The period of flooding constituted an exception, since then the natural seasonal conditions were disturbed.

(d) During the investigation period the backwater was not toxic.

Characterization of the backwater on the basis of phytoplankton composition.

In 1976 greater (average) total algal count characterized the backwater, the dominant groups of phytoplankton being also different from those of the Mártély backwater. Besides the dominance of Chlorophyta, the phylum Canophyta also seemd to be important. However, the dominance of Euglenophyta was evident also in this water body in March, May resp. September, Oktober and December (Fig. 8). The star-diagrams of the Körtvélyes backwater clearly suggest that the late spring and autumn increase in species and individual numbers of diatoms was characteristic of the backwater independently from flooding. The approx. 30% share of diatoms in phytoplankton composition observed in May 1976 — *Melorina granulata* var. *angustissima, Stephanodiscus hantzschii* — decreased below 20% by late summer, then increased again gradually to 45—50% from September. In this year the backwater was flooded by the Tisza only in December, causing the abundance of individuals of rheon type *Diatoma vulgare, Diatoma anceps.*

In 1977, winter and early spring floodings characterized the Körtvélyes backwater. In these periods the spring increase of diatoms typical of backwaters and the effect of flood on diatom increase interlapped. *Nitzschia acicularis* characterizing the samples taken in February was gradually supplanted by *Stephanodiscus hantzschii* in April, May.

In May, June and July, 1977, following the spring high-water period, the Cyanophyta-Euglenophyta-Bacillariophyceae-Chlorophyceae association characterized the water. The characteristic increase of diatoms in the backwater in autumn was again evident in August, September and October. During this period diatoms and green algae prevailed, wherease in November and December the Chrysophyceae (Figs. 12, 13).

During the flood time in spring 1978, phytoplankton exhibited a great variability, members of different groups prevailing in nearly each month. In March Pyrrophyta, in April Chrysophyceae, in May 4 groups within a smaller algal count became dominant. In June, July diatoms characterized the water. In August, *Euglena* sp. characteristic of the spring period dominated. In September, for the prevalence of Scherffelia deformis and that of *Chlamydomonas simplex,* the majority of phytoplankton was made up of green algae. In autumn the diatoms were prevalent and in November, December the diatoms were supplanted again by Euglenophyta and Chrysophyceae (Figs. 14, 15, 16).

The ratio of diatoms increased to 60—70% when the flood-plain became lastingly inundated in spring and summer, the individuals of *Cyclotella glomerata, Nitzschia subtilis, Stephanodiscus dubius, S. hantzschii* being represented in greatest numbers. The increase of diatoms characterizable by the presence of *Cyclotella comta* and *Stephanodiscus hantzschii* shifted in this year to October, November. The plankton associations succeeded one another according to a most varied pattern in this year.

Species competition well known in ecology could be observed in 1979, as well. From January through April the Chrysophyceae alternated with the Bacillariophyceae. This became balanced by May, and both groups predominated in nearly identical individual numbers. In June the backwater was characterized by Chlorophyceae and Bacillariophyceae. In summer the plankton contained the organisms in equal proportion — excepting two or three groups — giving the impression of balanced conditions. In autumn, besides the species of chlorophyceae those of Cyanophyta increased again essentially, though the subdominance of Chrysophyta — Bacillariophyceae — Pyrrophyta could not be left out of consideration either (Figs. 17, 18).

In this year the greater (70%) percentual ratio of diatoms became evident already

