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ZOOPLANKTON INVESTIGATIONS IN THE DAMMED RIVER TISZA REACHES

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Abstract

The paper is giving a faunistic-ecological elaboration of the Zooflagellata, Rotatoria, and Crustacea plankton of the dammed Tisza. It is analysing the effect of the river-bed damming and inundations upon the fauna.

Introduction

In the Middle Tisza Region (404 river-km) a river barrage was built and above it a shallow-water reservoir of 127 sq.km surface (water depth: 2.5 to 4.0 m) was established. The reservoir will be filled up in a few years. For recognizing the supplying water-course in advance and protecting the water quality of the reservoir, our laboratory has performed detailed hydroecological investigations since 1973. Within the framework of the work, we made hydrographical, hydrological, physical surveys (VÉGVÁRI 1975), carried on hydrochemical studies (B. TÓTH 1975, VÉGVÁRI 1975), bacteriological and algological (HAMAR 1975), as well as zooplankton investigations.

In the course of the zooplankton investigations, we have systematically studied the Zooflagellata, Rotatoria, and Crustacea plankton. The elaboration of the Zooflagellata fauna was carried out by my colleague J. HAMAR. I wish to express him my thanks, in this way, too, for having abandoned me his results.

Regular investigations were begun in April 1973. Our samples were collected from the reaches of the Tisza between Tiszacsege (at river-km 456) and Tiszaroff (at river-km 380). We have elaborated the Rotatoria and Crustacea fauna of the river by using the filtrate of 50 to 100 l water ladled, from the five sampling points designated, every fortnight. For investigating the planktonic Zooflagellates we have used ladled samples.

Zooflagellata fauna

Zooflagellates occurred in the dammed up water of the river, except for the winter months. In the course of investigations, we identified altogether eleven species. These are:

Bicoeca cylindrica (LACKEY) BOURR.
Bicoeca lacustris J. CLARK
Bicoeca sp (nova?)
Codonosiga botrytis (EHR.) KENT
Codonosiga longipes STOKES

Collodyction tricilliatum CARTER
Histonia velifera (VOIGT) PASCHER
Monosiga ovata KENT
Rynchomonas nasuta (STOKES) KLEBS
Salpingoeca buetschlii LEMM.
Stelexomonas dichotoma LACKEY

There were found first of all backwater species; in a water of higher suspended matter content we found only *Stelexomonas dichotoma* having rather strong lorica. The individual number of species fluctuated between 6 and 60 thousand ind./litre. Organisms designating polluted water were not found in the living samples, either.

Rotatoria and Crustacea fauna

About the Rotatoria and Crustacea fauna of the Hungarian Tisza Region we find some informations in the publications of ÁDÁMOSI *et al.* (1974), ÉBER (1955), GÁL (1963), and MEGYERI (1955, 1957, 1970). The fauna of the tributaries discharging into the Tisza (MEGYERI 1972), that of the backwaters (MEGYERI 1961) and of the borrow area of the Tisza (VARGA 1928, 1930) was similarly studied by a number of researchers. Most of the investigations so far have been carried out in the summer period. Our data concerning the autumn, winter, and spring periods are, therefore, defective enough.

In the course of our investigations lasting almost for two years, there were found 76 Rotatoria, 16 Cladocera, 2 Calanoida, and 10 Cyclopoida taxons. The enumeration of the species detected is contained in the following list:

