THE FRESHWATER MOLLUSCS FROM THE TÂRNAVA RIVERS BASIN (TRANSYLVANIA, ROMANIA)

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ABSTRACT

During the last 150 years, several authors have quoted 28 species of molluscs (8 of bivalves and 20 of gastropods) in the Târnava rivers basin. At least two species have probably disappeared, mainly because of pollution and environmental quality debasement, and others were not found during the 1996 - 2001 investigations, carried out by the author, in order to assess the faunistical dynamics which occurred both in time and space, mainly in relation to environmental quality debasement. Most of the 13 present-day living species (among them 7 are quoted for the first time in this basin) belong to tolerant, generalist and resistant groups of Pulmonates and clams, while the Prosobranchs became extinct, and the Unionidae are still living in some short sectors, having a highly patchy distribution.

ZUSAMMENFASSUNG: Die Süsswassermollusken aus den Gewässern im Târnava-Tal (Rumänien).

Im Târnava-Tal wurden 28 Süßwassermolluskenarten (8 Muscheln und 20 Schneckenarten) von verschiedenen Autoren in den letzten 150 Jahren nachgewiesen. Wenigstens zwei Arten sind bis heute durch Umweltverschmutzung ausgestorben oder verschollen, und weitere Arten wurden im Untersuchungszeitraum 1996 – 2001 durch den Autor nicht mehr aufgefunden. Die meisten der heutigen 13 Molluskenarten aus den Gewässern im Târnava-Tal (darunter 7 Neunachweise), sind tolerante Generalisten, euryöke Lungenschnecken und Pisidien. Im Gegensatz hierzu sind die Kiemenschnecken ausgestorben oder verschollen, und die Unioniden sind sehr selten und nur in kurzen Flußabschnitten anzutreffen.

REZUMAT: Moluştele acvatice din bazinul râurilor Târnave.

În bazinul Târnavelor diferiţii autori au identificat în ultimii 150 de ani 28 de specii de moluşte acvatice (8 specii de bivalve şi 20 de gastropode). În urma investigaţiilor efectuate de autorul prezentei lucrări în perioada 1996 - 2001 s-a constatat dispariţia a cel puţin 2 specii reo-oxifile, fapt explicat prin drasticele modificări ale calităţii mediului şi deprecierii stării ecologice a habitatelor acvatice din aria menţionată. Dintre cele 13 specii care populează actual apele Târnavelor (dintre care 7 sunt nou identificate în apele bazinului), majoritatea aparţin grupelor extrem de tolerante, generaliste şi euriece ale pulmonatelor şi pisidiilor. Prin contrast prosobranchiatele au dispărut, iar puţinele unionide au devenit extrem de rare, populând sectoare limitate de râu.

INTRODUCTION

At the beginning of the 1990's, the flowing point of the Târnava into the Mureş River was considered an inferior limit of the Unionidae and other species' distribution along its course. The reason was the pollution barrier, represented by the heavy metals industrial wastewater discharges, originating mainly from Copşa Mică. Downstream the confluence, in the Mureş River, highest heavy metals contents in the water and high loads in sediments were registered in 1991, and also the disappearance of naiads and some more exacting species from the Mureş course. Due to important industrial pollution reduction, the situation improved significantly during the last years. Many of the aquatic mollusc species are excellent indicators of the environmental quality and ecological state of freshwater systems; therefore it became necessary to trace the fauna dynamics both in time and space in order to highlight the trends. This paper's aim is to evidence the present day distribution of the mollusc fauna along the Târnava rivers, to compare it with that registered in the past by the work of several malacologists and to trace the faunistical changes as response to human impact.

MATERIALS AND METHODS

The Târnava Mare and Târnava Mică rivers were researched by selecting sampling sectors along their courses, from the spring areas down to the flow into the Mureş River, their positions being selected according to geomorphologic and hydrologic features and to the presence of human impact sources.

The molluscs were sampled directly by hand, by sieves, using bottom Surber or dredges. The systematics is given in accordance to the latest catalogue concerning the freshwater molluscs from the Romanian Inner Carpathians Basin (Glöer and Sîrbu, in press).