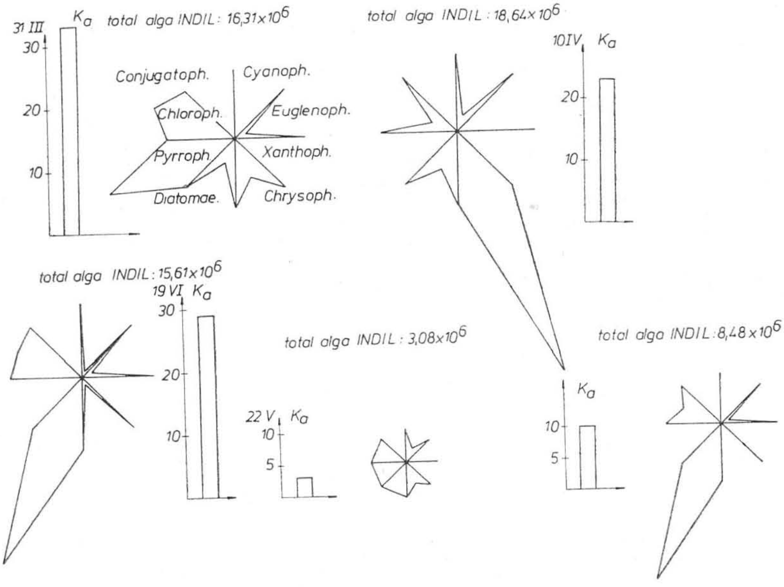

31 III
Ka
total alga INDIL: 16,31x10^6
Conjugatoph.
Cyanoph.
Chloroph.
Euglenoph.
Pyrroph.
Xanthoph.
Diatomae.
Chrysoph.
30
20
10
total alga INDIL: 18,64x10^6
10IV
Ka
20
10
total alga INDIL: 15,61x10^6
19 VI
Ka
30
20
10
total alga INDIL: 3,08x10^6
22 V
Ka
10
5
total alga INDIL: 8,48x10^6
Ka
10
5

Fig. 14

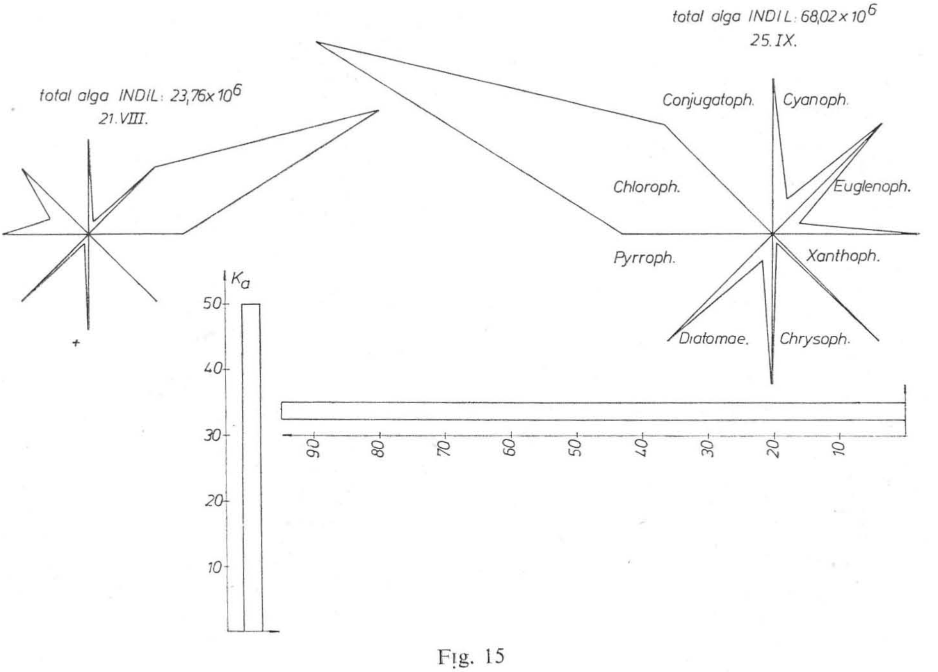
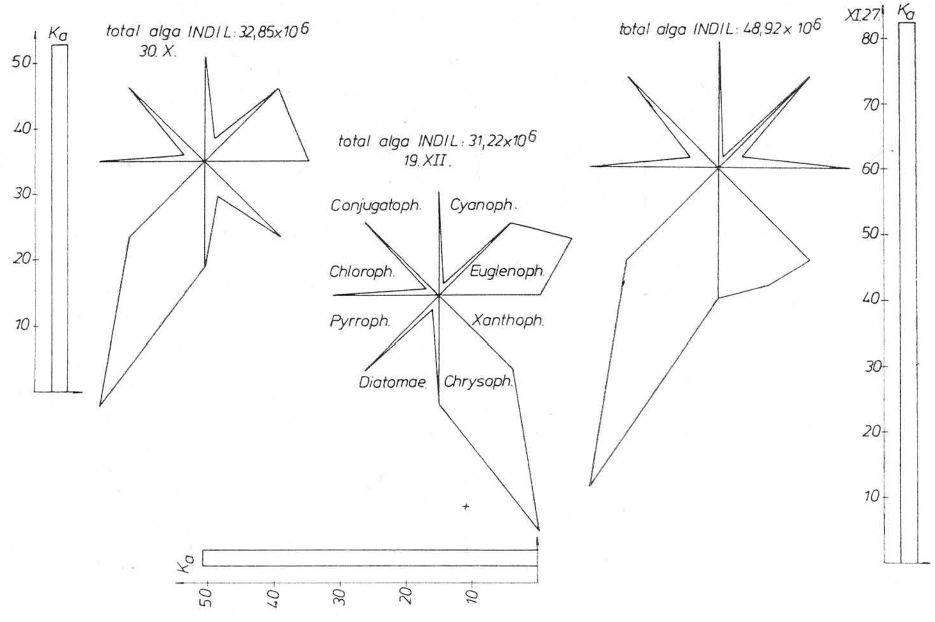

