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## THE FRESHWATER MOLLUSCA FAUNA FROM BANAT (ROMANIA)

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**Abstract.** The freshwater molluscs fauna from Banat comprises 61 species (41 of gastropods and 20 of bivalves). 10 species were newly identified in this area by the authors. This paper's aim is to establish the systematical and chorological catalogue of this fauna, to highlight the most characteristic and significant elements, the threats represented by human impact on the area's waters and their molluscs communities.

**Résumé.** La faune des mollusques aquatiques de Banat contient 61 espèces (41 escargots et 20 coquillages bivalves). 10 espèces ont été identifiées pour la première fois en cette région par les auteurs. L'objectif de ce travail est d'établir un catalogue systématique et chorologique de cette faune, de souligner les plus importants de ses éléments et les menaces représentées par l'impact humain pour les habitats et les communautés aquatiques de la région.

**Key words:** freshwater snails, bivalves, systematical catalogue, chorology, alien invasive species, human impact.

### INTRODUCTION

The Banat is the South-western province of Romania, bordered by the river Mureş in the North, the Danube in the South and the Southern Carpathian Mountains in the East. Some scattered material and information regarding the freshwater Mollusca from Banat date back to the 19<sup>th</sup> century. They were provided mainly by the naturalists from the Transylvanian Society for Nature Sciences in Sibiu, their collections being kept mainly in the museum from the same town. Most malacologists studied terrestrial molluscs, especially from mountain areas, the aquatic species being seldomly quoted. In the few mentions usually there are given no exact toponimes. However, some data are available from the collections of E. A. Bielz, M. v. Kimakowicz, I. P. Licherdopol, A. V. Grossu and others. These collections are preserved in the Museum of Natural History in Sibiu and the „Grigore Antipa“ National Museum of Natural History in Bucharest. Some published historical data are available from Bielz (1867), Clessin (1887), Kimakowicz (1883-1884). In the 20<sup>th</sup> century the faunistical data become more numerous. Most papers concerning the freshwater molluscs belong to A.V. Grossu. In 1942 he describes the mollusc fauna from Timișoara surroundings, in 1945-1946 it follows a paper concerning the prosobranch *Holandriana holandrii*, in 1946 *Bythinella dacica* is described as a new species to science, in 1955 a malacological paper concerning the Miniș Valley is published. Later several other papers are synthesized in the tome concerning the bivalves (1962) and the gastropods (1986, 1987) from Romania, as well as the catalogue of the molluscs published in 1993. Most papers contain mainly faunistical and systematical information and data on the autecology of the species. Some data on community ecology were published by Grossu in 1972 and 1974, and together with Doina Grossu, in 1968. Tudorancea & Gruia (1968) studied some ecological parameters of the *Unio crassus* population

from the Nera River. Maybe the most distinctive malacological feature of the Banat area are the highly abundant prosobranch communities from the Nera and Caraș rivers. The former were studied by Botoșăneanu & Negrea (1969), Bănărescu & Opreșcu (1971), Botoșăneanu & Negrea (1976), the latter by Bănărescu & Arion-Prunescu (1981, 1982, 1983). Several papers mentioned before referred also to the mollusc fauna from the Poștile de Fier area [the Iron Gates]. To these, several other references have to be added, like those published by Băcescu (1948), Popescu & Prunescu-Arion (1961), Bușniță et al. (1970) and Brezeanu et al. (1986). Some other papers deal with the taxonomy and distribution of the aquatic gastropods along the Danube's Romanian sector, published by Negrea & Popescu-Marinescu (1992), Negrea (1994) or, concerning also the bivalves, the volume written by Frank et al. (1990), the last being an inconsistent synthesis regarding the fauna of Romania. In this century, several studies on alien invasive species were carried out. Some concern species which live also in Banat, namely those published by Sárkány-Kiss et al. (2000), Bij De Vaate & Hulea (2000), Skolka & Gomoiu (2001), Popa & Popa (2006 a, b), Popa et al. (2007), Popa (2008).

Beginning with 1998, the authors of the present paper organized several sampling trips in the Romanian Banat in order to assess the systematics, distribution, chorology, population and community ecology of the freshwater molluscs from this area. Several papers were published, concerning the prosobranchs and naiads (Unionidae) communities from the Nera and Caraș rivers (Sîrbu & Sîrbu, 1998), a study concerning the morphologic and biometric variability of *Holandriana holandrii* (Sîrbu, 1998), distribution of the *Pisidium* species in Banat (Sîrbu, 2002; Sîrbu & Benedek, 2004), the Mollusca fauna from Timiș River (Sîrbu, 2004 a), the molluscs communities structure from the Danube's sector from Banat (Sîrbu, 2004 b), some papers concerning distribution and ecology of several groups from the regional mollusc fauna (Bănărescu & Sîrbu, 2002; Sîrbu & Benedek, 2005; Sîrbu, 2006; Sîrbu et al., 2006; Glöer & Sîrbu, 2006).

Up to present no publication deals with the whole region and several rivers and taxonomic mollusc groups are without references, a gap which the authors intend to fill in this paper, aiming to establish a malacological exhaustive systematical and chorological catalogue based on all available information, to highlight the present state and dangers faced by several significant species and communities.

#### STUDY AREA AND METHODS

The freshwater molluscs' systematical and chorological catalogue from Banat (Romanian territory) is based on all available references and collections, as well as on the authors' research accomplished since 1998.