Following abbreviations were used in order to present the chorologic catalogue in a brief and synthetic way: **col.** = collection; **leg.** = sampled by; **!** - original data; **Blz.** = Albert E. Bielz; **Km.** = data from the "Mauritius and Richard Winnicki von Kimakowicz collection" kept in the Natural History Museum from Sibiu; **SVNH** = stands for the collections of the "Siebenbürgischer Verein für Naturwissenschaften in Hermannstadt" (Transylvanian Society for Nature Sciences in Sibiu, its collections being kept mainly in the Museum from Sibiu), **NNHA** = collections from the National Natural History Museum "Grigore Antipa" in Bucharest. The other authors are given by surname and year of quotation or sampling.

RESULTS

The systematic and chorologic catalogue of the freshwater molluscs from the Târnava rivers basin, based on references, collections and original data gathered from several field researches accomplished by the author during the last years, is presented below. The used abbreviations were explained above.

Classis **Gastropoda** CUVIER 1795
Ordo **Neritopsina** COX & KNIGHT 1960
Family **Neritidae** LAMARCK 1809

1. *Theodoxus transversalis* (C. PFEIFFER 1828)

(Blz., 1867) - Târnava riverbed at Blaj;

Ordo **Neotaenioglossa** HALLER 1892
Family **Bithyniidae** TROSCHEL 1857

2. *Bithynia tentaculata* (LINNAEUS 1758)

(col. SVNH) - Dumbrăveni; **(Blz., 1867)** - Mediaş, Dumbrăveni;

Family **Hydrobiidae** TROSCHEL 1857

3. *Lithoglyphus naticoides* (C. PFEIFFER 1828)

(Blz., 1867) - Târnava rivers at Blaj;

Ordo **Pulmonata** CUVIER IN BLAINVILLE 1814

Family **Lymnaeidae** RAFINESQUE 1815

4. *Galba truncatula* (O.F. MÜLLER 1774)

(col. SVNH - Blz.). - Dumbrăveni and Valea Lungă; **(col. Km.)** - Sighişoara (leg. Petri, 1887); **(Blz., 1867)** - Jidvei; **(!)** - brooks and puddles at Vărşag, brook at Şaeş (outflow of a marsh; leg. Ana Benedek, 2003); upstream Mediaş and in Târnava village, the united Târnava at Mihalţ;

5. *Stagnicola palustris* (O.F. MÜLLER 1774)

Stagnicola palustris s. lat (agg.) - **(col. SVNH - col. Blz.):** Jidvei, Valea Lungă, Dumbrăveni; **(Blz., 1867)** - Şaeş, Dumbrăveni, Mediaş, Valea Lungă; **(col. Km.)** - Dealu (leg. Traxler, 1890), fishponds at Valea Lungă, sampled in 1866;

Stagnicola palustris (O.F. MÜLLER 1774) s. str. (anatomical evidence).

(!) - puddles and brooks at Vărşag, in the riverbed downstream Sighişoara;

6. *Stagnicola turricula* (HELD 1836)

(col. Km.) - Sighişoara (Blz.);

7. *Stagnicola corvus* (GMELIN 1791)

(col. Km.) - Valea Lungă (leg. Barth, 1866; leg. Km., 1906); **(Blz., 1867)** - ponds at Jidvei and Valea Lungă;

8. *Radix auricularia* (LINNAEUS 1758)

(col. SVNH) - Mediaş (leg. Barth), Valea Lungă (leg. Blz.); **(col. Km.)** - Mediaş (backwaters of Târnava Mare, leg. 1908), backwaters at Dumbrăveni (leg. 1888); **(Blz, 1867)** - isolated branch at Mediaş, Valea Lungă, Alba Iulia; **(!)** - the riverbed of Târnava Mare between Sighişoara and Târnava Sat, in the vicinity of the banks;

9. *Radix labiata* (ROSSMÄSSLER 1835)

Syn.: *Radix peregra* (O. F. MÜLLER 1774)

(col. SVNH) - Valea Lungă, Nicoleşti, Beclean - Odorhei, Sighişoara, Mediaş; **(col. Km.)** - Sighişoara, dead branch of Târnava at Mediaş (leg. Barth, 1908), Valea Lungă (ponds, leg. Barth, 1908); **(Blz., 1867)** - Ocna Sibiului, brook at Mândra; **(!)** - Târnava Mică in the riverbed and flood area, ponds and brooks on the Creanga Mică and Mare, in the riverbed downstream Sovata, in Târnava Mare riverbed, brooks, ponds and springs at Vărşag, and upstream Zetea;

