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HYDROECELOGICAL INVESTIGATIONS IN THE BAY OF THE FUTURE KISKÖRE RESERVOIR AT ABÁDSZALÓK

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Abstract

The paper is analysing the hydrobiloogical processes to be taken place in the bay of the future Kisköre Reservoir at Abádszalók.

The conditions to come after the reservoir being filled up may be inferred from the processes taking place in the bay durably overflowed by the inundation.

Introduction

The bay of about 12 sq.km surface at Abádszalók was filled up at the inundation of the Tisza in Summer and Autumn, 1974. The water surface nearly reached the water level of the future Kisköre Reservoir. In this way, an open-water surface of four metres or so was produced. About the biological investigations carried out, detailed analyses were given by BANCSI (1975) and HAMAR (1975). The bay and the flooding Tisza in the Kisköre profile were investigated parallel (Fig. 1).

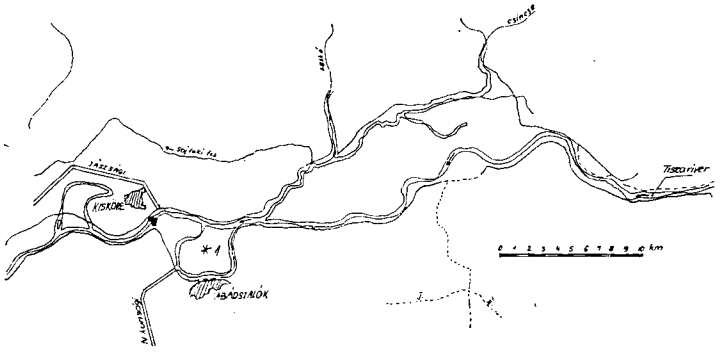

Fig. 1. Kisköre Reservoir and the bay at Abádszalók — Sampling point.

Characterization of the area investigated, material and method

From the beginning of June till August the 3rd and from the beginning of October till the beginning of December in 1974, there was a considerable flood in the Tisza. As a result of the two largest flood-waves since the great Tisza inundation in 1970, on June the 26th at Kisköre the water

level of the Tisza reached the A. O. D. 89.97, and on November the 4th it reached the A. O. D. 90.20 that was hardly lower than the planned damming surface of the Kisköre Reservoir. The flood-plain was inundated by the coming water masses, about 80 per cent of the future reservoir has got under water. As a result of a strange play of the nature, therefore, the reservoir was filled up what was expected by us only after four years, in 1978, on the occasion of filling the reservoir planned.

The initial formation of the quality of the water stored was followed with attention in a characteristic part of the reservoir, in the bay at Abádszalók. The Abádszalók-bay is lying in the part of the reservoir between Kisköre and Abádszalók, at a surface of about 12 sq.km (Fig. 1). The average water depth is 3.5 to 4 m, its covering with land vegetation is similar to that of the whole reservoir, the predominating wind direction is from the west, north-west.

The Tisza-backwater found at Abádszalók will certainly be considerable because of its micro- and macrovegetation after its being filled up, as well as owing to the distribution and "stabilization" of the microfauna.

The investigation of the chemical and biological changes in the bay at Abádszalók was carried out from July the 3rd till August the 27th and from October the 23rd till December the 17th, in the beginning more frequently (every one or three days), then with a weekly frequency, at a sampling point. Our investigations had been accomplished before isolating the various water surfaces of the bay.

For the chemical investigations we dripped out 5 l sample, and performed the determinations according to the "COMECON" Uniform water-research methods 1970, issued by the VITUKI (Water Research Institute), and on the basis of Felföldy's Biological water qualification (1970). The biological investigations are specified in the papers of BANCSI (1975) and HAMAR (1975).

Results of the investigations in the summer period

The most striking of the physical changes is the change in the suspended load content of water. In the period after inundation the concentration of the suspended matter suddenly decreased and fluctuated between 8.6 mg/l and 18.6 mg/l. In that period, values of about 550 mg/l were measured in the Tisza.

In the course of an aerial survey, we have observed a well-perceptible difference between the water-colours of the Tisza and the flood-plain. In the greenish and yellowish-green water of the flood-plain the line of the yellowish-brown, troubled water of the river stood out in a sharp contrast to it.

The temperature of water has developed in the bay at Abádszalók according to the weather and season.