The Banat region is drained by five large rivers and many small ones. Two of the large rivers (Bega and Timiș) flow through the North of the province and the three others (Caraș, Nera, and Cerna) drain its southern part. The sampling stations were established along the main rivers, in order to assess the longitudinal and altitudinal distribution of the mollusc communities, but also in other freshwater habitats: springs, brooks and rivulets, flood areas, pools, ponds, dam lakes, channels, ditches, and marshes. The sampling sites were selected according to geomorphologic and hydrologic features, but also to the human impact. The malacological investigations were carried out in the following rivers and basins: Mureș River in its lower sector from northern Banat, Aranca, Bega, Timiș, Caraș,

Nera, Cerna and the Danube's sector from Banat. Some material from Caraş and Nera rivers was donated by Dr. P. M. Bănărescu, in 1999.

The molluscs were sampled by hand, by sieves, using bottom Surber or dredges. The systematical catalogue is given according to Grossu (1993), Glöer & Meier-Brook (2003), Glöer & Sîrbu (2006), and to Fauna Europaea v. 2.2, namely the lists compiled by Bank (2010) for gastropods, and by R. Araujo (2010) for bivalves. However, the data for Romanian Mollusca given in the Fauna Europaea correspond to the Checklist of Romanian Fauna; terrestrial and freshwater species (2007), which contains many errors, being highly unreliable.

Following abbreviations were used in order to present the chorologic catalogue in a brief and synthetic way: \* = species identified for the first time in the area of reference by the authors; col. = collection; leg. = sampled by; NHMS = Natural History Museum in Sibiu and „Grigore Antipa“ NMNH = collections from the „Grigore Antipa“ National Museum of Natural History in Bucharest.

#### RESULTS

In the Banat region, 61 freshwater mollusc species (41 of snails and 20 of bivalves) were identified up to present. They belong to 7 orders and 14 families. Among the gastropods 17 species are prosobranchs, while 24 are pulmonates. Considering the bivalves, all the seven species of naiads (Unionidae) which live in Romania are encountered in the waters from Banat, sometimes in high densities. 13 species are veneroids. The complete list of taxa and their known chorology are presented in the following.

#### *The systematical and chorological catalogue of the freshwater molluscs from Banat (Romania)*

Classis Gastropoda Cuvier, 1795  
Ordo Neritopsina Cox & Knight, 1960  
Familia Neritidae Lamarck, 1809

##### 1. *Theodoxus transversalis* (C. Pfeiffer, 1828)

(col. Kimakowicz and col. Bielz in NHMS): the Danube Gorges (Cazanele Dunării) and Orşova; (col. Licherdopol at „Grigore Antipa“ NMNH): the Danube at Vârciorova; (col. Grossu in „Grigore Antipa“ NMNH): the Danube at Orşova (leg. Grossu, 1958) and in the Coronini - Turnu Severin sector (leg. Grossu, 1962); (Băcescu, 1948) – the Danube Gorges; (Grossu & Grossu, 1968) – the Danube at km 1042, km 1005, km 967 - 968 and others; (Grossu, 1972) – the Danube in the Porțile de Fier (Iron Gates); (Grossu, 1974) - Nera at Sasca Montană and outflow of the Cerna River; (Buşniță et al., 1970) – the Danube in the Porțile de Fier area (km 943 - 1055); (Negrea, 1994) the Danube, confluence with the Cerna River (leg. 1975, 1989), and quoted from different sources at Pescari, km 1005, Mraconia, the Danube Gorges and Svinița. The species was also quoted from the lower Mureş River on Hungarian territory, until the second half of the last century, the last samples being taken by K. Bába (1958, ap. Sárkány-Kiss, 1995) between Makó and Szeged, and Richnovszki & Pintér (1979, ap. Sárkány-Kiss, 2003) from Szeged. In the Mureş River lower sector it has disappeared during the late 80's, and is also most likely extinct in Banat, as well as in Transylvania (Sîrbu & Benedek, 2005). It was also not found again along the Danube, between Calafat and Oltenița localities (Popa, 2005).

The authors of the present paper searched for it, without success, in the summer of 2008 along the Danube, until Giurgiu, but in 2009 we found a spot, in the Danube Delta, where this species still lives. Thus, although highly endangered and extinct from the main part of its range, *T. transversalis* still lives in Romania having a highly patchy distribution, its future being uncertain.

2. *Theodoxus fluviatilis* (Linnaeus, 1758)

(M. Băcescu, 1948 and others): sporadically in the Danube Gorges; (Negrea & Popescu-Marinescu, 1992; Negrea, 1994): the Danube at Svinița.

Original data: the Danube at Baziaș, sampled by deep dredging between km 1070 - 1071, from sandy substratum; near the river's bank at Divici and in the Cazanele Mici.