10. *Lymnaea stagnalis* (LINNAEUS 1758)

(col. SVNH) - Odorheiu Secuiesc, Jidvei, Blaj; (Blz., 1867) - Sighişoara in the dead branch of Târnava, Şaeş, Richiş, Moşna fishpond, Mediaş - backwater of Târnava, marshes of Jidvei, Valea Lungă, pond at Blaj;

Family **Physidae** FITZINGER 1833

11. *Physella acuta* (DRAPARNAUD 1805)

(!) - Târnava Mare between Sighişoara and Târnava Sat, ponds from Mândra (Visa tributary);

12. *Aplexa hypnorum* (LINNAEUS 1758)

(Blz., 1867) - Dumbrăveni;

Family **Planorbidae** RAFINESQUE 1815

13. *Planorbarius corneus* (LINNAEUS 1758)

(col. SVNH and col. Km.) - Valea Lungă; **(Blz, 1867) -** Jidvei, pond at Blaj, Mediaş in a dead branch, Valea Lungă, Moşna and Mănărade;

14. *Planorbis planorbis* (LINNAEUS 1758)
(col. SVNH) - Nicoleşti (near Odorheiu Secuiesc), Şaeş, Sighişoara, Jidvei, Dumbrăveni, Valea Lungă; **(col. Km.)** - Sighişoara, Valea Lungă; **(Blz., 1867)** - Şaeş, pond at Dumbrăveni, Mediaş - Târnava backwater, Jidvei, Valea Lungă; **(!)** - fishponds from Mândra (Visa tributary);

15. *Anisus spirorbis* (LINNAEUS 1758)
(col. SVNH) - Beteşti (near Odorheiu Secuiesc); **(col. Blz. in NNHA)** Odorheiu Secuiesc; **(Blz., 1867)** - Ocna Sibiului, ponds at Jidvei; **(!)** - empty shells at Sighişoara;

16. *Anisus leucostoma* (MILLET 1813)
(!) - puddles and brooks close to Creanga Mică and Creanga Mare (Târnava Mică River); ponds and brooks at Vărşag (Târnava Mare River);

17. *Anisus calculiformis* (SANDBERGER 1874)
Syn.: *Anisus septemgyratus* (ROSSMAESSLER 1835)
(col. SVNH and Blz., 1867) - Valea Lungă;

18. *Segmentina nitida* (O.F. MÜLLER 1774)
(col. SVNH) - Valea Lungă; **(Blz., 1867)** - Ocna Sibiului;

Family **Ferrissiidae** WALKER 1917

19. *Ferrissia wautieri* (MIROLLI 1960)
(!) - in the Târnava Mare, on leaves of *Potamogeton natans* downstream Sighişoara;

Family **Ancylidae** RAFINESQUE 1815

20. *Ancylus fluviatilis* O.F. MÜLLER 1774
(!) - Târnava Mică from the Creanga Mică and Mare rivers, downwards to Sovata, and in the Târnava Mare from upstream Vărşag, down to Zetea;

Classis **Bivalvia** LINNAEUS 1758
Ordo **Unionoida** STOLICZKA 1871
Family **Unionidae** RAFINESQUE 1820

21. *Unio crassus* PHILIPSSON 1788
(col. SVNH) - Târnava Mare at Odorhei Secuiesc; **(Blz., 1867)** - Târnava Mare at Sighişoara and Dumbrăveni, Târnava Mare and Mică at Blaj, Târnava Mică at Chendu Mic; **(Sárkány-Kiss, 1983)** - Târnava Mică from downstream Sovata, once continuously spread between Ghindari and Târnăveni; **(!)** - Târnava Mică - one individual sampled by D. Bănăduc in 2001 from Sângeorgiu de Pădure; scattered groups upstream of Târnăveni. In Târnava Mare, only shells along its course.