total alga INDIL: 68,02x10^6
25. IX.
total alga INDIL: 23,76x10^6
21. VIII.
Conjugatoph.
Cyanoph.
Chloroph.
Euglenoph.
Pyrroph.
Xanthoph.
Diatomae.
Chrysoph.
Ka
50
40
30
20
10
90
80
70
60
50
40
30
20
10

Fig. 15



Figs. 14., 15., 16. Körtvélyes backwater, 1978.

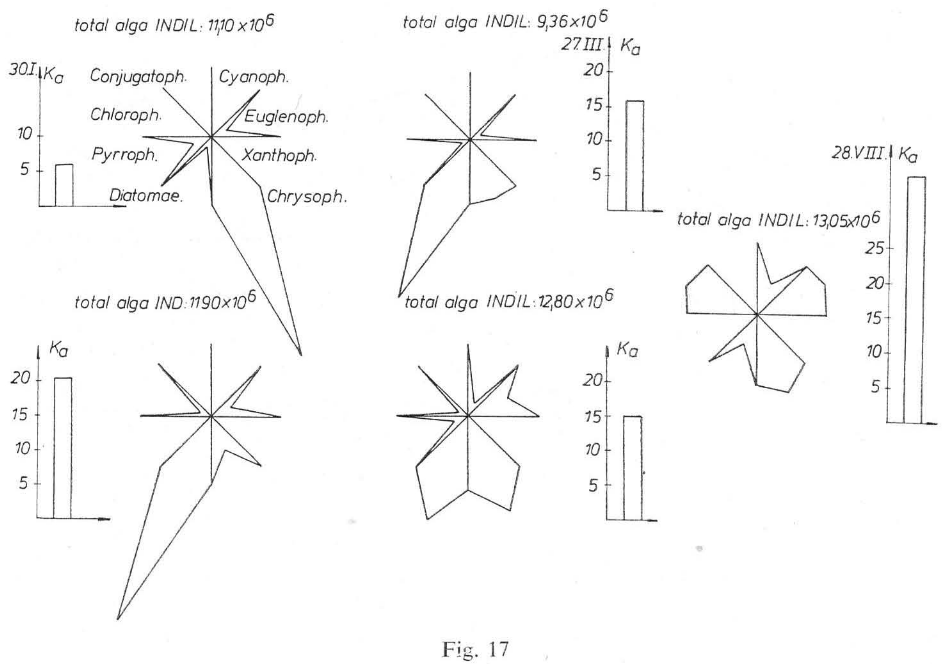
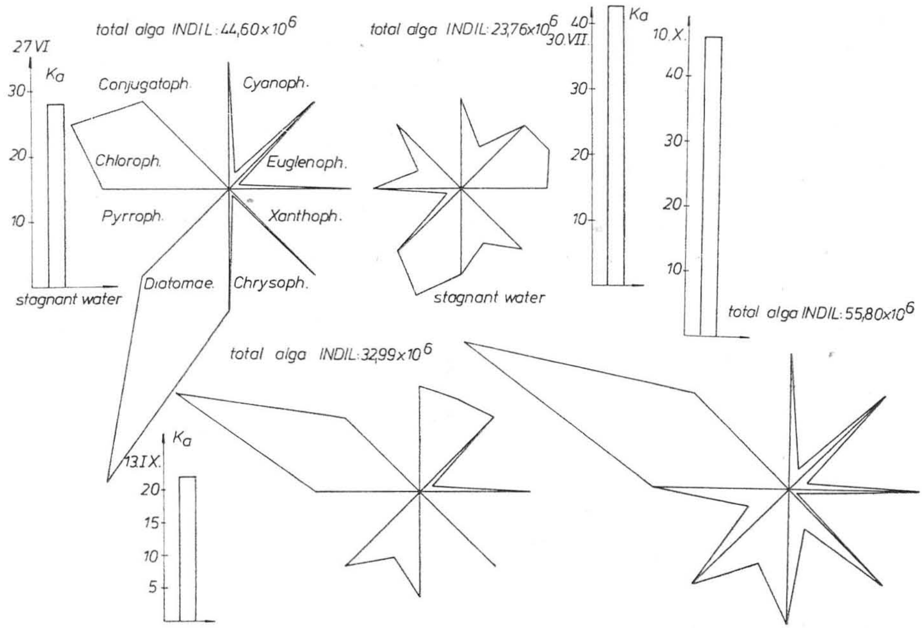


