DATA ON THE KNOWLEDGE OF ZOOFLAGELLATA OF THE RIVER TISZA

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Abstract

The present paper is raporting on the occurrence of the species *Bodo* and of *Collodictyon tricilliatum* CARTER from among the Zooflagellata to be found in the river Tisza.

Introduction

The most frequent ones of the Zooflagellata living in the Tisza are the species *Bodo* that are to be found almost in every biotop. 15 *Bodo* species were demonstrated by SZABADOS (1957, 1963, 1965) while 6 ones of the species reported on by the author are new for the Tisza.

Collodictyon triciliatum CARTER is new for the Tisza, as well.

About the occurrence of the genus Bodo

As the majority of Zooflagellata, a considerable part of the species *Bodo* are cosmopolites. Generally independently of climate and geographical distribution, they appear almost in every season even in the most extreme places where there is to be found some water, respectively organic matter.

They live and multiply like coprozoical organisms in faecal matter, some species of them can be found like cysts in the human and animal intestinal tracts, and getting out of the organism they prove viable. *Bodo caudatus*, *Bodo edax* are the species to be observed in large numbers in the faecal matter (HOARE 1927, WALKER 1911 in WATSON 1946, WENYON 1926).

The species *Bodo putrinus*, *Bodo edax*, *Bodo celer*, *Bodo saltans* are considerable representatives of the rich microfauna in the livestock manure (VARGA 1953, SZABADOS 1948).

After that it seems to be natural that they can be found in various stages of the decomposition of organic matters, of course with a different species and individual number, indicating anyway their surroundings well. They can therefore be used well in the saprobiological qualification (KOLKWITZ—MARSSON 1908, LIEBMANN 1951, SLÁDECEK 1963, etc.). They are not so characteristic of the first phase of decomposition (hypersaprobiological zone SRÁMEK—HUSEK (1956), coprozoical zone „a"; bacterium community FJERDINGSTAD (1964) as of the second phase (a-polysaprobical zone SRÁMEK—HUSEK (1956), coprozoical zone „b": *Bodo community* FJERDINGSTAD (1964) .

In the strongly polluted (polysaprobical) waters the species *Bodo putrinus, Bodo minimus, Bodo edax, Bodo caudatus, Bodo rostratus, Bodo celer* appear in large numbers. In another -third- phase of decomposition — called α-mesosaprobical zone — the species *Bodo globosus, Bodo saltans, Bodo mutabilis, Bodo compressus* are characteristic.

In rivers, brooks the organic matters of allochtonous or autochtonous origin can always be found to a certain degree, making possible the presence of the Bodo species. On this basis, the separation of three types seems to be necessary in case of the rivers (e.g. Zagyva, Tisza).

1. Waters polluted not at all, or but in a low degree, where the great masses of the decomposing organic matters are of autochtonous origin. In the plankton of these we can find the organisms indicating pure water — β-mesosaprobical ones —, in case of the Tisza we find *Bodo spora, Bodo variabilis, Bodo moroffi*, respectively more rarely the organisms indicating a water a little more polluted — α-mesosaprobical ones —, like *Bodo globosus, Bodo mutabilis*; in its periphyton *Bodo triangularis, Bodo globosus, Bodo mutabilis, Bodo saltans*, and *Bodo caudatus* are the most frequent ones (ERTL 1970).

2. In case of local pollutions a larger amount of waste-water gets into the river. That makes its effect feel for a shorter or longer time, depending upon the capacity of the river. At Szolnok, below the inrush of the waste-water from the sugar-works, *Bodo putrinus* and *Bodo caudatus*, indicating the strongly decomposing organic matter, can be found in large numbers while in the community of the *Sphaerotilus natans* KÜTZ. flakes, developed as a results of the waste-water of the paper-mill, *Bodo putrinus, Bodo globosus* and *Bodo minimus* are present. The river is polluted by these flakes that are often washed away to great distances.

3. In case of waste-water waves or of standing, strong pollutions, the self-purification of the river is frequently not enough for decomposing the organic matters and, therefore, the river changes into a sewer (HAMAR 1970—71). In its plankton *Bodo putrinus* and *Bodo saltans* appear. In the benthical community of the polluted river — in the α-polysaprobical zone — in the *Euglena* community *Bodo globosus* and *Bodo minimus* appear in the *Beggiatoa* community of the β-polysaprobical zone *Bodo minimus* can be observed (FJERDINGSTAD 1964).