Rotatoria

Anuraeopsis fissa (GOSSE)
Asplanchna priodonta GOSSE
A. siboldi (LEIDIG)
Brachionus calyciflorus var. *dorcas* (GOSSE)
Br. cal. var. *dorcas* f. *amphiceros* (EHRB.)
Br. cal. var. *dorcas* f. *anuraeiformis* BREHM
Br. cal. var. *dorcas* f. *spinosa* (WIERZEJSKI)
Br. angularis GOSSE
Br. bennini LEISSLING
Br. budapestiensis DADAY
Br. diversicornis (DADAY)
Br. falcatus ZACHARIAS
Br. leydigi var. *quadratus* ROUSSELET
Br. leydigi var. *tridentatus* f. *tripartitus* LEISSLING
Br. quadridentatus f. *typica* HERMANN
Br. quadridentatus var. *brevispinus* EHRB.
Br. quadridentatus var. *cluniorbicularis* SKORIKOV
Br. quadridentatus var. *latissimus* SCHMADRA
Br. quadridentatus var. *rhenanus* (LAUTERBORN)
Br. urceolaris O. F. MÜLLER
Br. rubens EHRB.
Cephalodella gibba (EHRB.)
Colurella adriatica EHRB.
Conochilus unicornis ROUSSELET
Dicranophorus caudatus (EHRB.)
Epiphanes pelagica JENNINGS
E. senta O. F. MÜLLER
Euchlanis dilatata EHRB.
Filinia brachiata ROUSSELET
F. longiseta (EHRB.)
Kellicottia longispina (KELLICOTT)
Keratella cochlearis cochlearis (GOSSE)
K. cochl. var. *irregularis* f. *angulifera* LAUTERBOR
K. cochl. var. *hispida* f. *pustulata* (LAUTERBORN)
K. cochl. var. *macracantha* LAUTERBORN
K. cochl. f. *micracantha* LAUTERBORN
K. cochl. var. *tecta* (GOSSE)
K. guadrata (O. F. MÜLLER)
K. guadrata var. *reducta* FADEEW
K. testudo (EHRB.)
K. valga (EHRB.)
Lecane bulla (GOSSE)
Lecane luna (O. F. MÜLLER)
Lepadella acuminata (EHRB).
L. ovalis (O. F. MÜLLER)
L. patella (O. F. MÜLLER)
L. rhomboides (GOSSE)
Lophocharis salpina EHRB.
Mytilina ventralis var. *brevispina* EHRB.
Notholca acuminata EHRB.
N. squamula O. F. MÜLLER
Paradicranophorus hudsoni GLASCOTT
Pedalia mira (HUDSON)
Platyias patulus (O. F. MÜLLER)
Polyarthra dolychoptera IDELSON
P. euryptera WIERZEJSKI
P. longiremis CARLIN
P. major BURCKHARDT

P. remata SKORIKOV
P. vulgaris CARLIN
Pompholyx sulcata HUDSON
Rotatoria neptunia (EHRB.)
R. rotatoria (PALLAS)
Synchaeta grandis ZACHARIAS
S. longipes GOSSE
S. oblonga EHRB.
S. pectinata EHRB.
Testudinella patina (HERMANN)
Tetramastyx opoliensis ZACHARIAS
Trichocerca bicristata (GOSSE)
Tr. birostris (MINKIVICZ)
Tr. dixon-nutalli (HENNINGS)
Tr. longiseta (SCHRANK)
Tr. pusilla (JENNINGS)
Tr. rattus (O. F. MÜLLER)
Trichotria pocillum (O. F. MÜLLER)
Wolga spinifera WESTERN

Crustacea

Cladocera

Alona rectangula SARS
Alonella nana (BAIRD)
Bosmina longirostris (O. F. MÜLLER)
Ceriodaphnia laticaudata P. E. MÜLLER
C. pulchella SARS
C. reticulata (JURINE)
Chydorus sphaericus (O. F. MÜLLER)
Daphnia cucullata SARS
D. hyalina var. *lacustris* SARS
D. longispina O. F. MÜLLER
Leptodora kindtii (FOCKE)
Moina rectirostris (LEYDIG)
Pleuroxus aduncus (JURINE)
Scapholeberis murconata O. F. MÜLLER
Simocephalus vetulus (O. F. MÜLLER)
Simocephalus exspinosus var. *congener* SCHOEDLER

Calanoida

Eudiaptomus gracilis G. O. SARS
E. graciloides LILLJEBORG
copepodit, nauplius nymph

Cyclopoida

Acanthocyclops robustus G. O. SARS
A. vernalis FISCHER
Cyclops strenuus FISCHER
C. vicinus ULJANINE
Diacyclops bicuspidatus CLAUS
Eucyclops serrulatus FISCHER
E. speratus LILLJEBORG
Megacyclops viridis JURINE
Mesocyclops leuckartii CLAUS
Thermocyclops oithonoides G. O. SARS

It is to be established from the enumeration above that the Rotatoria fauna of the Tisza is formed in its majority by ubiquitous species. The high number of the taxons of the genera Brachionus and Keratella having strong shells is particularly striking. Comparing our data to the results of the earlier investigations, it turns out too, that the species combination — in relation to the state between 1951 and 1967 — has not changed. This is also a proof for that the Tisza has a proper, autochtonous plankton formed by some species tolerating the aquatic conditions of life more or less well and being able to multiply there. A great number of the organisms, not found in the Tisza so far *(Brachionus budapestiensis, Epiphanes pelagica, Lepadella acuminata, Paradicronophorus hudsoni, Polyarthra euriptera, Syncheta grandis)*, were given by the species getting in from the flood-plain on the occassion of indundations. The occurrence of *Wolga spinifera* in the Tisza is an interesting event; in the Carpathian Basin it is only mentioned from the basin of the river Garam by VARGA (1957). Almost each of the Rotatoria species living in the Tisza is a member of the Danube plankton, as well (KERTÉSZ 1963, KOL—VARGA 1960).