The waves of often one metre height, originating as a result of the frequently very strong north-west winds, threw the remains of land vegetation floating in the water, as well as the broken fragments, on the slope of the dam at Abádszalók. In the river-side bars we have found a large amount of cereals, too, uprooted by the strong waves from the agricultural area lying 4 km far from the dam and washed away on the bank.

The water of the bay at Abádszalók was, like that of the Tisza, beta-alpha oligohalobic, of Ca—HCO_3-type, in the whole period of the investigation. In its inorganic chemical composition there was no essential change to be found. The slow increase in its total salt content is referring to the growing concentration of water that followed from the very intensive evaporation.

On the basis of the summer investigations, there were separated five characteristic periods of the processes taking place in the bay.

In the initial period (from July the 3rd to the 9th), the mineralization of land-vegetation (plants at grass-level) and that of the organic components of the suspended matter commenced with a surprising speed. Then we observed the rapid increase in number of the catabolic bacteria and simultaneously, the rise in concentration of the dissolved orthophosphate and nitrogen of inorganic bond that meant a concentra-

tion of the food available for autotrophic organisms (Figs. 2, 3). In the water cleared, the development of the microvegetation became intensive, engendering an increase in the concentration of the nitrogen of organic bond. In the period of mineralization, therefore, the increase in the total nitrogen content was characteristic. The high total nitrogen content was a result of the amount of forms partly existing in the water from the beginning, partly dissolved from the decomposition of the land vegetation having remained in the area, as well as from the bottom of the river bed (Figs. 2, 3).

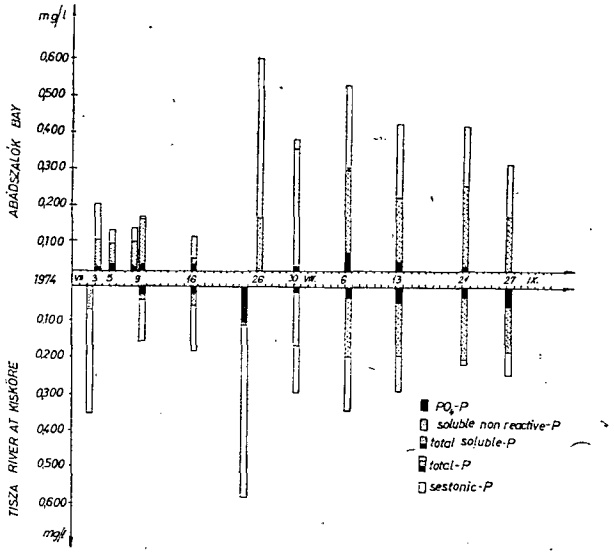

Fig. 2. The dynamism of phosphorus forms in the Kisköre profile of the Tisza and the bay at Abádszalók, in the period of the summer inundation in 1974.

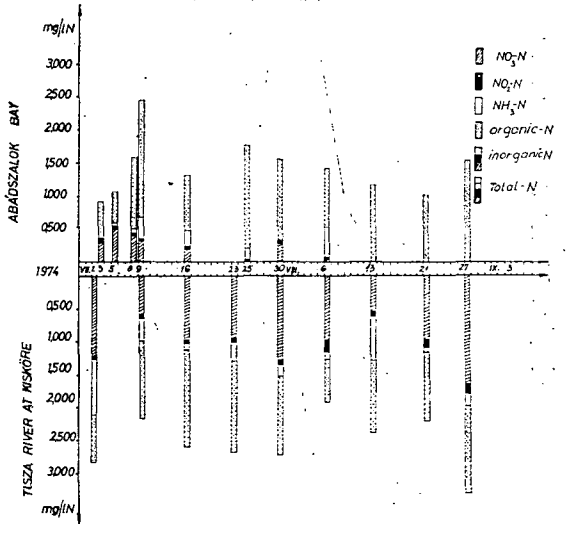

Fig. 3. The dynamism of nitrogen forms in the Kisköre profile of the Tisza and the bay at Abádszalók, in the period of the summer inundation in 1974.

Of the second period (from July the 9th to the 16th) the sudden development of the phyto-and zooplankton was characteristic. The decreasing intensity of the decomposition of the organic matter was indicated by the decrease in the total bacterial number, and the increase in the degree of trophity by the quick multiplication of algae. The overmultiplication of the microvegetation was restricted by the amount of the available food. In this period began the decrease in the nitrogen content of inorganic bond. The multiplication of zooplankton on the existing phytoplankton continued, its overmultiplication however could not follow, either, owing to the limited amount of food (Figs. 2, 3).