Fig. 17



Figs. 17., 18. Körtvélyes backwater, 1979.

in March. In April, this value increased to 80%, and because of the high-water period in May remained at this level by the end of July. The fragile species *Nitzschia acicularis* characteristic of the spring period was gradually replaced by *Cyclotella stelligera, Nitzschia longissima* var. *reverse, Stephanodiscus astrea, S. hantzschii.* The autumn maximum of diatoms observed earlier did not occur in this year.

In 1980, phytoplankton composition varied again according to the course of water. In January — in the samples taken from under the ice cover — the more frequent Xanthophyceae — Bacillariophyceae and Chlorophyceae community characterized the water, in February most interestingly only the total algal count diminished, the qualitative composition of the phytoplankton remained unaltered. In May, June, on the effect of the flooding in late spring diatoms preponderated, but the green algae were replaced by Pyrrophyta. In summer the Tisza was characterized by a long lasting water level in an unusual period, causing the flushing out effect of it — low algal concentration — to take place during September and October (Fig. 19).

The autumn maxima of diatoms observed earlier were not unequivocal.

* * *

1. The examinations necessary for the biological qualification of water proved to be sufficient for the qualification of both backwaters.

2. Concerning the qualitative and quantitative composition of phytoplankton, the Körtvélyes backwater exhibited a greater variability, the algal counts being generally greater, and the sudden increasing in species number occurring more frequently.

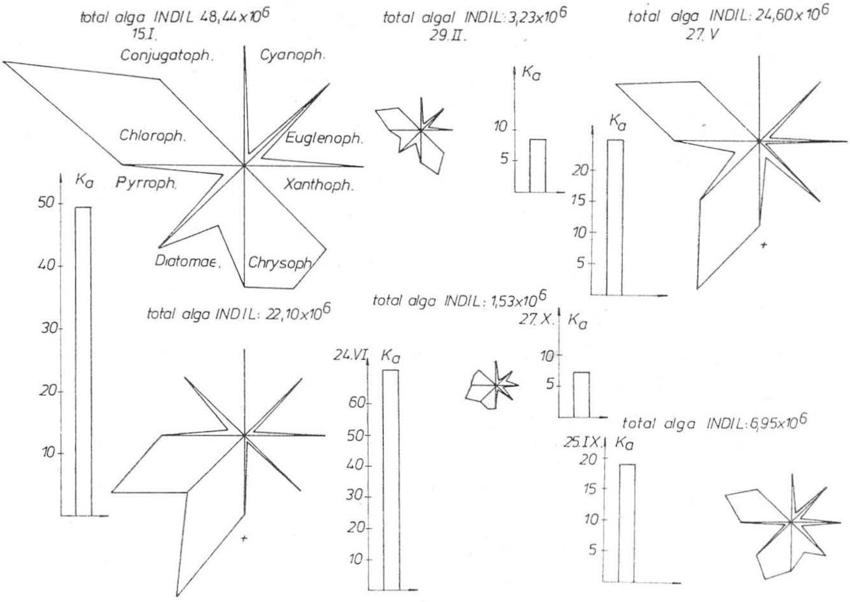


Fig. 19. Körtvélyes backwater, 1980.