22. *Anodonta cygnaea* (LINNAEUS 1758)
(Blz., 1867) - backwaters at Blaj;

23. *Anodonta anatina* (LINNAEUS 1758)
(col. SVNH) - Visa River at Veşeud (leg. Look Thomas, 1975); **(Sárkány-Kiss, 1983)** - scattered individuals in the Târnava Mică;

Ordo **Veneroida** H. & A. ADAMS 1856
Family **Sphaeriidae** DESHAYES 1855 (1820)

24. *Musculium lacustre* (O.F. MÜLLER 1774)
(col. SVNH) - Valea Lungă; **(col. Km.)** - Sighişoara, Valea Lungă (leg. Barth, 1906); **(Blz., 1867)** - Şaeş near Sighişoara;

25. *Pisidium casertanum* (POLI 1791)
(!) - brooks and puddles near Creanga Mică and Creanga Mare, upstream of Praid (Târnava Mică); ponds and rivulets at Vărşag and in Târnava Mare at Zetea;

26. *Pisidium personatum* MALM 1855

(!) - ponds and brooks near Creanga Mică and Mare (upstream Praid), Vărşag, outflow of the Şaeş marsh (leg. Ana Benedek, 2003);

27. *Pisidium obtusale* (LAMARCK 1818)

(Blz., 1867) - Şaeş;

28. *Pisidium subtruncatum* MALM 1855

(!) - Târnava Mică riverbed upstream Târnăveni, puddles at Vărşag (Târnava Mare basin).

DISCUSSION

The oldest records of some freshwater molluscs species from the Târnava rivers date back to the XIXth Century, especially regarding riverbeds' sectors in the vicinity of the main localities, such as Blaj, Mediaş, Sighişoara, Odorheiu Secuiesc and others. Some prosobranchs, like *Theodoxus transversalis* and *Lithoglyphus naticoides*, once largely spread, were not found again during the last decades, being presumably extinct in these rivers. A. Sárkány-Kiss (1989) stated that Târnava Mică, downstream Sovata, was populated with *Unio crassus* down to its confluence, and scattered individuals of *Anodonta anatina* could also be found. In the Târnava Mare River, he quoted *Unio crassus* downstream Odorheiu Secuiesc.

Târnava Mare was thoroughly checked out in 1996 (with Monica Sîrbu), and in the years 2000 - 2001, but no living Unionidae were found again in the whole course of this river. However, lots of empty shells belonging to *U. crassus*, prove its former continuous distribution and the effect of the past wastewater discharges. Investigations of some areas along the Târnava Mică River, together with A. Sárkány-Kiss, during 1996 - 97, remained also without result in the attempt to find naiads, and we assumed that all Unionidae, have also disappeared from this river (Sárkány-Kiss and Sîrbu, 1998). But in 2000 the author has found scattered but abundant groups of individuals belonging to the former mentioned species upstream Târnăveni, and D. Bănăduc sampled in 2001 one individual from Sângeorgiu de Pădure. It became clear that the species has not disappeared from the whole Târnava Mică course, but it became rare, having a highly patchy distribution, in a shorter sector bordered downwards by the Târnăveni locality.

During the investigations carried out in the years 2000 and 2001, 13 present-day living species have been found, among them 7 are quoted for the first time in the area of reference. By contrast, no prosobranchs and no other Unionidae (excepting the former mentioned case regarding *Unio crassus*) have been found again. One of the exacting rheo-oxyphillous Pulmonates, indicating a certain quality of the aquatic environment, *Ancylus fluviatilis*, is in present restricted on both rivers to some short sectors in the upper reaches.

In the Târnava Mică upper basin, the river is formed by the confluence of two mountain shaped rivulets named Creanga Mică and Creanga Mare. Upstream their confluence, 5 species were found; among them *Ancylus fluviatilis* inhabits the riverbeds, while *Radix labiata* is confined to some shallow sectors, puddles, pools and brooks from their valleys. In small waters from this area, large populations of *Pisidium casertanum, Pisidium personatum* and *Anisus leucostoma* have been found, the last two being premier identifications in this area. *A. fluviatilis* can still be found upstream Praid and some scattered individuals close and downstream Sovata, but not further. The rest of the river's course is very poor in species, and some sectors were proved to shelter no mollusca species at all, for instance near the localities of Coroisânmartin and Suplac. Downwards, although the single living naiad, *Unio crassus*, became very scarce and patchy distributed, the presence of both reproductive adults and juveniles, at the level of Târnăveni, signifies a certain guarantee of the species' maintenance in the future. In the riverbed near this locality, the euribiont *Pisidium subtruncatum* was first time found in the Târnava basin.

