# THE PROTOZOAN PLANKTON AND THEIR SAPROBITY RELATIONS IN THE MAROS (MUREş) RIVER

MAGDOLNA CS. BERECZKY

## Introduction

Protozoa are without doubt of great importance for both the natural living system and human activity. Their significance regarding the latter cannot be restricted only to the medical and/or veterinary aspects, as their role in the process of self purification or their use as indicator organisms is just as important.

The aims of our investigations were to determine the species composition, abundance relations of planktonic protozoan communities, and to follow the changes of the saprobity relations of the Maros River from its source to the mouth. This investigation was the very first for protozoological research.

## Materials and Methods

Water samples were collected from 15 sampling sites along the Maros River. Each time 30 l water was filtered through a net of 10 mesh size. The method used for protozoa is the bromphenol blue test, applied to estimate the protozoa density in planktonic and periphytic communities (Bereczky 1985). In this technique the fresh sample is fixed in HgCl2 solution and "stained" with bromphenol blue. This method allows an accurate counting of individuals in natural samples. We used Protargol impregnation (modified by Wilbert 1974), as well. Evaluation of saprobity by Foissner (1992).

## Discussion

Though we looked through many protozoological works we did not find any previous protozoological investigations of the Maros. This was the reason why at first we wanted to get to know what kind of heterotrofic protists live in this river. We found 148 protozoa species from the source to the mouth:

Amoeba: 9
Testacea: 25
Heliozoa: 22
Ciliata: 92

Ciliata appeared to be the richest community. They are dominant according to both their species number and individual number. Regarding the species diversity and distribution three areas can be distinguished along the river.

The first section is between Izvorul Mureş (source) and Sărmaş (62 km), where the species number was low-average and the individual number was in accordance with flow velocity (see Table 1-4).

From Rastoliţa (105 km) through Tîrgu Mureş (188 riv km, retained water) to Gura Arieşului (282 riv km) extends the region which we identified as the middle section. In this area at Ungheni-Moreşti (207 km) we found the highest species number (39). This community - rich in species - is characteristic of eutrophic waters. In running waters, current rate is one of the most effective factors selecting distribution. In this section, because of the retained water, the river slows and thus the euplanktonic organisms multiply. At site 7 we found Trachelophyllum clavatum (Stokes Cl- ion 33.7 mg/l), which is of small density, but is a good indicator organism for salt water occurrence (Table 7).

At Gura Arieşului (below Arieş) the individual number decreases, which may refer to changes in the nearly natural conditions. A drastic anthropogenic environmental effect occurs at Sîntimbru (355 km), proved by conductivity of 1117 s/cm and the total lack of protozoan communities. We could not identify even a single representative of the investigated groups (Amoeba, Testacea, Ciliata), only a few empty testacean shells and some ciliata cysts indicate the rich community mentioned above.

The third section of the river begins at Alba Iulia (376 km). The low species number and the high individual number is characteristic of mesosaprobic waters. That is without question. Only 8 species form the community where Phascolodon vorticella is dominant and this indicates advanced eutrophication.

The great masses of algae and at the same place the Protozoa become competitors and at this stage (mainly at 375, 445 and 520 km) the autotrophs push the heterotrophs out of the plankton. Under such conditions the afore-mentioned Phascolodon vorticella became absolutely dominant with $1359*10^3$ ind/$m^3$.

At Deva (455 riv km) the abundance of Protozoa increases and the community is invariably formed of euplanktonic organisms (Table 12).

At Zam (520 km) the individual number begins to decrease, later on at Pecica (676 km) and over Szeged (766 km) come into force such conditions which are characteristic of rivers of the same order (Table 13,14,15).

Most of the Protozoan species found in the Maros as indicators have unknown saprobial classification. The plankto-seston of the upper section is formed by many rare species and is similarly formed by the potamoplankton of the middle and lower sections.

Most species of known saprobity are oligo-beta, betamesosaprobic ones. Though we found alpha- and polysaprobic organisms several times downwards over Rastoliţa, their abundance, though essential to determine indicator values, never reached more than 20% of any community. We found a greater polysaprobic population of Vorticella microstoma only below Arieş (282 km).