3. *Theodoxus danubialis* (C. Pfeiffer, 1828)

(col. Kimakowicz in NHMS): the Danube upstream of Orșova; (col. I. P. Licherdopol in „Grigore Antipa“ NMNH): Vârciorova; (Soós, 1943): „from Nera at Sasca Montană; quoted by Kormos also from Caraș“; (Grossu, 1942): Bega River at Timișoara; Nera at Sasca Montană; 1956 – the Danube at Vârciorova; 1962 - the Danube at Coronini (km 1042) - Turnu Severin sector; 1966, 1972, 1974 - Nera, Bârzava, Caraș, Danube and some small rivers, ponds from the Danube's flood area; the Danube Gorges; Orșova - Porțile de Fier sector; (Botoșăneanu & Negrea, 1976): Nera Gorges (Cheile Nerei); (Bănărescu & Arion-Prunescu, 1981, 1982): Caraș River, between Grădinari and Vrani; (Negrea, 1994): the Danube at Moldova Veche (leg. Zinevici in 1975, leg. Negrea in 1993), at Mraconia (leg. 1975, 1982) and Bahna (leg. 1975);

Original data: Caraș River at Grădinari; Nera Gorges from upstream Lacul Dracului (the Devil's Lake) downstream to Naidăș; in the Danube from Baziaș to the Cazanele Mici, sampled by dredging and from stones close to the banks. It went extinct in the Bega River, due to pollution and habitats' debasement (Sîrbu & Benedek, 2005), and became scarce, being highly endangered in the lower Caraș and Nera rivers.

Ordo Architaenioglossa Haller, 1890

Familia Viviparidae J. E. Gray, 1847 (1883)

4. *Viviparus contectus* (Millet, 1813)

(Grossu, 1986): Timișoara; (Sárkány-Kiss, 1983): a dead branch near the Mureș River at Pecica.

5. *Viviparus acerosus* (Bourguignat, 1862)

(Clessin, 1887): in the Danube, quoted „probably as far as Banat“; (Soós, 1943): mentioned that it was identified by Kobelt at Baziaș, and described as var. *banatici*; (Grossu, 1942): marshes full of aquatic and paludal vegetation from Timișoara; 1956 – ponds close to Timișoara; 1972 – the Danube's flood area at the Porțile de Fier; (Bușniță et al., 1970): the Danube in the Porțile de Fier area (km 943 - 1055); (Negrea & Popescu-Marinescu, 1992; Negrea, 1994): in the Danube's Defile.

Original data: Mureș River Basin in Bezdin Lake; Aranca River in the Munar - Periam Port sector; empty shells in the Bega Veche River at Cenei; Timiș River at

Grăniceri; Caraş at Vrani; alive in the Nera River (the „Dead Nera“ or „Nera Moartă“ in Romanian) downstream Socol. In the whole Danube's sector from Banat, from Baziaş to Orşova, in the whole riverbed and on all substratum types, being often the dominant species within the benthic communities.

Ordo Neotaenioglossa Haller, 1892  
Familia Melanopsidae H. & A. Adams, 1854

6. *Fagotia (Fagotia) esperi* (Férussac, 1823) (syn. *Esperiana esperi*)

(Clessin, 1887): „from Banat“; (Grossu, 1942): „in the Danube, seldom also in tributaries from Banat, at Vârciorova“; 1956 – Nera and Caraş rivers; 1972 - Nera River at Sasca Montană (col. Grossu in „Grigore Antipa“ NMNH); 1972 – Cazanele Mici; (Botoşăneanu & Negrea, 1976): Nera Gorges; (Bănărescu & Prunescu-Arion, 1981): Caraş at Grădinari and Vrani.

Original data: Nera Gorges from upstream Dracului Lake down to Naidăş; in the Danube Gorges and downstream especially close to the banks on hard substrata.

7. *Fagotia (Microcolpia) daudebartii acicularis* (Férussac, 1823) (syn. *Esperiana daudebartii acicularis*)

(Soós, 1943): Caraş River; (Grossu, 1942, 1972): the Danube between Coronini and Turnu Severin; in the Porţile de Fier area, from the Gorges to Orşova; 1972 - in col. „Grigore Antipa“ NMNH from Sasca Montană, Nera River; (Buşniţă et al., 1970): the Danube in the Porţile de Fier area (km 943 - 1055); (Botoşăneanu & Negrea, 1976): Nera Gorges; (Bănărescu & Prunescu-Arion, 1981, 1982): Caraş at Grădinari and Vrani; (Negrea & Popescu-Marinescu, 1992; Negrea, 1994): the Danube at Moldova Veche.

Original data: Nera River from the gorges downstream to Naidăş; in the Danube Gorges and downstream; empty shells in the Caraş River.

8. *Holandriana holandrii* (C. Pfeiffer, 1828) (syn. *Amphimelania holandrii*)

(Clessin, 1887): „Banat“; (Soós, 1943): „quoted by Kormos from Caraş“; (col. Grossu in „Grigore Antipa“ NMNH, leg. 1941, 1972): Nera from Sasca Montană; 1979 - Caraş from Grădinari; (Bănărescu & Arion-Prunescu, 1981): Caraş from Grădinari and Vrani; (Botoşăneanu & Negrea, 1976): Nera Gorges.

Original data: Caraş River at Goruia, Grădinari, Mercina, Vrani; Nera River from the Gorges down to Naidăş.

Familia Bithyniidae Troschel, 1857

9. *Bithynia tentaculata* (Linnaeus, 1758)

(Grossu, 1942): Timişoara; 1972 - puddles in the Danube's flood area at the Porţile de Fier; (Buşniţă et al., 1970): the Danube in the Porţile de Fier area, ponds at km 960, km 1000, km 1032; (Negrea, 1994): the Danube in Baziaş - Gura Văii sector, Moldova Veche, Mraconia (leg. 1975-1982), Cerna and Bahna; (Negrea & Popescu-Marinescu, 1992): gulfs and small lakes from km 1032-1015, at Cozla and km 961, at Ieşelniţa.