There are known some species that could be found so far only in pure waters, like *Bodo designis* SKUJA, *Bodo stigmatophorus* SKUJA, *Bodo fusiformis* LEMM. (SKUJA 1946—48, 1956, LEMMERMANN 1914).

Bodo curvifilus GRIES. is a sea species (GRASSÉ 1952).

Bodo perforans HOLL. is an ectoparasite of *Chilomonas paramecium* EHR. (HOLLANDE 1938).

It is proved by the investigation of some samples taken from various places of Earth that from among the Protozoa of soil the Zooflagellata, more intimately the species *Bodo (saltans, celer, edax)* are the most frequent ones (VARGA 1933, 1953, 1956, ROSA 1957, 1961, 1963).

Bodo celer KLEBS (Fig. 3. 4)

A little bent, oval cells, of size 8—10×4—5.5 μ, below widely rounded, ahead ending in a blunt point from which a flagellum of 1.5—2-fold body-length protrudes. The central nucleus, one contractile vacuole can be found at the anterior end of the body. Its motion is rotaring or bounding here and there.

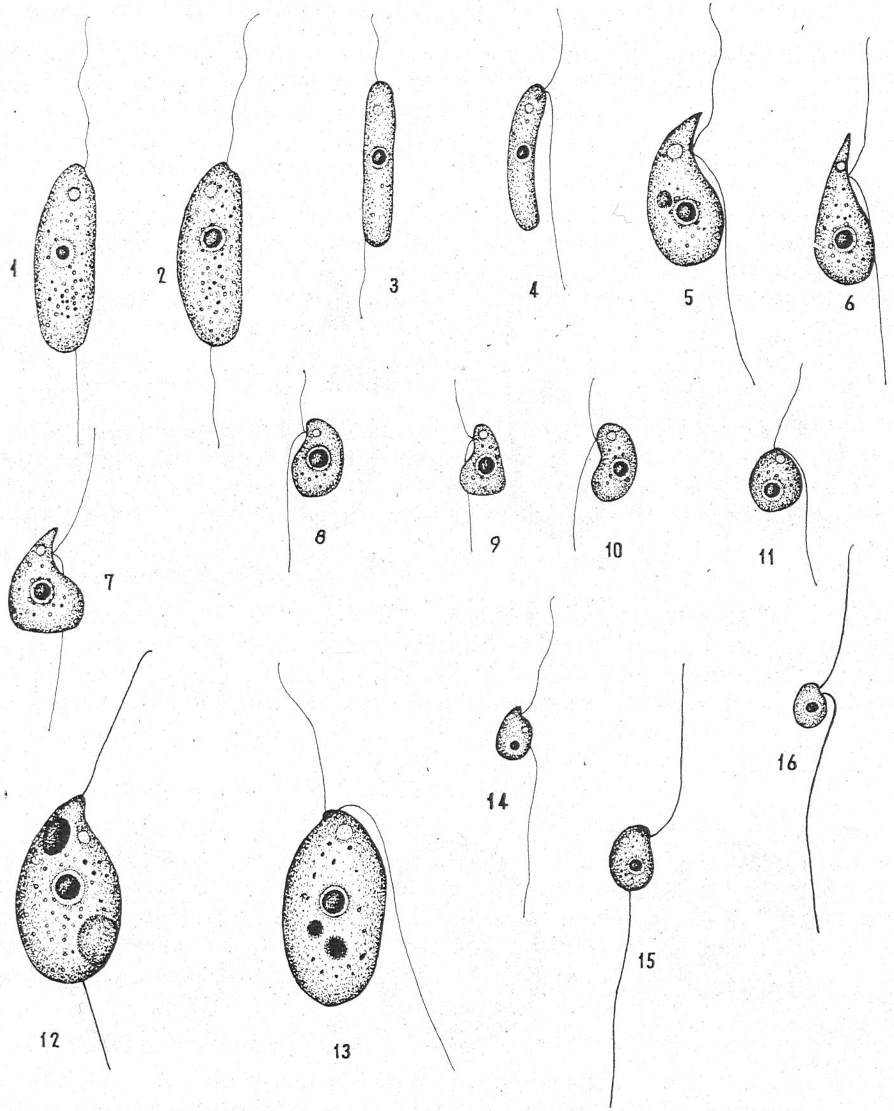

Fig. 1. 1—2, *Bodo mutabilis,* 3—4, *Bodo varians,* 5—7, *Bodo uncinatus,* 8—10, *Bodo minimus,* 11, *Bodo moroffi,* 12—13, *Bodo compressus,* 14—16, *Bodo spora*

Bodo compressus LEMM. (Fig. 1.: 12—13)

The cells are oval, flattened, of size 10—17.5×6—10μ. Its anterior part ends in a short, bent point from where flagella of obout 1.5-fold body-length take their origin. There are a central nucleus, one contractile vacuole in various parts of the body. The kinetonucleus can rarely be seen even unstained immediately under the anterior part. There are always to be found in the cell food vacuoles of different sizes. In movement the cell lies on its pressed left side and advances wobbling.