The saprobic indexes can be found as percentages in Table 16, they are characteristic of water in summers with high temperatures. In this period the elimination of dissolvable organic matters needs shorter time than in winter. Probably, in colder seasons we could find species which indicate much worse water quality.

Introducing the protozoan community according to their nutrition types helps the evaluation of trophy. It can be read from Table 17, that we found mainly algivorous,

algibacteriavorous and bacteriavorous organisms. Detritus- and bacteriavorous species, predators, omnivores and ectocommenzalists are relatively few.

At 207 km, and below Arieş we found species in a relatively high percentage of unknown nutrition types. At Alba Iulia the algivorous dominance of 94.5% indicates a change of conditions from eutrophy to hypertrophy. Algivorous species are dominant at Szeged, too.

## Summary

In the Maros River there exists a rich protozoan community which would be worth investigating systematically. I found many organisms, which I could identify only to species. This means that it would be possible to find new species for science with the help of quick examinations. I have to mention that the perishing of protozoa at Sîntimbru may indicate the beginning of more significant, irreversible environmental damage.

At numerous places I found amoeba belonging to the Naegleria genus, which can be identified to species only in laboratory cultures. Some stock of these amoeba has been stated pathogenic. It would be worth extending the investigations to this direction, too.

## Reference

Bereczky, M.Cs. (1985): Fixations- und Ferbungsschnellverfahren bei quantitative ökologische Untersuchungen von Protozoen in Binnengewässe. Arch. Protistenk. 129: 187-190.

Foissner, W. (1992): Taxonomic and nomenclatural revision of Sladacek's list of ciliates (Protozoa: Ciliphora) as indicators of water quality. Hydrobiologia 166:1-164.

Wilbert, N. (1974): Eine verbesserte Technik der Protagol-impregnation für Ciliaten. Mikrokosmos 6: 171-178.

*Magdolna Cs. Bereczky, Danube Research Station of Hungarian Academy of Sciences, 2131 Göd, Jávorka S. u. 14., Hungary*

**Table 1.**

Izvorul Mures (Marosfö) 1. 850 m a.s.l. 0 rkm

| | | |
|---|---|---|
| Mayorella sp. | | AB |
| Arcella gibbosa Penard | | A |
| Arcella vulgaris Ehrenberg b | | AB |
| Bullinula sp. | | A |
| Centropyxis platystoma Penard | | AB |
| Difflugia lobostoma Leidy | | AB |
| Euglypha alveolata Dujardin | b | AB |
| Qudrulella symmetrica Wallich | | AB |
| Aspidisca marsupialis Penard | | B |
| Lagynophrya sp. ? | | |
| Rakovicia sp. Tucolesco ? | | |
| Thigmogaster potamophilius Foissner | | AB |
| Vorticella citrina O.F. Muller | b | B |
| Vorticella incisa Stiller | | AB |
| Species number | | 14 |
| Individual number 1000 x ind/m3 | | 153 |

| Saprobity relations (%) | Nutrition types (%) |
|---|---|
| b 23.5 | A 11.8 |
| sn 76.5 | A+B 58.8 |
| | B 17.6 |
| | ? 11.8 |

**Table 2.**

Senetea (Szenete) 2. 780 m a.s.l. 10 rkm

| | | |
|---|---|---|
| Amoeba proteus (Pallas) | b | AB |
| Vahlkampfia dubia Kahl | | B |
| Centropyxis platystoma Penard | | AB |
| Cyphoderia trochus Penard | | AB |
| Euglypha alveolata Dujardin | b | AB |
| Qudrulella symmetrica Wallich | | B |
| Trinema enchelys Ehrenberg | b | B |
| Histiobalantium sp. | | ? |
| Holophyra hexatricha Savi | | A |
| Pseudoprorodon sp. | | A |
| Telotrichidium sp. | | B |
| Vorticella microscopica Fromentel | | B |
| Vorticella sp. | | B |
| Species number | | 13 |
| Individual number 1000 x ind/m3 | | 180 |

| Saprobity relations (%) | Nutrition types (%) |
|---|---|
| b 20.0 | A 10.0 |
| sn 80.0 | A+B 20.0 |
| | B 65.0 |
| | ? 5.0 |