Original data: near the Mureş River in the Bezdin Lake; Aranca River in Munar - Periam sector; Caraş at Vrani; Nera River downstream Socol; very

abundant in the whole Danube's sector from Banat, sampled from all riverbed's substrata.

10. *Bithynia troschेलii* (Paasch, 1842)  
(Grossu, 1942) - ponds near Timișoara.  
Original data: Bega canal at Pustiniș (Glöer & Sîrbu, 2006).

Familia Hydrobiidae Troschel, 1857

- 11.\* *Potamopyrgus antipodarum* (J. E. Gray, 1843)  
An alien species, known in Romania until recently only from the Razim-Sinoie lagoonar system (Grossu, 1986, 1993), under the name *Potamopyrgus jenkinsi*.

Original data: beginning with 2002 it was found several times by the authors on Cerna River in a sector from Băile Herculane downstream. The species probably inhabits the river course down to its flow. It lives downstream the thermal spring outflows, as it happens in other European countries, on and under boulders close to the banks, in slow flow.

12. *Lithoglyphus naticoides* (C. Pfeiffer, 1828)  
(col. Bielz and col. Kimakowicz in NHMS): the Cazanele Mici and Orșova;  
(col. I. P. Licherdopol in „Grigore Antipa“ NMNH): the Danube at Ada Kaleh and Vârciorova (from here quoted as var. *aperta*) and Bega River at Timișoara; (Soós, 1943): along the Danube down to Orșova and in the Caraș; (Grossu, 1942): Bega canal at the entrance in Timișoara (also in col. „Grigore Antipa“ NMNH, leg. 1948); 1972 - Porțile de Fier - Orșova; (leg. 1961): from Nera at Sasca Montană; (Grossu, 1962): the Danube in Coronini - Turnu Severin sector; (Bușniță et al., 1970): the Danube in the Porțile de Fier area (km 943 - 1055); (Bănărescu & Arion-Prunescu, 1981): Caraș at Grădinari; Bănărescu leg. from Timiș at Peciu Nou and Bega at Timișoara (during the 1970s); (Negrea, 1994): the Danube in Baziaș - Gura Văii sector, from Moldova Veche, Svinița, Mraconia, Cerna, Bahna, Pescari and Orșova.

Original data: Bega River at Chizătău, Topolovătu Nou and Timișoara; Timiș River at Hitiaș, Șag and Grăniceri; Caraș River at Grădinari and Vrani; Nera Gorges and downstream Socol; in the Danube at Divici, Gornea, Cozla and Cazanele Mici.

13. *Lithoglyphus apertus* (Küster, 1852)

It is a controversial species; some authors consider it a subspecies or even a morph of *Lithoglyphus naticoides*, while others, among them A. V. Grossu (1987) and R. Bank (in Fauna Europaea) stand for its validity. It was quoted by Negrea & Popescu-Marinescu (1992) also from the Banat's Danube sector (between km. 1055 to 943).

14. *Bythinella dacica* Grossu, 1946

The validity of this endemic species was recently proved by both anatomical and molecular methods (Falniowski et al., 2009 a, b).

(col. Kimakowicz in NHMS): Anina precipice (these specimens were labeled by Kimakowicz as *B. austriaca*, but the most recent studies showed that this species is not present in Romania and that the only species of *Bythinella* living in the area is

*B. dacica*. Thus, we have strong evidence to assume the affiliation of these specimens to *B. dacica*.; (Grossu, 1974, 1986, 1999): from cold springs and rivulets close to 7 Izvoare („Seven Springs“), at Băile Herculane (Băile Herculane; leg. 1945, in col. „Grigore Antipa“ NMNH), from the Cerna Valley, Semenic and Țarcu Mountains, Timiș springs (at 1400 m).

Original data: rivulets tributaries of the Bega River at Valea lui Liman; brook flowing into Surduc Lake; along Cerna Valley in springs and rivulets, from Băile Herculane 20 km upstream.

Ordo Ectobranchia P. Fischer, 1884

Familia Valvatidae J. E. Gray, 1840

15. *Valvata cristata* O. F. Müller, 1774

(col. I. P. Licherdopol in „Grigore Antipa“ NMNH): from Ada Kaleh; (Negrea, 1994): the Danube in Baziaș - Gura Văii sector; (Grossu, 1974): unspecified puddles and ponds in the Bega basin.

16. *Valvata macrostoma* (Mörch, 1864)

A species with an uncertain status in the area. Possibly some samples quoted as *Valvata pulchella* by Negrea (1994) from the whole Danube, and some puddles or ponds by Grossu (1974), belong to this species.

17. *Valvata piscinalis* (O. F. Müller, 1774)

(Grossu, 1962): the Danube in the Coronini - Turnu Severin sector; (Grossu & Grossu, 1968): the Danube at Coronini, km 1042, Orșova; (Grossu, 1972): puddles in the Danube's flood area in the Porțile de Fier; 1974 - ponds and puddles, such as Țariga or Satchinez; 1986 - Freidorf pond near Timișoara; (Bușniță et al., 1970): the Danube in the Porțile de Fier area (km 943-1055); (Negrea, 1994): the Danube in the Baziaș - Gura Văii sector: Mraconia, Cerna, Bahna, Pescari and Orșova.

Original data: Bega canal at Pustiniș, downstream Timișoara; canal close to the Timiș River at Hitiaș; Nera downstream Socol; along the whole Danube's sector, more frequent in the banks' area; at Divici, Cazanele Mici, Cerna flow, Orșova.