The dominant species of the summer Rotatoria plankton belong to the genera *Brachionus, Filinia, Keratella* and *Polyarthra*, and the characteristic organisms of the autumn, winter, spring period to the genera *Notholca, Polyarthra* and *Synchaeta*. On the basis of the occurring species, the river may be classified to the-b-mesosaprobic category although the presence of Epiphanes senta is referring to a more than average pollution.

By reason of the literary data (MEGYERI 1972), the Rotatoria plankton of the Tisza is not influenced considearbly by the tributaries, except the Sajó, as the species combination of these tributaries, as well, is similar to that of the Tisza. The water quality of the Sajó improved certainly much of late years. This establishment is prov-

ed also by the nine Rotatoria and one Crustacea species found in the spring period (March 22nd, 1974), especially if taking into consideration that during the investigations in the years 1950 and 1956, MEGYERI (1972) did not find any taxon at all belonging to this group.

The number of the species Cladocera and Copepoda occurring in the Tisza is high. The species combination of the Crustacea fauna is strongly influenced by shallow lenitical water spaces formed after damming up beside the backwaters, borrow areas and canals and are in occasional connection with the river (MEGYERI 1971). According to our observations, they get from these places from time to time in large numbers into the current of the river, and keep on living there. The autochtonous Crustacea fauna of the Tisza is formed by the well-accomodating species of wide ecological valence getting from the river environment appropriate living conditions.

In the river reaches investigated, from Cladocera the species *Bosmina longirostris*, *Moina rectirostris,* and *Simocephalus vetulus* may be considered as comparatively permanent plankton members.

From Copepods, *Acanthocyclops vernalis, Cyclops strenuus* and *Thermocyclops oithonoides* are regularly occurring members of the Tisza plankton. The existence of the individuals in different stages of development (nauplius, copepodit) and of well-developed individuals with ovules is proving their multipliability under conditions of the Tisza.

In case of a permanently small water output, the conditions of a considerable multiplication of any investigated zooplankton groups are assured in the reaches dammed up.

Rotatoria and Crustacea occur in the whole year, although in the period of floods the amount of Cladocera is as a rule very small, and even they are missing from time to time.

In 1974, in the small-water period in Spring, the Tisza was populated by cold-water species *(Notholca squamula, Synchaeta oblonga*, etc.). In that period, the zooplankton number was about 500 to 600 ind./100 litres value. The summer flood

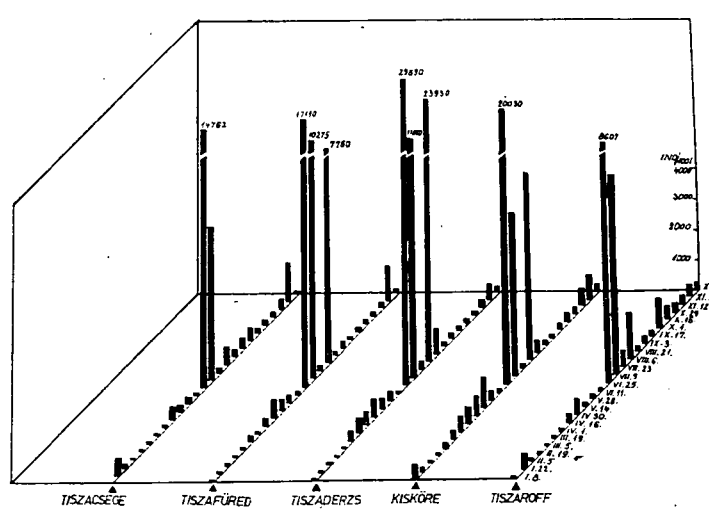

Fig. 1

substituted species drifted in from the flood-plain for the species existing there earlier. In the period of the flood passing, the zooplankton count reached 20 thousand ind./100 l, and from time to time even surpassed that (Fig. 1).

After the flood-wave passing, in the autumn period, the zooplankton count was low, then at the end of November it was higher.

A change in the character of water (pollution, speed of flow, turbidity, etc.) involved a change in the combination of the species- and individual numbers of the zooplankton, as well. The systematic investigations enable us to follow the changes in the hydroecological peculiarities of the Tisza, on the basis of the permanent disappearance of one or more species or the appearance and prevalence of other ones. If treating the data with due reservation, we can conclude the future formation of the zooplankton, too, from the transformation of the environment, in our case from bringing about damming and then from the storage in the reservoir. The species Rotatoria and Crustacea, found in a comparatively high number in the course of studying the zooplankton of the river and having generally a considerable individual density in the plankton of backwaters, will certainly exert a positive influence upon formation and "stabilization" of the zooplankton of the Kisköre Reservoir built at the Tisza. The multiplication in large numbers of the species living in the river, as well as in its backwaters, and borrow areas will be promoted by the standing-water conditions to be developed in the reservoir.

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