In the third period from July the 16th to August the 6th) the decrease in food supply resulted in the decay of phytoplankton, and then in that of zooplankton. The mineralization of the individuals perished was indicated by the rise in the total bacterial number but the food released in that way was built into the phytoplankton already but in a minor amount, its larger part was transported towards the macrovegetation, appearing and spreading more and more. As a result of that, we were witnesses of the appearance and distribution of *Schoenoplectus lacustris* (L.) PALLA and *Polygonum amphybium* L. (Fig. 6).

Of the fourth period (from the 6th to the 21st of August), the comparative sta-

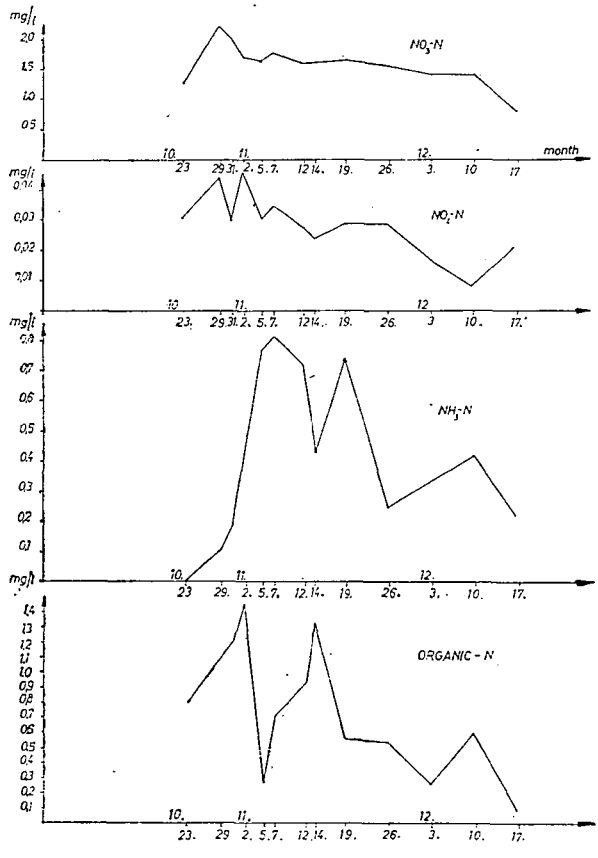

Fig. 4. Formation of the nitrogen forms in the bay at Abádszalók, in the time of the autumn inundation.

bilization of the microvegetation and microfauna was characteristic. The amount of the phyto- and zooplankton did not change essentially but the qualitative combination is different. The inorganic food, released from the organic matters that are not easily dissociable and that dissolved from the soil, infiltrated into the more and more prevailing macrovegetation. The amount of the nitrogen of inorganic bond in the water did not reach the limit of demonstratibility. In this period, the concentration of the total nitrogen was given by the amount of the nitrogen of organic bond in the phyto- and zooplankton, moving at an approximately constant value (Figs. 2, 3).

The fifth period (from August the 21st to the 27th) was the result of the flood passed. The decrease in water level was not favourable to a further development of macrovegetation. Its gradual decay and mineralization made possible a repeated rise in the amount of the phyto- and zooplankton. To further observations and investigations the isolation of the various water surfaces has put a stop after the flood had passed.

On the occasion of a local survey on September the 3rd, we observed alocal alga bloom at the single water surfaces (Hamar 1975).

Results of the investigations in the autumn-winter period

We investigated the bay from October the 23rd till December the 17th, when, the water was frozen over, in the flood-plain inundated on the occasion of the autumn flood repeatedly, at the same sampling point as in Summer.

In accordance with the season, the water temperature decreased more and more, being initially 7 °C, then on December the 17th 0 °C at the surface.

The period of investigation was characterized by a strongly windy, cloudy and foggy weather. In the beginning, the colour of water was "blond", characteristic of the "yellow" Tisza, on November the 5th, however, it was greenish-yellow, later on greenish, and at last opaline green. Transparency that was 25 cm at sampling, increased more and more, achieving the maxima (70 cm) on November the 26th. That was followed by the 20 ot 25 cm values of the opaline green water.

The mineral matter content of the water of bay did not changed considerably in this period. Oxygensaturation was between 70 and 90 per cent, the amount of free carbon dioxide 3 to 7 mg/l. The values of the C. O. D. (chemical oxygen demand) measured with potassium permanganate were lower than those measured in the Tisza.