Ordo Pulmonata Cuvier in Blainville, 1814

Familia Acroloxidae Thiele, 1931

18. *Acroloxus lacustris* (Linnaeus, 1758)

(Grossu, 1942): from the Bega River, puddles and marshes with much vegetation near Timișoara and Buhui Lake; 1956 – Țariga pond.

Original data: Bega River Valley at Sintești, in puddles from the flood area; Ochiul Beilului Lake, Nera River Basin.

Familia Lymnaeidae Lamarck, 1812

19. *Galba truncatula* (O. F. Müller, 1774)

(Negrea, 1966): Caraș River Basin; (Grossu, 1942): permanent marshes with aquatic vegetation at Timișoara.

Original data: Bega River at Chizătău; Timiș - Bega canal downstream Coșteiu; Caraș River at Goruia, Grădinari, Mercina and Vrani; the Danube Gorges;

it usually lives in the very neighbourhood of the banks, sometimes above the waterlevel, on all types of substratum.

20. *Stagnicola palustris* (O. F. Müller, 1774)

(Buşniţă et al., 1970): the Danube in the Porţile de Fier area, at Ieşelniţa, ponds at km 960 and 1000; (Grossu, 1942): permanent marshes at Timișoara; 1972 – the Danube at the Porţile de Fier, between the Gorges and Orșova, in the flood area; 1974 - puddles and ponds like Țariga or Satchinez; (Negrea, 1994): small lakes in the Danube's valley at km 1032 and 1000; (Negrea & Popescu-Marinescu, 1992; Negrea, 1994): Ieşelniţa.

Original data: Bega River at Sintești.

21.\* *Stagnicola turricola* (Held, 1836)

Original data: found in 2002 and 2004 at the Cerna flow, at the entrance in Orșova (based on anatomical evidence, confirmed by P. Glöer).

22. *Radix auricularia* (Linnaeus, 1758)

(Grossu, 1942): marshes at Ronat, Blașcovici, Kunst, Freidorf, Țariga, Timișoara.

Original data: Surduc Lake; Bega River at Chizătău and Pustiniș; Bega Veche River at Beregsău and Cenei; Caraș at Grădinari and Vrani; Nera downstream Socol; along the whole Danube's sector from Banat, especially near the banks and in the tributaries' outlets.

23.\* *Radix ampla* (Hartmann, 1821)

Original data: in the Cerna River, inhabiting from upstream Băile Herculane to downstream Topleț, identified on the basis of anatomical evidence by Glöer & Sîrbu (2006).

24. *Radix labiata* (Rossmässler, 1835)

(col. I. P. Licherdopol in „Grigore Antipa“ NMNH): Moldova Veche; (Grossu, 1955): Miniș Valley; 1967 - in col. „Grigore Antipa“ NMNH from Miniș at Bozovici; (Negrea, 1966): Comarnic Cave, entrance of Ponicoava, leg. 1965; Caraș River and Miniș River basins; (Buşniţă et al., 1970): the Danube in the Porţile de Fier area, Alibeg, Liuborajdea, Oravița, Mraconia; ponds at km 972, 1000, 1015, 1032; spring in Mraconia Valley; (Negrea, 1994): the Danube's Defile at km 1034, 1031, 1023, 1018 and Mraconia; small lakes at Cozla and Dubova (Negrea & Popescu-Marinescu, 1992).

Original data: puddles in the flood area of the Bega River downstream Luncaii de Sus; brook at Valea lui Liman; Timiș River valley, in the riverbed and tributaries, from upstream Teregova down to Armeniș; Nera River at Bozovici and along its gorges; brooks in the upper Cerna Valley downstream to Băile Herculane.

25. *Radix balthica* (Linnaeus, 1758) (syn. *Radix ovata*)

Some of the next quotations have to be regarded as uncertain, because there are no anatomical evidence of the identified specimens. (Buşniţă et al., 1970): the Danube in the Porţile de Fier area, Alibeg, Crușovița; puddles at km 960, 976, 1000; (Negrea, 1994; Negrea & Popescu-Marinescu, 1992): small lakes near the Danube at



km 1000 and 976, Mraconia, Ieşelniţa; (Grossu, 1972): ponds in the Danube's flood area in the Gorges - Orşova reach; 1974 - ponds and puddles at Țariga and Satchinez.

26. *Lymnaea stagnalis* (Linnaeus, 1758)

(col. Kimakowicz in NHMS): Bega River (leg. Traxler, 1890); (Grossu, 1942) - marshes from Timișoara, Ronaț, Blașcovici, Kunst, Freidorf, Țariga; 1972 - puddles in the Danube's flood area at Porțile de Fier.

Original data: Bega River at Topolovățu Nou; lateral canal of the Timiș River at Hitiaș; the Timișul Mort („the Dead Timiș“) at Jebel; Nera downstream of Socol; in the Danube, close to the banks at Baziaș.

Familia Physidae Fitzinger, 1833

27. *Physa fontinalis* (Linnaeus, 1758)

(Bușniță et al., 1970): the Danube in the Porțile de Fier area, Liuborajdea tributary, pond at km 1015, Cozla; (Grossu, 1974): ponds and puddles at Țariga and Satchinez; (Negrea, 1994): the Danube's Defile between km 1054–1031; (Negrea & Popescu-Marinescu, 1992): small lake at Cozla.

Original data: Nera River downstream Socol.