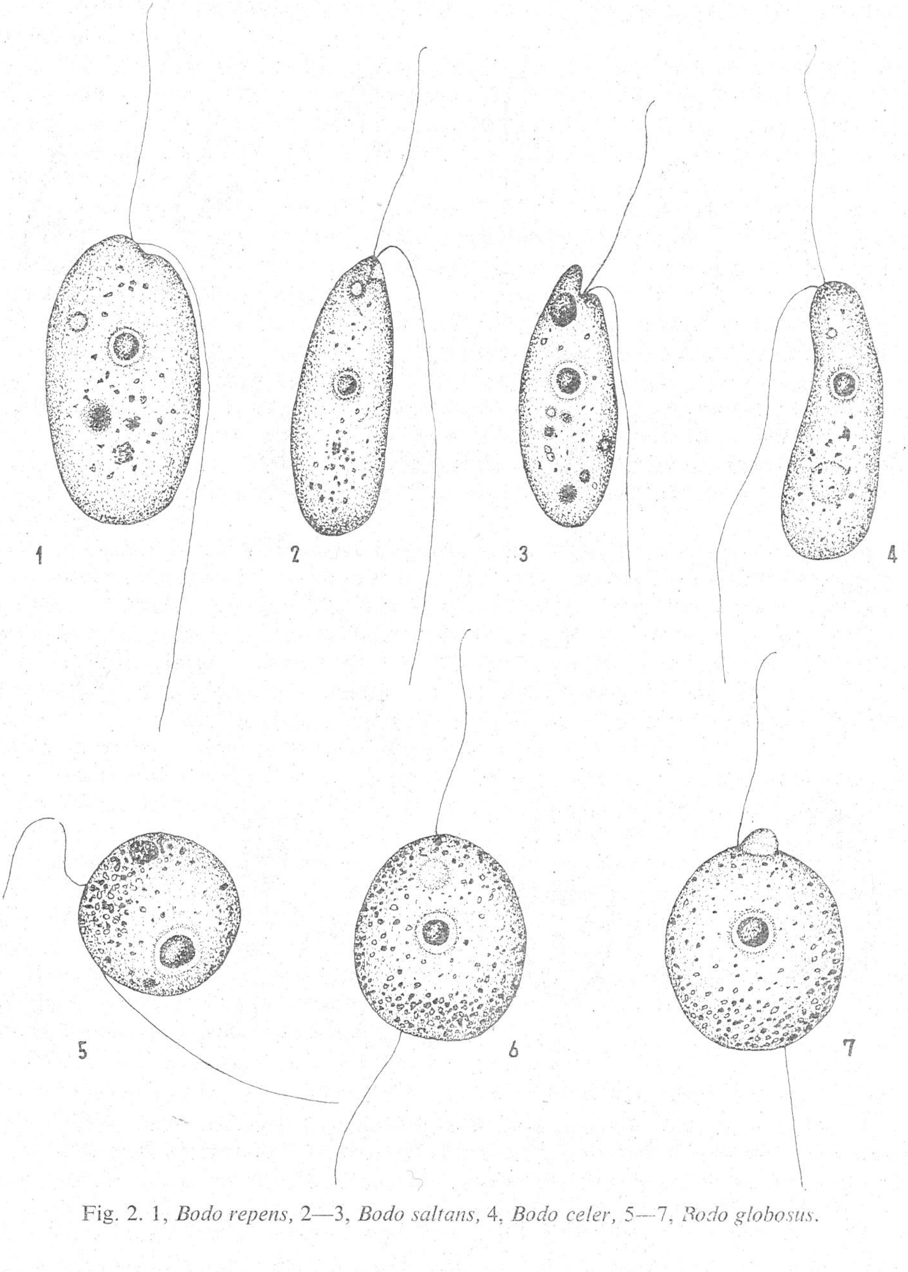

Fig. 2. 1, *Bodo repens*, 2—3, *Bodo saltans*, 4, *Bodo celer*, 5—7, *Bodo globosus*.