The fluctuations of the autumn flood, the sedimentation following that and later the whirling effect of the wind are accurately reflected by the changes in the amount of the suspended matter, of the nitrogen and phosphorus forms (Figs. 4, 5). The relative constancy of the nitrogen content of inorganic bond is a result of the balanced functioning of reducent and producent organisms. The dissolved orthophosphate decreased in the descending branch of the flood-wave, and its quantity was periodically zero (Fig. 5). In its disappearance the colloids must have had a part, as well.

By investigating the bay at Abádszalók, we have obtained some results giving us some informations on the changes in the water quality in the period after filling up the reservoir.

On the basis of the observations and results of the investigation it may be established that in forming the water quality of the reservoir, the direction and strength of the wind and the waves induced by that have a very large part.

Halobity, *i. e.*, the sum of the inorganic chemical factors of water, that is important in biological respect, has not changed essentially.

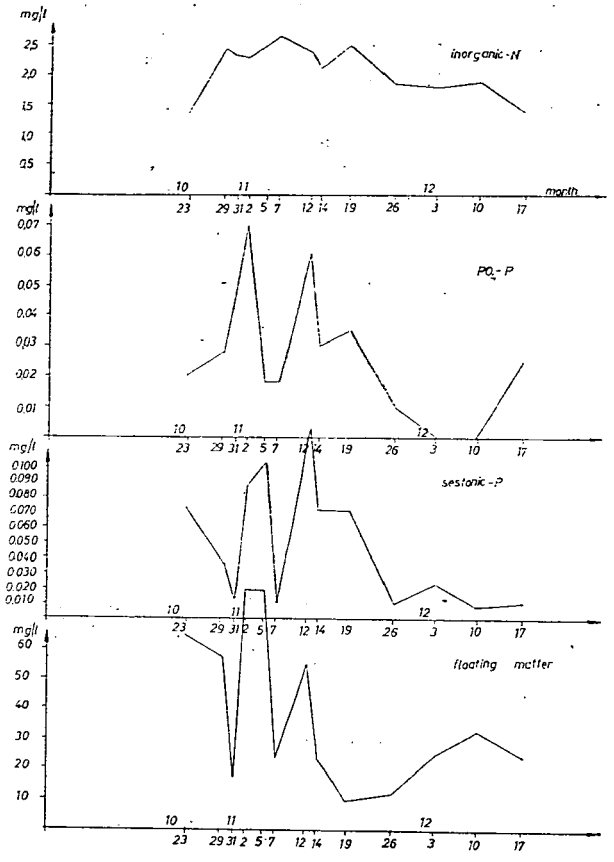

Fig. 5. Formation of the suspended matter content and of some chemical components bound to it in the bay at Abádszalók, in the period of the autumn inundation.

In respect of saprobity and trophity, however, we have already observed very essential changes, that can possibly be brought into connection with the dissolution of the organic and inorganic matters of the soil, as well as with the mineralization of the land vegetation remaining in the riverbed.

It is proved both with the summer and the autumn-winter investigations that a quick utilization of the food supply in the Tisza is made possible by the backwater conditions formed (B. TÓTH 1975, VÉGVÁRI 1975), enabling the beginning of a very intensive biological life, following the decomposition of the land vegetation left in the riverbed. By reason of the results it is to be expected that the water of the reservoir will be eutrophic.

It is proved by the very high individual and species numbers found in the course of the biological investigations, by the comparative stability of the plankton developed in the fourth period, by distribution of the marshy vegetation and reed-grass, that the natural history of Kisköre Reservoir will be determined fundamentally first of all not by a fortuitous settling but certainly by the micro- and macrofauna, as well

as macroflora, living at present in the backwaters and borrow area of the flood-plain, overflowed by the water of the Tisza.

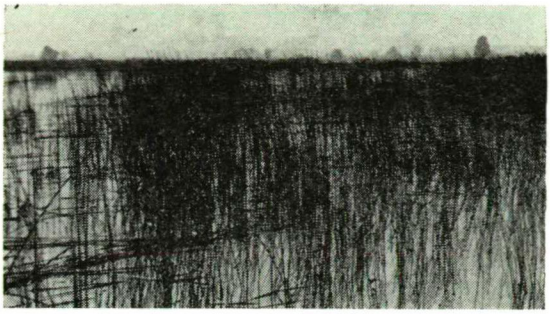

Fig. 6. The well-developed stand of *Schoenoplectus lacustris* (L.) PALLA.

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