Along the Târnava Mare the mollusc fauna is even poorer than it was formerly presented. There can be distinguished only two groups of species: those sheltered in the area delimited between the springs and downstream the dam placed above Zetea locality, and that formed by a very few euribionts species, pollution resistant Pulmonates, from the whole rest of the river.

Table 1: Distribution of the freshwater molluscs species, found by the author between 1996 and 2001 in the Târnava rivers basin.

No.	Species / Sampling station	Târnava Mică						Târnava Mare										UT
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1.	*Galba truncatula*							b			b	X		X	X			X
2.	*Stagnicola palustris*							p b				X						
3.	*Radix auricularia*											X	X	X	X			
4.	*Radix labiata*	X b p	X b p		X			X b p s	p									
5.	*Physella acuta*											X	X	X	X		L	
6.	*Planorbis planorbis*																L	
7.	*Anisus leucostoma*	p	p					p b										
8.	*Ferrissia wautieri*											X						
9.	*Ancylus fluviatilis*	X	X	X	X			X b	X									
10.	*Unio crassus*					X	X			+			+		+	+		
11.	*Pisidium casertanum*	p	p	X				p b	X									
12.	*Pisidium personatum*	p	p					p b			b							
13.	*P. subtruncatum*						X	p										

The codes and symbols used in Tab. 1: UT - the river formed by the confluence of Târnava Mare and Târnava Mică, 1 - Creanga Mică rivulet upstream the confluence with 2. - Creanga Mare river, both forming the Târnava Mică, 3. - upstream Praid, 4. - downstream Sovata, 5. - Sângeorgiu de Pădure, 6 - upstream Târnăveni; (sampling stations on Târnava Mare) 7. - upstream Vărşag, 8. - upstream Zetea, 9. - downstream Odorheiu Secuiesc, 10. - Şaeş, 11. - downstream Sighişoara, 12. - Lunca-Hoghilag, 13. - upstream Mediaş, 14. - Târnava Village, 15. - downstream Copşa Mică, 16. - fishponds at Mândra - Visa tributary, 17. - Mihalţ. In the cells: p - pools or puddles, b - brooks or rivulets, s - springs, L - lakes or ponds, X - Târnava riverbed, + - only empty shells were found in the rivers' sediments.

From upstream Vărşag down to Zetea, *Ancylus fluviatilis* is frequently encountered in the riverbed and brooks, sometimes being associated with *Radix labiata*, the last being sampled also from lots of small-sized flowing or stagnant waters. In brooks and puddles from the mountain valleys *Pisidium personatum,* sometimes joined by *Galba truncatula*, can be found. In the marshy bed of a former trout fishpond, a very interesting and abundant community was registered, the populations being ascribed to *Stagnicola palustris, Radix labiata, Anisus leucostoma, Pisidium casertanum, P. personatum* and *P. subtruncatum.* Downstream Odorheiu Secuiesc the riverbed is very poor in species, but sometimes rich in individuals. The characteristic community for organic overloaded waters is best shown downstream Sighişoara, down to Târnava locality, formed by abundant populations belonging to *Galba truncatula,*

Radix auricularia and *Physella acuta*, rarely joined by *Stagnicola palustris*. Most are capable to survive and develop on thick muddy layers placed close to the riverbanks, or above the water level (*G. truncatula* or *P. acuta*), being less dependent on dissolved oxygen, or even adapted to semi-amphibious life. The premier encounter of *Ferrissia wautieri* on leaves of *Potamogeton natans*, downstream Sighişoara, is an exception explained by chance, this habitat resembling no specific required conditions (usually stagnant waterbodies, rich in vegetation). Most probably, both plant and mollusca have been washed from the flood area or some pools in the vicinity. Downstream, at Copşa Mică and further to Blaj, no living mollusc has been found in the riverbed. The distribution of the present-day species along the Târnava rivers is given in Tab. 1.

Some rarely encountered species can still be sampled from tributaries, like the Visa River or the outflow of the Şaeş marsh. Downstream the confluence of the Târnava Mică and Târnava Mare, only *Galba truncatula* was found alive.

Analysing the present day structure and distribution of the mollusc fauna along the Târnave rivers suggests the effects of human impact, expressed mainly by pollution and hydrotechnical works. But in this case, the improvement of the ecological state is hard to be evidenced by molluscs, because the rivers lack the flood areas and the repopulating sources, responsible for the fauna recovery.