28. *Physella acuta* (Draparnaud, 1805)

(Bușniță et al., 1970): the Danube River in the Porțile de Fier area and the tributaries Bozneățca, Camenița and Mraconia; (Negrea, 1994): Mraconia (leg. 1972, 1974); (Negrea & Popescu-Marinescu, 1992; Negrea, 1994): Porțile de Fier dam lake, the Danube at km 1054, 1025, 1018.

Original data: the Mureș River banks between Săvârșin and Periam Port, and probably the whole river's lower sector; Bega River Valley in a pond at Valea lui Liman; Bega Veche („the Old Bega“) at Beregsău and Cenei; brook at Hitiaș (close to the Timiș River); Caraș River at Vrani; Cerna River along its banks on all substratum types, from downstream Băile Herculane to its flow into the Danube; in the whole Danube's sector from Banat.

Familia Planorbidae Rafinesque, 1815

29. *Planorbarius corneus* (Linnaeus, 1758)

(Ciessin, 1887): „in Banat“; the Danube at Moldova Veche and Ada Kaleh, also from Timiș (col. in „Grigore Antipa“ NMNH); (Grossu, 1942): marshes at Timișoara and surroundings; 1972 - ponds in the Danube's flood area at the Porțile de Fier area; (Bușniță et al., 1970): the Danube in the Porțile de Fier area and ponds at km 960, Ieşelnița; (Sárkány-Kiss, 1983): Mureș River at Săvârșin, Băluța, upstream and downstream of Chelmac; (Negrea, 1994; Negrea & Popescu-Marinescu, 1992): small lakes in the Danube's Valley at km 1032, 1025 (Camenița), km 1015 (Cozla), km 1000 and 961 (Ieşelnița).

Original data: Bezdin Lake, close to the Mureș River, Aranca River's sector between Bezdin and Periam; Bega River at Remetea and Pustiniș; „Dead Timiș“ River at Jebel; Nera downstream Socol; sporadically along the whole Danube's sector from Banat, especially close to the banks and in gulfs with vegetation.

30. *Planorbis planorbis* (Linnaeus, 1758)

(col. „Grigore Antipa“ NMNH): Vârciorova; (Grossu, 1942, 1955): Bega canal at Timișoara, among plants close to the bank and in permanent marshes; 1972 – the Danube’s ponds and flood area in the Porțile de Fier area (between the Cazanele Mici and Orșova); (Bușniță et al. 1970): the Danube in the Porțile de Fier area; ponds at km 960 at Ieșelnița, km 1000, km 1015 (Cozla), km 1025 (Cămenița), km 1032; (Sárkány-Kiss, 1983): Mureș River at Săvârșin, Băluța, at Chelmac and downstream; (Negrea & Popescu-Marinescu, 1992; Negrea, 1994): the Danube in the Porțile de Fier first damlake; small lakes at km 1032, km 1025 at Cămenița, km 1015 at Cozla, km 1000 and km 961 at Ieșelnița. Although Grossu (1942) reported also *Planorbis carinatus* O. F. Müller, 1774 from marshes close to Timișoara, there is some evidence that it was a morph of *P. planorbis*. Up to present there is no reliable proof of *P. carinatus*’ presence in Banat.

Original data: Bezdin Lake; Aranca River in Munar – Periam sector; lateral canal and brook at Hitiaș in the Timiș River Valley; „Dead Timiș” at Jebel; in the Danube at the Cerna River flow and at Orșova, in fluvial bays.

31. *Anisus spirorbis* (Linnaeus, 1758)

(col. Blz. in NHMS, and Bielz, 1867): Bistra River close to the Transylvanian Iron Gate (upstream of Bucova, Timiș River Basin); (Grossu, 1974): ponds and puddles from Banat, like Ronaț, Blășcovici and Kunst; (Negrea, 1994): the Danube at Berzasca (Negrea & Popescu-Marinescu, 1992).

Original data: Cerna River flood area, in puddles covered with aquatic and paludal flora, 4 km upstream Topleț.

32. *Anisus calculiformis* (Sandberger, 1874)

(Grossu, 1942): Bega canal at Timișoara, among plants close to the bank; 1974 - ponds and puddles from Banat. Probably the individuals found by Grossu in marshes at Timișoara, and quoted as *Anisus rotundatus* are in fact *Anisus calculiformis*. Despite the fact that *A. rotundatus* was later usually ascribed to *Anisus leucostoma* (Millet, 1813) it is questionable if the latter is able to survive at such low altitudes (up to the present it was reported in Romania only from mountain or hilly regions). Anyhow, in 1955, Grossu quoted „*Anisus leucostomus*“ from Timișoara, but he revised his opinion, and did not include this species in the Banat fauna. It is still a matter of question, to be solved in the future.

33.\* *Anisus vortex* (Linnaeus, 1758)

Original data: „Dead Timiș” at Jebel; Nera River downstream Socol („the Dead Nera“); empty shells close to the Danube’s River bank near Divici.

34. *Anisus vorticulus* (Troschel, 1834)

(Grossu, 1942): permanent marshes covered by vegetation at Timișoara; Bega canal, among vegetation near the bank; 1972 - puddles from the Danube’s flood area in the Porțile de Fier area, between the Gorges and Orșova; (in col. „Grigore Antipa“ NMNH): Freidorf pond at Timișoara, leg. Grossu, 1946.