3. The analysis of phytoplankton association was made by the determination of the algal counts. The phytoplankton communities characterizing both backwaters — high-water periods also included — were established.

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A mártélyi és körtvélyesi Tisza holtágak biológiai vízminősége 1976—1980 között, különös tekintettel a fitoplankton változására

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Kivonat

Dolgozatunkban beszámolunk a mártélyi és körtvélyesi holt ág biológiai vízminőségéről 5 éves adatsor alapján. (1976—1980. évek között havonkénti mintavétel.) A biológiai vizsgálatok elvégzésekor választ kaptunk arra a kérdésre, hogy a víztér halobitása, trofitása, szaprobitása és toxicitása milyen fokú. Részletesen foglalkoztunk a fitoplankton összetételének szezonális változásaival és a Tisza folyó áradásának a holtág fitoplanktonjára gyakorolt hatásával.

A fitoplankton minőségi és mennyiségi összetételét tekintve a Körtvélyesi holtág víztere változatosabb képet mutatott; az algaszámok általában nagyobbak, gyakrabban alakult ki robbanásszerű fajszám növekedés. A fitoplankton együttes analízisét az algaszám meghatározásával végeztük. Mindkét holtág jellemző planktontársulásait Hortobágyi T. által javasolt csillagdiagramon ábrázoltuk és ezt dolgozatunkban közöltük.

Biološka osobenost vode mrtvaja Tise Mártély i Körtvélyes u toku 1976—1980 godine sa posebnim osvrtom na dinamiku fitoplanktona

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Abstrakt

U radu se prikazuje biološka osobenost kvaliteta vode mrtvaja Mártély i Körtvélyes na bazi petogodišnjih podataka (mesečni uzorci u toku 1976—1980). Biološkom analizom je utvrdjivan stepen halobitnosti, trofičnosti, saprobitnosti i toksičnosti vodenog basena. Posebna pažnja je posvećena sezonskoj dinamici sastava fitoplanktona u funkciji uticaja reke Tise na fitoplankton mrtvaja u zavisnosti od vodostaja.

U odnosu na kvalitativni i kvantitativni sastav fitoplanktona, mrtvaja Körtvélyes pokazuje veću raznovrsnost. Uopšte uzev broj algi je veći i češće su eruptivna povećavanja broja vrsta.

Analiza zajednice fitoplanktona vršena je na osnovu utvrdjivanja broja algi. Karakteristične planktonske zajednice obe mrtvaje su obradjene i prikazane po metodi HORTOBÁGYI T.

БИОЛОГИЧЕСКОЕ КАЧЕСТВО ВОДЫ МАРТЕЛЬСКОЙ И КЕРТВЕЛЬЕШСКОЙ СТАРИЦ ТИСЫ 1976Ц1980 ГОДАХ, С ОСОБЫМ ВНИМЕНИЕМ НА СМЕНЫ В ФИТОПЛАНКТОНАХ

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Резюме

В работе на основании 5-летних данных приводится ответ на биологическое качество воды Мартейевской и Кёртвейешской старицы. (На основании проб, взятых в 1976—1980 годах).

Биологические исследования показали в какой степени находится в приведенных водах галобичность, трофичность, сапрофичность и токсичность.

В деталях изучалась изучением сезонная смена составной части фитопланктонов, а также влияние разливов реки Тисы на фитопланктоны обеих стариц.

В качественных и количественных отношениях фитопланктоны воды старицы Кёртвейеша дали довольно изменчивую картину. Количество водорослей значительно ивеличилось. В отдельных случаях даже бурным способом. Общий анализ фитопланктонов в осовном закончили определением количества водорослей.

Типичные планктонные сообщества обеих стариц приведенные по сводной диаграмме, предложенной Тибором Гортобадьи, в научном труде.