**Table 3.**

Suseni (Gyergyóújfalu) 3. 744 m a.s.l. 16 rkm

| | | |
|---|---|---|
| Mayorella vespertilio Penard | | B |
| Trichamoeba villosa Wallich | | B |
| Arcella gibbosa Penard | | A |
| Arcella hemisphaerica Perty | | A |
| Centropyxis aculeata Stein | ob | DB |
| Centropyxis constricta Ehrenberg | | DB |
| Centropyxis hirsuta Deflandre | | DB |
| Cyclopyxis arcelloides (Penard) | | DB |
| Euglypha alveolata Dujardin | b | AB |
| Trinema enchelys Ehrenberg | b | B |
| Trinema linea Penard | b | B |
| Aspidisca marsupialis Penard | | B |
| Cyclidium sp. | | B |
| Enchelys sp. | | ? |
| Holophrya hexatricha Savi | | A |
| Oxytricha sp. | | ? |
| Prorodon sp. | | ? |
| Strobilidium sp. | | ? |
| Stylonychia mytilus complex | a | AB |
| Suctoria sp. | | P |
| Trichodina sp. | | EC |
| Trithigmostoma cucullulus (O.F. Muller) Jankowski | a | AB |
| Vorticella nebulifera O.F. Muller | ob | BA |
| Vorticella sp. | | ? |
| Species number | | 24 |
| Individual number 1000 x ind/m3 | | 207 |

| Saprobity relations (%) | Nutrition types (%) |
|---|---|
| ob 6.8 | A 14.0 |
| b 18.8 | A+B 17.0 |
| a 6.8 | B 24.0 |
| sn 67.6 | B+A 3.4 |
| | D+B 17.4 |
| | EC 3.4 |
| | P 3.4 |
| | ? 17.0 |

**Table 4.**

Sarmas (Salomas) 4. 671 m a.s.l. 62 rkm

| | | |
|---|---|---|
| Centropyxis constricta Ehrenberg | | DB |
| Centropyxis discoides Penard | ob | DB |
| Aspidisca marsupialis Penard | | B |
| Cyclidium sp. | | B |
| Epistylis elegans Stiller | | B |
| Glaucoma myriophylli Penard | | BA |
| Lembadion lucens (Maskell) | b | A |
| Nassula sp. | | ? |
| Trichodina sp. | | EC |
| Species number | | 9 |
| Individual number 1000 x ind/m3 | | 99 |

| Sarobity relations (%) | Nutrition types (%) |
|---|---|
| ob 9.1 | A 27.3 |
| b 27.3 | A+B 27.3 |
| sn 63.6 | B+A 9.1 |
| | D+B 18.1 |
| | EC 9.1 |
| | ? 9.1 |

**Table 5.**

| Rastolita (Rastonya) 5. 522 m a.s.l. 105 rkm | | |
|---|---|---|
| Centropyxis aculeata Stein | ob | DB |
| Centropyxis constricta Ehrenberg | | DB |
| Cyclopyxis arcelloides (Penard) | | DB |
| Difflugia oblonga Ehrenberg | | DB |
| Difflugia sp. ures hej | | ? |
| Euglypha alveolata Dujardin | b | AB |
| Aspidisca marsupialis Penard | | B |
| Carhesium sp. | | ? |
| Colpidium colpoda (Losana) | p | B |
| Enchelys simplex Kahl | | P |
| Epistylis elegans Stiller | | B |
| Epistylis sp. | | ? |
| Lembadion lucens (Maskell) | b | A |
| Lembadion magnum (Stokes) | b | A |
| Paramecium caudatum Ehrenberg | a | B |
| Pseudocohnilembus pusillus (Quennerstedt) | ap | BA |
| Vorticella similis Stokes | ob | A |
| Vorticella striata v. octava Stokes | p | B |
| Species number | | 18 |
| Individual number 1000 x ind/m3 | | 207 |

| Saprobity relations (%) | Nutrition types (%) |
|---|---|
| ob 8.7 | A 30.4 |
| b 30.4 | A+B 4.3 |
| a 8.7 | B 26.1 |
| ap 4.3 | B+A 4.3 |
| p 8.7 | D+B 17.4 |
| sn 39.1 | P 4.3 |
| | ? 13.0 |