35. *Gyraulus albus* (O. F. Müller, 1774)

(Grossu, 1942): Timișoara, in Țariga pond and Bega canal; 1972 - the Danube’s puddles and flood area between the Gorges and Orșova; (Bușniță et al., 1970): the Danube in the Porțile de Fier area, ponds at km 960 (Ieșelnița), km 972

(Dubova), km 1015 (Cozla); (Negrea, 1994): the Danube at Ieşelniţa and Bahna, small lakes at Cozla, Dubova and Ieşelniţa.

Original data: the Bega Veche (Old Bega) at Cenei; lateral canal of the Timiş River at Hitiaş; in the Danube's fluvial bay at the entrance in the Mraconia Valley, especially among aquatic vegetation; the same habitat type at the Cerna River flow at Orşova.

36. *Gyraulus laevis* (Alder, 1838)

(Soós, 1943): Arad; (Buşniţa et al., 1970): the Danube in the Porţile de Fier area (km 943-1055); (Grossu, 1987): Timişoara, ponds close to the Bega River; (Negrea, 1994): the Danube, in the Porţile de Fier first dam lake, and between km 1055-943 (Negrea & Popescu-Marinescu, 1992).

Original data: Cerna River 4 km upstream of Topleţ; the Danube downstream the Gorges from shallow water with aquatic vegetation; the Mala tributary flow; the Cerna flow fluvial bay at Orşova.

37. *Gyraulus (Armiger) crista* (Linnaeus, 1758)

(Grossu, 1942, 1955, 1974, 1987): Ţariga and Freidorf ponds at Timişoara, and also from the Aranca River.

38. *Hippeutis complanatus* (Linnaeus, 1758)

(Grossu, 1942): permanent marshes covered with aquatic vegetation at Timişoara; (col. „Grigore Antipa“ NMNH): Freidorf pond, leg. Grossu, 1946; 1987 - Lacul Dracului (The Devil's Lake) in the Nera Gorges.

Original data: the Danube Valley in the Mraconia fluvial bay, close to the bank, among vegetation.

39. *Segmentina nitida* (O. F. Müller, 1774)

(col. „Grigore Antipa“ NMNH): Satchinez, leg. Grossu, 1965.

40. *Ferrissia wautieri* (Mirolli, 1960) (syn. *Ferrissia (Pettancylus) clessiniana* (Jickeli, 1882))

(Grossu, 1987): Freidorf pond at Timişoara; Buhui Lake.

Original data: Bezdin Lake in Mureş River Basin; Bega River at Chizătău (empty shells) and at Pustiniş, on plants; Mraconia fluvial bay in the Danube's Valley.

41. *Ancylus fluviatilis* O. F. Müller, 1774

(col. Bielez in NHMS): Cerna River at Mehadia; (Grossu, 1942): „in Banat“; 1955 - Miniş Valley, Băile Herculane, Nera, Beiu Sec, Caraş rivers, in the surroundings of Timişoara; (col. „Grigore Antipa“ NMNH): leg. Grossu, 1956 from the Cerna River at Băile Herculane; (Grossu, 1972): Porţile de Fier, outflow of some Danube's tributaries; 1974 - „all mountain waters with stony substratum from Banat“; (Buşniţa et al., 1970): the Danube in the Porţile de Fier area - the tributaries Plavişeviţa, Mraconia, Ieşelniţa, Cerna and Vodiţa; ponds at km 960 (Ieşelniţa), km 1000, km 1015 (Cozla), km 1025 (Camenita); (Botoşăneanu & Negrea, 1976): Nera Gorges; (Negrea & Popescu - Marinescu, 1992; Negrea, 1994): the Danube confluence with Mraconia tributary (leg. 1974 and 1975); confluence with the tributaries Plavişeviţa (km 976), Ieşelniţa (km 961), Cerna (km 954) and Vodiţa (km 953); small lakes at Cameniţa (km 1025), Cozla (km 1015), Ieşelniţa (km 961).

Original data: along the Bega River from Luncanii de Sus to Sintești; Timiș River from the springs area to Petroșnița (upstream Caransebeș); Caraș River from the Gorges to Grădinari; Nera River from Pătaș to Naidăș; the Cerna River from 20 km upstream Băile Herculane down to its flow into the Danube, in its tributary Belareca. In most small tributaries of the Danube, occasionally around their flow: Liubotina, Mraconia, Ogralena, Mala.

Classis Bivalvia Linnaeus, 1758  
Ordo Unionoida Stoliczka, 1871  
Familia Unionidae Rafinesque, 1820

42. *Unio pictorum* (Linnaeus, 1758)

(Grossu, 1962): Niarad pond at Timișoara (leg. 1943); the Danube in the Coronini - Turnu Severin reach and ponds in the flood area; (Bușniță et al., 1970): the Danube in the Porțile de Fier sector (km 943-1055); (Sárkány-Kiss, 1983): the Mureș River at Chelmac.

Original data: along the Timiș River between Hitiaș and Șag; Caraș River at Vrani; empty shells in the Bega at Chizătău and in the Old Bega at Beregsău; in the whole riverbed of the Danube at Baziaș, close to the bank downstream of Moldova Veche, at the Cornea tributary outflow, and at Cozla.

43. *Unio tumidus* Philipsson, 1788

(Grossu, 1962; Grossu & Grossu, 1968): the Danube in the Coronini and Turnu Severin sector; (Bușniță et al., 1970): the Danube in the Porțile de Fier area (km 943 - 1055); (Sárkány-Kiss, 1983): Mureș River at Chelmac; 1989 - the lower sector of the Mureș River.

