Tiscia (Szeged) Vol. XI, pp. 41—44 (1976)

DATA TO THE BACTERIOLOGICAL AND ALGOLOGICAL CONDITIONS OF THE REGION OF KISKÖRE RIVER BARRAGE

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(Received 30 June, 1975)

Abstract

The Kisköre River Barrage, built in the middle Tisza Region, began to damm up the water of the river in 1973. The present paper is making a survey of the bacteriological and algological results of the period passed since the damming. It is to be emphasized that, as a result of damming, a backwater plankton developed and the occurrence of the microorganisms indicating the eutrophic water became frequent.

Method

The investigation of the total bacterial count was carried out with the membrane filter method (Felföldy 1974). For elaborating the algological samples and counting Planctomyces bekefii, we have used Utermöhl's technique. At measuring the chlorophyll content, methanol solution was carried out (Felföldy 1974). From the beginning of damming we took longitudinal-section sampl's above the river barrage at four sites, below it at one site, in every month or fortnight. The bacteriological results were placed by István Bancsi at my disposal, the chlorophyll content was measured by MÁRIA B. TÓTH. Special thanks are due to them for that.

Results

Bacteriological investigations have so far been carried out in the Tisza only from hygienic point of view. The beginning of damming and the creation of the future reservoir lake made it imperative, however, to introduce hydrobacteriological investigations, as well. As a first step, it seemed to be advisable to determine the total bacterium count. At flood (Spring, early Summer, Autumn), the Tisza carries a considerable amount of organic suspended matter from the watershed area, with a rather high bacterium content (e. g., on June 18th 1974: 114 million ind./ml). On the basis of the recordings in 1974, the bacterium count generally changes as a function of the suspended matter carried by the floods. In 1974, this value fluctuated at the flood between 50—110 million ind./ml. In case of a small water output there is river-bed damming and then the total bacterium count is considerably lower (6—50 million ind./l). Some increase can only be observed in the time of a summer damming, taking into consideration that the backwater character, established in that way, is raising the trophic degree. In the longitudinal sector there cannot be demonstrated any significant deviations but the higher total bacterium count in the post-damming phase is striking. On the basis of our experiences, the bacterium count is not influenced essentially by the temperature.

It seems so that the total bacterium count will be suitable for separating from each other the water masses of identical water motion but of different pollution.

We have some data concerning the occurrence in the Tisza of *Planctomyces bekefii* GIM. (OLÁH et HAJDÚ 1973), belonging to the family Caulobacteriaceae (UHERKOVICH 1971). In the summer plankton of the dammed Tisza their quantity is considerable, maximum 5 million ind./l. It may be supposed that *Planctomyces bekefii* will be a good eutrophic indicator.

The algological conditions of the Tisza are rather well-known from Uherkovich's more than 15-year long activity. The summing up of the hydrobiological and algological results, achieved concerning the Tisza, is connected, as well, with his name (UHERKOVICH 1971). The effect of the dam, built above the Kisköre river barrage at Tiszalök, exerted upon the algological composition, could be demonstrated (UHERKOVICH 1960, 1961). After beginning the Kisköre damming (on April 16th 1973), the flowing speed of water decreased, the suspended matter settle down, making the water more transparent. Light can, therefore, penetrate deeper. The food solved in water became approachable. These changes have resulted in the qualitative and quantitative change of the algal stand in the river.

The most conspicuous was the transformation of the typical potamoplankton into limnoplankton (ÁDÁMOSI *et al.* 1974). Potamoplankton is characterized by the dominance of some alga species that tolerate the drifting, shearing effect of water [*Ceratoneis arcus* KÜTZ., *Diatoma vulgare* BORY, *Synedra ulna* (NITZSCH) EHR.], that is to say, first of all the diatom. It is characteristic of the qualitative composition

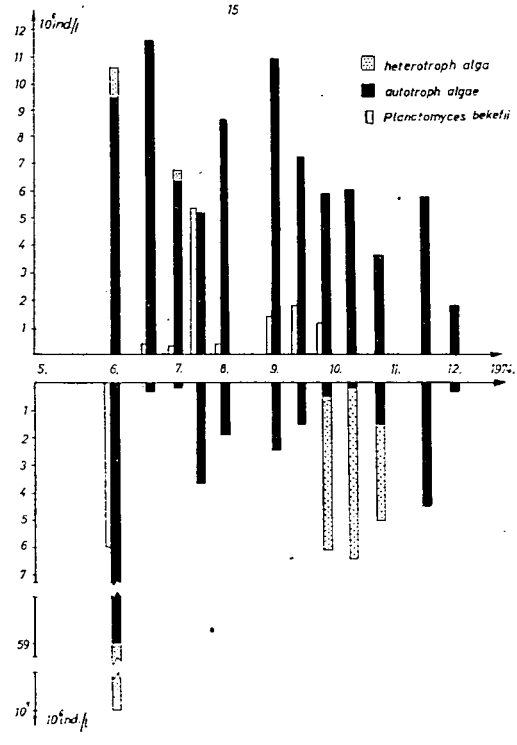

Fig. 1. Total alga count of the Tisza in the region of the Kisköre river barrage, on the basis of the investigations in 1974.