**Table 6.**

| Tirgu Mures (Marosvásárhely) 6. 307 m a.s.l. 188 rkm | | |
|---|---|---|
| Amoeba priteus (Pallas) | b | AB |
| Mayorella sp. | | ? |
| Mayorella vespertilio Penard | | AB |
| Arcella c.f. hemisphaerica Perty | | AB |
| Arcella discoides Ehrenberg | ob | AB |
| Centropyxis aculeata Stein | ob | DB |
| Cyphoderia ampulla Ehrenberg | ob | AB |
| Euglypha alveolata Dujardin | b | AB |
| Hyalosphaenia cuneata Stein | | ? |
| Trinema enchelys Ehrenberg | b | B |
| Heliozoa sp. | | P |
| Balanonema sapropelica Foissner | | B |
| Bizonula parva (Linneaus) Corliss | | B |
| Chilodontopsis vorax (Stokes) | ba | BA |
| Cyclidium sp. | | ? |
| Glaucoma myriophylli Penard | | BA |
| Halteria grandinella (O.F. Muller) | ba | ? |
| Holoprya hexatricha Savi | | A |
| Lembadion lucens (Maskell) | b | A |
| Lembadion magnum (Stokes) | b | A |
| Litonotus fasciola (O.F. Muller) | a | P |
| Paramecium aurelia complex | b | B |
| Paramecium bursaria (Ehrenberg) | b | B |
| Rhabdostyla congregata Zacharis | ? | |
| Tachysoma pellionella (O.F. Muller) | ap | BA |
| Tintinnidium semiciliatum Sterki | | B |
| Tracheilus ovum Ehrenberg | ba | P |
| Trichodina sp. | | EC |
| Vorticella incisa Stiller | | AB |
| Species number | | 29 |
| Individual number 1000 x ind/m3 | | 372 |

| Saprobity relations (%) | Nutrition types (%) |
|---|---|
| ob 6.7 | A 8.3 |
| b 28.8 | A+B 22.0 |
| ba 6.7 | B 25.5 |
| a 1.6 | B+A 15.6 |
| ap 1.6 | D+B 5.1 |
| sn 54.6 | EC 8.6 |
| | P 4.8 |
| | ? 9..9 |

**Table 7.**

Unheni-Moresti (Nyárádtô) 7. 287 m a.s.l. 207 rkm

| | | |
|---|---|---|
| Amoeba proteus (Pallas) | b | AB |
| Amoeba sp. | | ? |
| Mayorella sp. | | ? |
| Mayorella vespertilio Penard | | AB |
| Arcella hemisphaerica Perty | | A |
| Centropyxis constricta Ehrenberg | | DB |
| Centropyxis platystoma Penard | | DB |
| Cyclopyxis arcelloides Penard | | DB |
| Cyphoderia ampulla Ehrenberg | ob | DB |
| Difflugia oblonga Ehrenberg | | DB |
| Euglypha alveolata Dujardin | b | AB |
| Sphenoderia lenta Schlumberger | | ? |
| Trinema enchelys Ehrenberg | b | B |
| Chilodontopsis vorax (Stokes) | ba | BA |
| Colpidium campylum (Stokes) | p | B |
| Condylostoma vorticella (Ehrenberg) | b | O |
| Glaucoma myriophylli Penard | | BA |
| Loxophyllum meleagris (O.F. Muller) | b | P |
| Nassula sp. | | ? |
| Oxyitricha saprobia Kahl | ap | BA |
| Paramecium aurelia complex | b | B |
| Paramecium bursaria (Ehrenberg) | a | B |
| Paramecium multimicronucleata (Powers) | | B |
| Podophrya fixa (O.F. Muller) | p | P |
| Stentor polymorphus (O.F.Muller) | b | O |
| Stentor sp. | | ? |
| Tachysoma pellionella (O.F. Muller) | ap | BA |
| Trachelius ovum Ehrenberg | ba | P |
| Trachelophyllum clavatum (Stokes) | | ? |
| Trithigmostoma cucullulus (O.F. Muller)Jankowski | a | AB |
| Vorticella convallaria (Linneaus) | b | A |
| Vorticella incisa Stiller | | AB |
| Vorticella margaritata Fromentel | b | A |
| Vorticella mayeri Faure-Freimet | b | AB |
| Vorticella nebulifeta (O.F. Muller) | ob | AB |
| Vorticella picta (Ehrenberg) | o | AB |
| Vorticella striata v. octava Stokes | p | B |
| Zoothamnium ramosissimum Sommer | | BA |
| Peritricha (Telotroch phase) | | ? |
| Species number | | 39 |
| Individual number 1000 x ind/m3 | | 938 |