Bodo globosus STEIN (Fig. 2.: 5—7)

The cell are spherical, rarely deformed, of 3—13μ diameter. The two flagella are of the same length, monstly the double of the body-length. Central nucleus, one contractile vacuole may be found in different parts of the body, rarely protruding. The plasma contains small granules. Its motion is wobbling, without rotation.

Bodo moroffi VALKANOV (Fig. 1.: 11)

The cells are spherical, with 3—7μ diameter. The central nucleus, one contractile vacuole take place below the origin of the flagellum. The flagella are of 1.5-fold body-length. Their motion is slow, steady.

Bodo minimus KLEBS (Fig. 1.: 8—10)

The cells are bean-shaped, of 4—5$\times$2—2.5μ size. The flagella take their origin from the recess beneath the anterior part, the swimming flagellum being of body-length, the trailing flagellum somewhat longer. The central nucleus, one contractile vacuole can be found in the anterior part of the body. The plasma is finely granulated. It has a slow, bowing-crawling motion.

Bodo mutabilis KLEBS (Fig. 1.: 1—2)

The cells are cylindrical, behind rounded, ahear ending in a blunt point. One side is straight, the other one bent in various degree. The cells are of 8—14$\times$3—5μ size. The flagella are about 1.5-fold body-length. The central nucleus, one contractile vacuole can be observed in the anterior half of the body. It is of swimming motion.

Bodo repens KLEBS (Fig. 2.: 1)

The shape of cells is from oval to ovoid one, their size being 10—15$\times$5—7μ The cell is ahead flattened, behind rounded. The swimming flagellum is shorter than the body-length, the trailing flagellum is of double body-length. The nucleus and one contractile vacuole may be found in the anterior half of the body. It is of bowing-crawling motion.

Bodo saltans EHR. (Fig. 2.: 2—3)

The oval cells are 16—21μ long, the anterior part ending in a blunt point. The flagella take their origin from the recess beneath the anterior part that can be of different depth. The central nucleus, one contractile vacuole can be found in the anterior half of the body. The plasma is granulated in various degree. The swimming flagellum is of body-length while the trailing flagellum is 1.5—2 times longer than the body. Its motion is wobbling.

Bodo spora SKUJA (Fig. 1.: 14—16)

The cells oval, somewhat romboid, mildly metabolic, of 3—3.5$\times$3μ size. The flagella come from the mild recess beneath the anterior part. The swimming flagellum is of 2—3, the trailing flagellum of 3—4-fold body-lenght. The central nucleus, one contractile vacuole can be found in the anterior part. Its motion is uniformly advancing.

Bodo uncinatus (KENT) KLEBS (Fig. 1.: 5—7)

The egg-shaped cells are a little metabolic, 8—10 μ long. Their posterior part is rounded, the anterior part is laterally declining and anding in a point, under these take place the flagella. The swimming flagellum is of body-length, the trailing flagellum is a double body-length. The central nucleus, one contractile vacuole can be found in the anterior part. Its motion is quick, jumping.

Bodo variabilis (STOKES) LEMM. (Fig. 1.: 3—4).

The cells are cylindrical, at their ands rounded, straight or weakly bent, having a size of $11 \times 2\ \mu$. The swimming flagellum is of a half, the trailing flagellum of 1.5—2-fold body-lenght. The central nucleus, one contractile vacuole are in the anterior half of the body. The plasma is a finely granular. It is a bowing motion.