Table 2: Mean density (D = no. of individuals/m^2) and relative abundance (A%) of the benthic macroinvertebrates groups in the Mureş River, at Gura Arieş and Sântimbru (upstream and downstream the Târnava rivers flow) in 1999 - 2000 (based on 12 samples taken in all seasons).

Sampling station	Gura Arieş		Sântimbru	
Systematic group	D	A%	D	A%
Hydroidea	4.35	.095	1.74	.015
Nemathelminthes	4.35	.095	16.54	.145
Oligochaeta	2033.20	44.257	7382.22	64.555
Hirudinea	.87	.019	.00	.000
Mollusca	17.42	.379	101.88	.891
Amphipoda	.00	.000	3.48	.030
Hydracarina	5.22	.114	1.74	.015
Collembola	4.35	.095	3.48	.030
Ephemeroptra	274.29	5.970	653.93	5.718
Odonata	1.74	.038	1.74	.015
Plecoptera	.00	.000	.87	.008
Trichoptera	134.10	2.919	64.44	.563
Coleoptera	.00	.000	.87	.008
Chironomidae	2080.22	45.280	3161.69	27.649
Other Diptera	33.96	.739	40.93	.358
Total:	4594.07	100	11435.55	100

The environmental changes can be better traced by comparing the past and present day effect of the Târnave discharge in the Mureş River and its benthic communities' dynamics (I. Sîrbu and A. Sárkány-Kiss, 2002; I. Sîrbu, A. Sárkány-Kiss and M. Sîrbu, 2002). Until the 8th decade of the last Century, the Unionidae populated the whole middle course of the Mureş River, being represented by 5 species. During the expedition in 1991, A. Sárkány-Kiss has not found a single living individual downstream the discharge of the Târnava River, because of the heavy metals pollution originating from Copşa Mică. Downstream the confluence, high

concentrations in the water were registered by Waijandt (published in 1995) for Cu (25 mg/l), Zn (147 mg/l), Cr (75 mg/l), Hg (9 mg/l), Cd (2 mg/l) and Pb (30 mg/l) and also high contents in sediments. The discharging point was also the threshold for some other species' distribution along the river. During 1999 - 2000 the Unionidae were found again downstream the confluence; at least two species (*Unio pictorum* and *Anodonta anatina*) were once again capable to repopulate the Mureş riverbed. Scattered individuals are found in present, in the vicinity of riverbanks, from this point downstream to Alba Iulia and further to Vinţu de Jos. Later, in the lower sector (western lowland) of the Mureş River, there were also noticed *Anodonta cygnaea* (individual sampled by D. Bănăduc near the town of Arad) and *Sinanodonta woodiana* (Sárkány-Kiss, in. verbis). In 2000 the team lead by A. Sárkány-Kiss recorded a decrease in heavy metal pollution of the water (concentrations were 4 times lower in case of Pb, and more than 2 times lower in case of Cu and Cd), and also of sediments, compared with the situation registered in 1991. All these are linked to the important reduction of industrial pollution during the past decade. But there are some certain clues that household and farms' organic wastewater discharges are not decreasing at all, but in contrary, as it was proved by both chemical analysis and macrozoobenthos studies (A. Szitó, 1995, 2002, I. Sîrbu et al., 2002).