| Saprobity relations (%) | Nutrition types (%) |
|---|---|
| o 0.6 | A 5.5 |
| ob 4.8 | A+B 20.5 |
| b 21.2 | B 11.6 |
| ba 1.3 | B+A 7.5 |
| a 2.0 | D+B 4.7 |
| ap 2.0 | P 1.9 |
| p 5.4 | O 2.8 |
| sn 62.6 | ? 45.5 |

**Table 8.**

Ludus-Gheja (Ludas) 8. 263 m a.s.l. 270 rkm

| | | |
|---|---|---|
| Amoeba proteus (Pallas) | b | AB |
| Amoeba sp. | | ? |
| Mayorella sp. | | ? |
| Mayorella vespertilio Penard | | B |
| Naeglaria sp. | | ? |
| Pelomyxa palustris Greef | p | BA |
| Arcella gibbosa Penard | | A |
| Cochliopodium bilimbosum Auerbach | | B |
| Sphenoderia lenta Schlumberger | | ? |
| Chilodontopsis vorax (Stokes) | ba | BA |
| Cinetochilum margaritaceum (Ehrenberg) | p | B |
| Codonella cratera Leidy | ob | BA |
| Coleps hirtus v. lacustris Faure-Fremiet | | P |
| Colpes nolandi Kahl | | P |
| Condylostoma vorticella (Ehrenberg) | b | O |
| Enchelyomorpha vermicularis (Smith) | p | ? |
| Enchelys simplex Kahl | | ? |
| Epistylis plicatilis Ehrenberg | a | B |
| Epistylis rotans Svec | ob | B |
| Euplotes eurystomus (Wrzesniokowski) | a | O |
| Euplotes patella f. planktonicus Kahl | | O |
| Glaucoma myriophylli Penard | | BA |
| Glaucoma scintillans Ehrenberg | p | B |
| Holophrya hexatricha Savi | | AB |
| Litonotus faciola (O.F. Muller) | a | P |
| Pleuronema crassum Dujardin | BA | |
| Prorodon sp. | ? | |
| Stentor coeruelus Ehrenberg | | O |
| Stentor igneus Ehrenberg | b | O |
| Stentor polymorphus (O.F. Muller) | b | O |
| Tachysoma pellionella (O.F. Muller) | ap | BA |
| Vorticella incisa Stiller | | BA |
| Vorticella monilata Tatem | | B |
| Vorticella nebulifeta (O.F. Muller) | ob | BA |
| Species number | | 34 |
| Individual number 1000 x ind/m3 | | 352 |

| Saprobity relations (%) | Nutrition types (%) |
|---|---|
| ob 6.0 | A 2.0 |
| b 12.2 | A+B 6.2 |
| ba 2.0 | B 13.9 |
| a 8.2 | B+A 20.2 |
| ap 2.0 | P 8.2 |
| p 7.9 | O 25.0 |
| sn 61.4 | ? 24.4 |