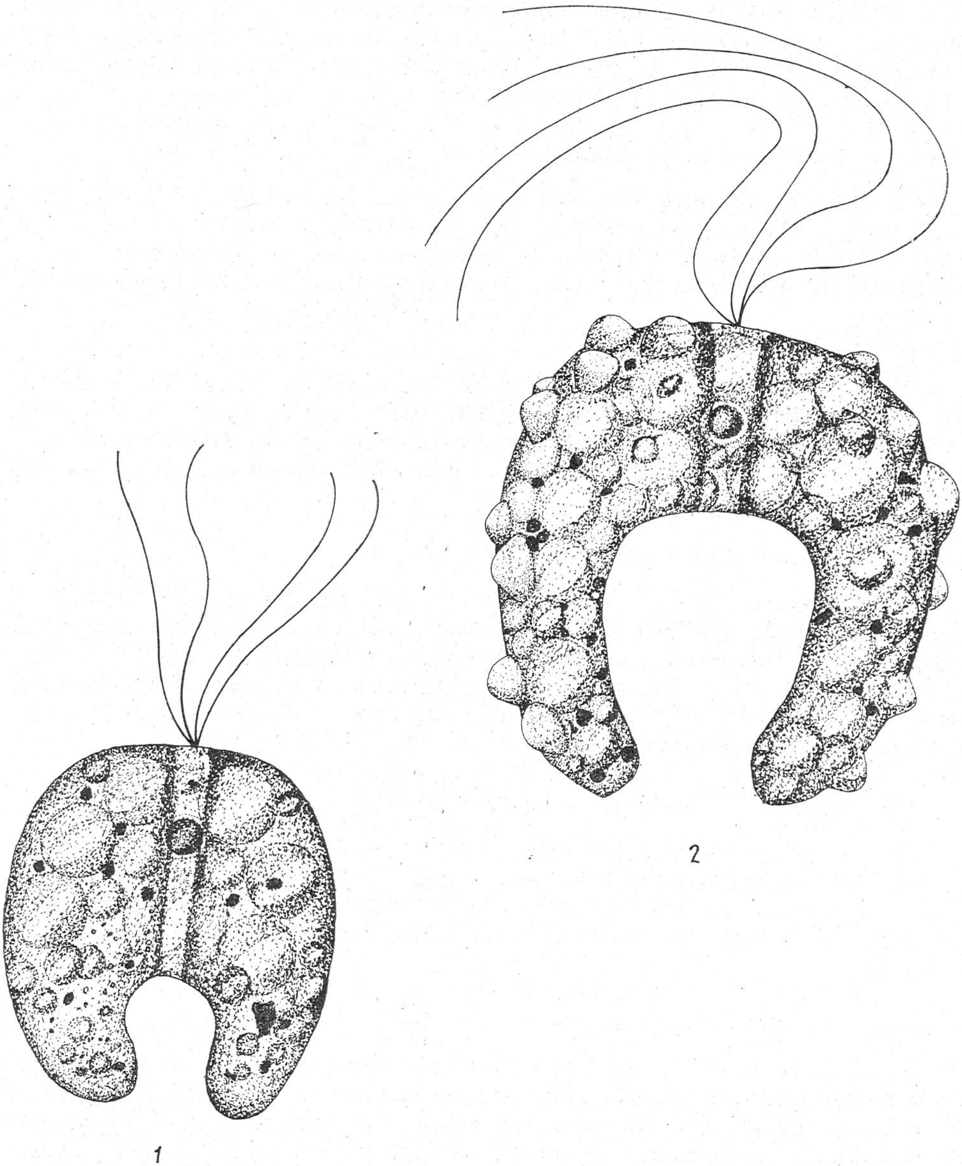

Fig. 3. 1—2, *Collodictyon triciliatum*

Data on the distribution of Collodictyon triciliatum Carter

The characterization of the species described by CARTER is completed by FRANCÉ (1904). Then its morphological peculiarities, the way of its multiplication is reported on in details by BELAR 1921).

According to FRANCÉ it is to be found in rather smaller muddy pools, in ditches along the way, in smaller eutrophic waters in larger numbers and in the company of *Trachaelomonas*-es as their consumer. GRASSÉ (1952) mentions it as a phagocyte, consuming smaller unicellular animals, e.g. Ciliata. The author found it in the Tisza, under the influance of the paper-mill waste water in large numbers, in a little polluted (α-mesosaprobical) water, as well as in the overflowing water of the oxidation tank, in the company of the species *Euglena, Uronema marinum*, in an α—β mesosaprobical water.

PASCHER (1927) and SKUJA (1956) regard it as Phytomonadina that is a member of the colourless and phagotrophic family. GRASSÉ (1952) classes it among the Zooflagellata of uncertain sistematic place while LEMMERMANN (1914) and STARMACH (1968) are reporting on it among the Zooflagellata.

Collodictyon triciliatum CARTER (Fig. 3.: 1—2)

The oval-shaped cell is strongly metabolic, ahead rounded, behind supplied with 1—3 processes, of 20—60 μ length. Four anterior flagella of equal length, with 2—4 blepharoplast. The plasma is often filled in by the central nucleus, 1—3 contractile vacuoles, and several food vacuoles. Its motion is rotating. It is phagocyte, taking its food by means of the longitudinal furrow observed on its side.

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