of limnoplankton that it consists partly of species found in potamoplankton in smaller individual number (*Nitzschia acicularis* W. SMITH, *Synedra acus* KÜTZ., *Fragillaria crotonensis* KITTON, *Asterionella formosa* HASSAL, *Nitzschia actinastroides* (LEMM.) GOOR, *Melosira granulata* var. *angustissima* MÜLL.), partly of backwater species occurring but rarely in potamoplankton or being so far unknown in the Tisza (*Stephanodiscus tenuis* HUST., *Cryptomonas marssonii* SKUJA, *Craytomonas ovata* EHR., *Cryptomonas platyuris* SKUJA, *Cryptomonas pusilla* BOCH., *Chrysococcus biporus* SKUJA, and cosmopolitan green algae — first of all the species *Ankistrodesmus*). The characteristic of limnoplankton is that *Staphanodiscus tenuis* HUST. is its dominant species, in association mostly with *Nitzschia acicularis* W. SMITH, *Asterionella formosa* HASSAL, *Melosira granulata* var. *angustissima* MÜLL., and *Fragillaria crotonensis* KITTON. In the summer plankton, besides the diatom, also the dominance of the species Chlorophyceae and Pyrrhophyta is considerable.

One month after the beginning of damming (May 17th 1973) the count: several millions ind./l of *Stephanodiscus tenuis* HUST. and *Nitzschia acicularis* W. SMITH was already indicating the change. On the basis of our experiences, the high individual count of *Stephanodiscus tenuis* HUST. always refers to a eutrophic environment. Something similar was observed in case of Lake Ontario (NALEWAJKO 1966) and other waters, as well (FOGED 1954). The total algal count may achieve several millions per litre, too, at the summer damming (Fig. 1).

The multiplication of algae is assured by the food content of the Tisza. It is, therefore, a result of the joint effect of suspended matter and temperature that the total alga count of a period can be separated well as a function of the suspended matter (Fig. 2), their correlation being significant.

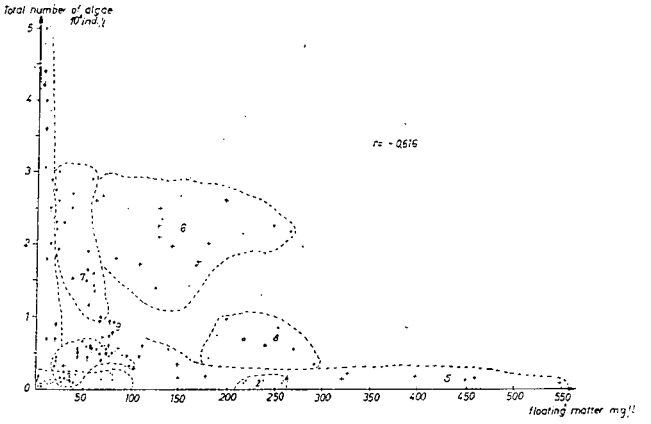

Fig. 2. Connection between suspended matter and total alga count.

If there is no damming, then the algological composition of the reaches investigated hardly changes, while at damming the alga count increases if we came nearer to the river barrage but after that it decreases (Fig. 3).

It is shown by the results of the chlorophyll content obtained in 1974 that at time of floods the chlorophlyl content is very low, while the values measured at damming are somewhat higher. The total chlorophyll content was fluctuating between 0.83 and 27.62 mg/cc.m. The maxima of the chlorophyll content were coinciding with the maxima of the total alga count, but owing to the low chlorophlyl values and methodical problems the correlation between them was not too strong, $r=0.503$.

The masses of benthic filamentous algae (*Cladophora, Spyrogyra* spp.), appearing after damming, are referring to the conditions changed, as well. The formation of

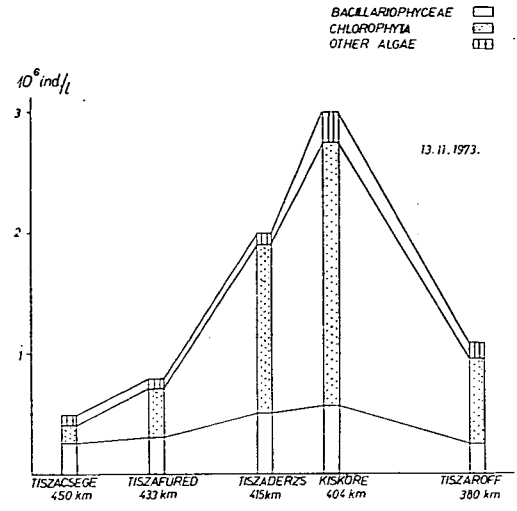

Fig. 3. Effect of damming on the algological composition of the Tisza in the Kisköre River Barrage region (November 13th 1973).

an eutrophic state is indicated by the algal blooms, too, before the river barrage. Although the blue alga, *Aphanizomenon flos-aquae* RALFS, that induces the frequent algal blooms, was not rare in the plankton, the algal blooms were here caused by *Microcystis aëruginosa* KÜTZ. and *Chlamydomonas reinhardii* DANG.

A large part of the limnoplanktic species may have originated from the polluted and eutrophic river, the Sajó, above the river barrage, and from the dammed reaches above the Tiszalök River Barrage, as well. In the Kisköre dammed reach a limnioplanktical algal stand of high species and individual count develops as a result of damming. We may suppose the development of a similar eutrophic stand in the future reservoirs, as well.

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