**Table 9.**

Gura-Ariesului (Aranyos) 9. 262 m a.s.l. 282 rkm

| | | |
|---|---|---|
| Amoeba sp. | | ? |
| Mayorella sp. | | ? |
| Trichamoeba villosa Wallich | | B |
| Arcella hemisphararica Perty | | A |
| Centropyxis constricta Ehrenberg | | DB |
| Trinema enchelys Ehrenberg | b | B |
| Coleps hirtus v. lacustris Faure-Fremiet | | P |
| Colpidium colpoda (Losana) | p | B |
| Euplotes eurystomus (Wrzesniokowski) | a | O |
| Loxophyllum meleagris (O.F. Muller) | b | P |
| Spirostomum ambiguum (O.F. Muller) | a | B |
| Stentor igneus Ehrenberg | b | O |
| Tintinnidum sp. | | ? |
| Vorticella convallaria (Linneaus) | b | A |
| Vorticella microstoma Ehrenberg | | ? |
| Vorticella nebulifeta (O.F. Muller) | ob | BA |
| Vorticella sp. | | ? |
| Peritricha (Telotroch phase) | | ? |
| Species number | | 18 |
| Individual number 1000 x ind/m3 | | 318 |

| Saprobity relations (%) | Nutrition types (%) |
|---|---|
| ob 6.9 | A 2.2 |
| b 6.6 | B 24.8 |
| a 9.1 | B+A 11.6 |
| p 18.9 | D+B 2.2 |
| sn 59.1 | P 4.4 |
| | O 4.4 |
| | ? 50.3 |

**Table 10.**

Sintimbru (Marosszentimre) 10. Kûkûllô, Trnavelli, 229 m a.s.l. 355 rkm

Neither Amoeba, Testacea nor Ciliata can be found in the collected samples.

**Table 11.**

Alba Julia (Gyulafehérvár) 11. 213 m a.s.l. 376 rkm

| | | |
|---|---|---|
| Arcella arenaria Greeff | | A |
| Coleps hirtus (O.F. Muller) | ba | P |
| Euplotes moebiusi Kahl | p | B |
| Holosticha sp. | | ? |
| Phascolodon vorticella Stein | b | A |
| Urceolaria sp. | | EC |
| Urosona butschlii Schewiakoff | p | B |
| Vorticella similis Stokes | ob | A |
| Species number | | 8 |
| Individual number 1000 x ind/m3 | | 1431 |

| Saprobity relations (%) | Nutrition types (%) |
|---|---|
| ob 0.6 | A 96.2 |
| b 95.0 | B 1.9 |
| ba 0.6 | EC 0.6 |
| p 1.9 | P 0.6 |
| sn 1.9 | ? 0.6 |

**Table 12.**

Deva (Déva) 12. 182 m a.s.l. 455 rkm

| | | |
|---|---|---|
| Naegleria sp. | | ? |
| Halteria grandinella (O.F. Muller) | ba | ? |
| Halteria oblonga Kellicott | | ? |
| Phascolodnon vorticella Stein | b | A |
| Strobilidium sp. | | ? |
| Vorticella mayeri Faure-Fremiet | b | B |
| Vorticella sp. | | ? |
| Species number | | 7 |
| Individual number 1000 x ind/m3 | | 2420 |

| Saprobity relations (%) | Nutrition types (%) |
|---|---|
| b 95.4 | A 94.5 |
| ba 1.4 | B 0.9 |
| sn 3.2 | ? 4.5 |

**Table 13.**

Zam (Zam) 13. 155 m a.s.l. 520 rkm

| | | |
|---|---|---|
| Astrmoeba radiosa Dujardin | ba | B |
| Naegleria sp. | | ? |
| Actinosphaerium eichonii (Ehrenberg) | ob | P |
| Coleps hirtus v. lacustris Faure-Fremiet | | P |
| Phascolodnon vorticella Stein | b | A |
| Stylonychia pustulata (O.F. Muller) | b | A |
| Vorticella citrina O.F. Muller | | B |
| Vorticella mayeri Faure-Fremiet | b | B |
| Species number | | 8 |
| Individual number 1000 x ind/m3 | | 1969 |

| Saprobity relations (%) | Nutrition types (%) |
|---|---|
| ob 11.7 | A 81.6 |
| b 82.1 | B 2.8 |
| ba 1.7 | P 12.8 |
| sn 4.5 | ? 2.8 |