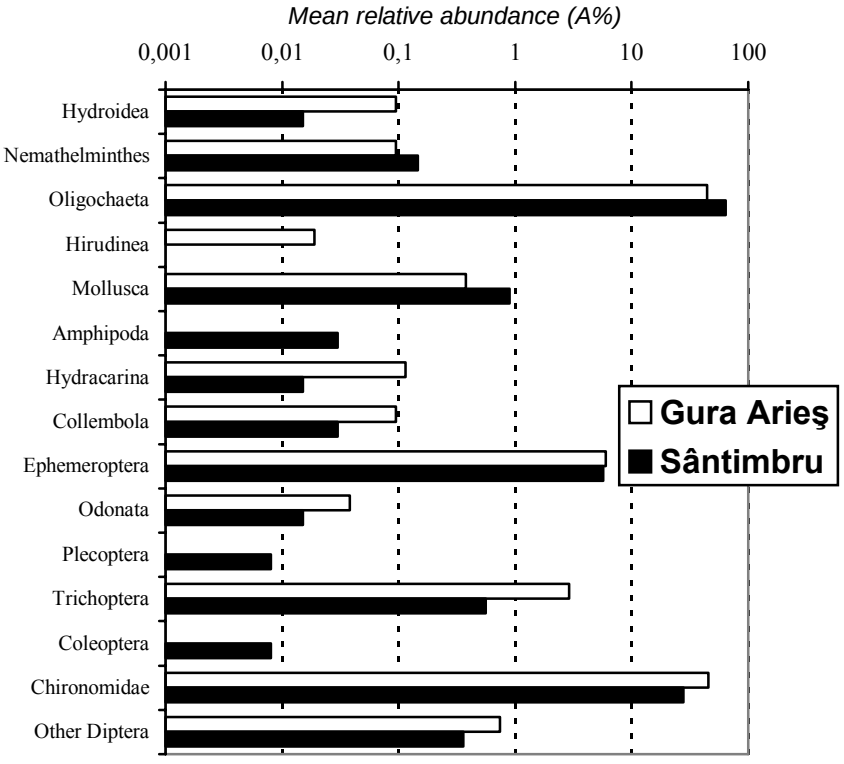

Fig. 1: Benthic macroinvertebrates communities' structure from the Mureş River, at Gura Arieş (downstream the Arieş tributary flow and upstream the Târnava discharge) and from Sântimbru (downstream the flow of the Târnava River) in terms of relative abundance (A%), based on 12 samples taken in 1999 - 2000 (on logarithmic scale).

In Tab. 2 the benthic macroinvertebrates communities' structure from the Mureş River, at Gura Arieş (downstream the Arieş River tributary flow) and from Sântimbru (downstream the Târnava River flow) is presented. The values of mean density (D = no. of individuals / m^2) and mean relative abundance (A%) are based on 12 benthic samples taken between 1999 and 2000, all seasons being represented. Because the two stations are placed upstream and downstream the Târnava flow, the environmental conditions changes can be highlighted. In 1991 A. Szitó found at Gura Arieş some few species belonging to 4 benthic groups. In 2000 we found a much more diverse benthic community, 12 systematic groups being represented. Analysing the present structures from the two stations, it is obvious that downstream the Târnava flow, among the 14 systematic groups, Amphipoda, Plecoptera and Coleoptera representatives are once again appearing in the riverbed. The actual benthic total density is raising downstream (from 4594.97 individuals/m^2 at Gura Arieş to 11435.55 individuals /m^2 at Sântimbru). The thick muddy layers placed downstream along the banks, prove a higher organic pollution, the Târnava River being an important responsible for this state. But, as chemical analysis also suggests, the heavy metal discharge is much higher at the Arieş tributary flow. Comparing the benthic macroinvertebrates structure (in terms of relative abundance; Fig. 1) it is evidenced that at Gura Arieş the Oligochaeta and Chironomidae larvae are codominant, while at Sântimbru the Oligochaeta became the prevailing group.

CONCLUSIONS

In the Târnave rivers basin, a total of 28 species of freshwater molluscs (8 of bivalves and 20 gastropods) belonging to 10 families were quoted until the present. During the 1996 - 2001 period, the author has found 13 species, among them 7 are identified for the first time in this area. Another species, *Anisus spirorbis* was found only by empty shells. Among the species that were not recovered, at least two (*Theodoxus transversalis* and *Lithoglyphus naticoides*) are probably extinct. No prosobranchs have been found again, and the Unionidae have either totally disappeared from the whole course (as it happened in Târnava Mare), or have restrained their distribution to some sectors and patches (as it happened with *Unio crassus* along the Târnava Mică). There can be roughly distinguished two groups of species and two sectors of environmental quality: the source areas, were the species *Ancylus fluviatilis* is restricted in present, indicating also the border between the two categories, and the rest of the flowing waters, where a few euribiont, highly resistant or opportunistic Pulmonates populate a narrow sector close to the riverbanks. Although the recovery of Unionidae distribution and of other benthic groups, downstream the Târnave flow in the Mureş River, prove a certain improvement of environmental quality the mollusc fauna of the Târnave riverbeds is still very poor. This is explained by hydrotechnical works (draining of wetlands, debasement of flood area, damming, etc.) that destroyed the potential repopulating sources of lots of species, and the prevailing effect of organic household wastewater discharges, despite the fact that industrial pollution (and especially the heavy metals discharges) has drastically decreased during the last years.

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