**Table 14.**

| Pecica (Pecske) 14. 97 m a.s.l. 675 rkm | | |
|---|---|---|
| Naegleria sp. | | ? |
| Centropyxis constricta Ehrenberg | | DB |
| Euglypha alveolata Dujardin | b | AB |
| Actinosphaerium eichonii (Ehrenberg) | ob | P |
| Codonella cratera Leidy | ob | AB |
| Condylostoma vorticella (Ehrenberg) | b | O |
| Epistylis plicatilis Ehrenberg | a | B |
| Holophrya hexatricha Savi | | AB |
| Litonotus lamella (Ehrenberg) Schewiakoff | b | P |
| Oxytricha saprobia Kahl | ap | O |
| Paramecium aurelia complex | b | B |
| Paramecium caudatum Ehrenberg | a | B |
| Paramecium putrinum Clapaderei & Lachman | p | B |
| Phascolodon vorticella Stein | b | A |
| Prorodon sp. | | ? |
| Trichodina sp. | | ? |
| Vorticella convallaria (Linneaus) | a | AB |
| Vorticella microstoma Ehrenberg | p | B |
| Vorticella natans (Faure-Fremiet) | b | A |
| Vorticella nebulifeta (O.F. Muller) | ob | AB |
| Vorticella sp. | | ? |
| Vorticella striata v. octava Stokes | p | B |
| Peritricha (Telotroch phase) | | ? |
| Species number | | 23 |
| Individual number 1000 x ind/m3 | | 638 |

| Saprobity relations (%) | Nutrition types (%) |
|---|---|
| ob 15.5 | A 34.5 |
| b 41.4 | A+B 17.2 |
| a 10.3 | B 17.2 |
| ap 3.4 | D+B 1.7 |
| p 10.3 | P 8.6 |
| sn 19.0 | O 5.2 |
| | ? 15.5 |

**Table 15.**

| Szeged 15. 82.5 m a.s.l. 766 rkm | | |
|---|---|---|
| Trinema enchelys Ehrenberg | b | B |
| Actinosphaerium eichonii (Ehrenberg) | ob | P |
| Codonella cratera Leidy | ob | AB |
| Cyclidium citrullurs (Cohn) | a | B |
| Euplotes eurystomus (Wrzesniowski) | a | O |
| Euplotes moebiusi Kahl | p | B |
| Oxytricha saprobia Kahl | ap | O |
| Paramecium caudatum Ehrenberg | a | B |
| Phascolodon vorticella Stein | b | A |
| Prorodon sp. | | ? |
| Strobilidium humile Penard | b | A |
| Strobilidium velox Faure-Fremiet | | A |
| Strombidium viride Stein | b | A |
| Vorticella nebulifeta (O.F. Muller) | ob | AB |
| Vorticella picta (Ehrenberg) | o | AB |
| Vorticella similis Stokes | ob | A |
| Vorticella sp. | | ? |
| Species number | | 23 |
| Individual number 1000 x ind/m3 | | 638 |

| Saprobity relations (%) | Nutrition types (%) |
|---|---|
| o 1.5 | A 62.1 |
| ob 15.1 | A+B 12.1 |
| b 56.1 | B 7.6 |
| a 4.5 | P 3.0 |
| ap 3.0 | O 4.5 |
| p 1.5 | ? 10.6 |
| sn 18.2 | |

A = alga, A+B = alga+bacterium, B = bacterium, D = detrius,
EC = ectocomens, P = predator, O = omnivorus.

**Table 16.**

| Saprobity relations % | | | |
|---|---|---|---|
| Izvorul Mureş | b 23.5 | | ba 2.0 |
| | sn 76.5 | | a 8.2 |
| Senetea | b 20.0 | | ap 2.0 |
| | sn 80.0 | | p 7.9 |
| Suseni | ob 6.8 | Gura-Arieşului | sn 61.4 |
| | b 18.8 | | ob 6.9 |
| | a 6.8 | | b 6.6 |
| | sn 67.6 | | a 9.1 |
| Sărmas | ob 9.1 | | p 18.2 |
| | b 27.3 | | sn 59.1 |
| | sn 63.6 | Sîntimbru -Alba Julia | ob 0.6 |
| Răstolita | ob 8.7 | | b 95.0 |
| | b 30.4 | | ba 0.6 |
| | a 8.7 | | p 1.9 |
| | ap 4.3 | | sn 1.9 |
| | p 8.7 | Deva | b 95.4 |
| | sn 39.1 | | ba 1.4 |
| Tîrgu Mureş | ob 6.7 | | sn 3.2 |
| | b 28.8 | Zam | ob 11.7 |
| | ba 6.7 | | b 82.1 |
| | a 1.6 | | ba 1.7 |
| | ap 1.6 | | sn 4.5 |
| | sn 54.6 | Pecica | ob 15.5 |
| Ungheni-Moresti | o 0.6 | | b 41.4 |
| | ob 4.8 | | a 10.3 |
| | b 21.2 | | ap 3.4 |
| | ba 1.3 | | p 10.3 |
| | a 2.0 | | sn 19.0 |
| | ap 2.0 | Szeged | o 1.5 |
| | p 5.4 | | ob 15.1 |
| | sn 62.6 | | b 56.1 |
| Ludus-Gheja | ob 6.0 | | a 4.5 |
| | b 12.2 | | ap 3.0 |
| | | | p 1.5 |
| | | | sn 18.2 |

**Table 17.**

| Nutrition types % | |
|---|---|
| Izvorul Mureş | A 11.8 |
| | A+B 58.8 |
| | B 17.6 |
| | ? 11.8 |
| Seneta | A 10.0 |
| | A+B 20.0 |
| | B 65.0 |
| | ? 5.0 |
| Suseni | A 14.0 |
| | A+B 17.0 |
| | B 24.0 |
| | B+A 3.4 |
| | EC 17.0 |
| Sărmas | A 27.3 |
| | B 27.3 |
| | B+A 9.1 |
| | D+B 18.1 |
| | EC 9.1 |
| | ? 9.1 |
| Răstolita | A 30.4 |
| | A+B 4.3 |
| | B 26.1 |
| | B+A 4.3 |
| | D+B 17.4 |
| | P 4.3 |
| | ? 13.0 |
| Tîrgu Mureş | A 8.3 |
| | A+B 22.0 |
| | B 25.5 |
| | B+A 15.6 |
| | D+B 5.1 |
| | EC 8.6 |
| | P 4.8 |
| | ? 9.9 |
| Ungheni-Moresti | A 5.5 |
| | A+B 20.5 |
| | B 11.6 |
| | B+A 7.5 |
| | D+B 4.7 |
| | P 1.9 |
| | O 2.8 |
| | ? 45.5 |
| Ludus-Gheja | A 2.0 |
| | A+B 6.2 |
| | B 13.9 |
| | B+A 20.2 |
| | P 8.2 |
| | O 25.0 |
| | ? 24.4 |
| Gura-Arieşului | A 2.2 |
| | B 24.8 |
| | B+A 11.6 |
| | D+B 2.2 |
| | P 4.4 |
| | O 4.4 |
| | ? 50.3 |
| Sîntimbru | - |
| Alba Julia | A 96.2 |
| | B 1.9 |
| | EC 0.6 |
| | P 0.6 |
| | ? 0.6 |
| Deva | A 94.5 |
| | B 0.9 |
| | ? 4.5 |
| Zam | A 81.6 |
| | B 2.8 |
| | P 12.8 |
| | ? 2.8 |
| Pecica | A 34.5 |
| | A+B 17.2 |
| | B 17.2 |
| | D+B 1.7 |
| | P 8.6 |
| | O 5.2 |
| | ? 15.5 |
| Szeged | A 62.1 |
| | A+B 12.1 |
| | B 7.6 |
| | P 3.0 |
| | O 4.5 |
| | ? 10.6 |