Original data: Timiș - Bega canal at Coșteiu, empty shells at Chizătău; Timiș River at Șag; Caraș River at Vrani; Nera at Socol; in the Danube from Baziaș, Divici, Cozla, Moldova Veche, Cazanele Mici.

44. *Unio crassus* Lamarck, 1819

(Kobelt & Haas, 1911, ap. Grossu, 1962): Mureș River at Arad; (Grossu, 1962): in Bega close to Timișoara and surroundings, Timiș River at Lugoj, Mureș at Arad; (Bușniță et al., 1970): the Danube in the Porțile de Fier area (km 943-1055); (Botoșăneanu & Negrea, 1976): Nera Gorges; (Popescu & Prunescu-Arion, 1961; Grossu, 1962): in the Danube in Coronini - Turnu Severin sector; (Sárkány-Kiss, 1983): Mureș River at Chelmac.

Original data: Bega between Sintești and Chizătău; Timiș-Bega canal at Coșteiu; Timiș River at Găvojdia, Hitiaș and Șag; Caraș from Goruia, down to Grădinari, Mercina and Vrani; Nera between Bozovici and Naidăș; only empty shells from the Danube at Cozla; probably extinct in the lower Mureș River. Because of the dams built at the Porțile de Fier it became most likely extinct from this Danube's sector.

45. *Anodonta cygnaea* (Linnaeus, 1758)

(Sárkány-Kiss, 1983): Mureș River at Chelmac.

Original data: Mureș River upstream of Arad (leg. Doru Bănăduc); Bega River at Topolovațu Nou; Timiș-Bega canal at Coșteiu; Timiș River at Hitiaș and

Şag; Caraş River at Vrani; Nera at Socol; in the Danube at Baziaş, Divici, Moldova Veche, Cozla, Cazanele Mici and Mraconia bay (surely the whole Danube's sector from Banat).

46. *Anodonta anatina* (Linnaeus, 1758)

(Buşniţă et al., 1970) quoted as *A. piscinalis* from the Danube in the Porţile de Fier area.

Original data: Bega River Valley in a pond at Valea lui Liman; Surduc Lake; Bega River at Chizătău; Timiş River at Găvojdia, Hitiaş and Şag; Timiş-Bega canal at Coşteiu; Caraş River at Grădinari; in the Danube at Baziaş; empty shells downstream the Gornea flow.

47. *Sinanodonta woodiana* (Lea, 1834)

In the lower Mureş River at Pecica (Sárkány-Kiss, *in verbis*, 2001).

Original data: Bega River at Chizătău; Timiş River at Hitiaş and Şag; Caraş River at Vrani (first sampled from Banat in 1998 by the authors) and Mercina; in the Danube at Baziaş (close to the bank, thousands of young individuals), at Divici, downstream of Gornea flow, Mraconia bay in the Cazanele Mici, Cerna fluvial bay at Orşova.

48. *Pseudanodonta complanata* (Rossmässler, 1835)

(Grossu, 1942): Bega at Timişoara, from a canal with sandy substratum; 1962 - from the Danube at Moldova Nouă; (Sárkány-Kiss, 1983): Mureş River at Chelmac.

Original data: Timiş River at Hitiaş and Şag; along the Danube only empty shells found in sediments.

Ordo Veneroida H. & A. Adams, 1856

Familia Corbiculidae J. E. Gray, 1874

49. *Corbicula fluminea* (O. F. Müller, 1774)

This species was first sampled in Romania from the Danube in the Porţile de Fier sector, at Berzasca and Moldova Nouă, in 1997 (Skolka & Gomoiu, 2001) and in 1999 from Vadu Oii, by Bij De Vaate & Hulea (2000). As yet, it lives along the whole Romanian Danube's course and in the Danube Delta.

Original data: sampled along the whole Danube's sector from Banat, between Baziaş and Turnu Severin.

Familia Sphaeriidae Deshayes, 1855 (1820)

50. *Sphaerium corneum* (Linnaeus, 1758)

(Sárkány-Kiss, 1988): Mureş River at Pecica.

Original data: Bega River at Topolovăţu Nou.

51. *Sphaerium rivicola* (Lamarck, 1818)

(Grossu, 1962): along the Danube.

Original data: along the whole Danube's sector from Banat, between Baziaş and the Gorges.

52. *Musculium lacustre* (O. F. Müller, 1774)

(Sárkány-Kiss, 1989): sporadic in the lower Mureş Valley, in the flood area, in shallow waters, muddy ditches, puddles and dead branches.

Original data: canals in the Bezdin area (Aranca Valley); in the Cazanele Mici and Mraconia fluviatile bay, at the flow of Cerna River at Orşova.

53.\* *Pisidium amnicum* (O. F. Müller, 1774)

Original data: Bega River at Chizătău and Topolovăţu Nou; Timiş River at Şag; Caraş River at Grădinari; Nera River in the Gorges and at Naidăş; Cerna River at its entrance in the Timiş-Cerna corridor; the Danube Gorges and rivulet tributary of the Danube, upstream Divici.

54.\* *Pisidium casertanum* (Poli, 1791)

Original data: Timiş River basin in rivulets at Teregova and upstream, ponds at Petroşniţa; Nera River along the Gorges downstream to Socol; Bega River Basin in puddles close to the river at Luncanii de Sus; rivulet tributary to the Danube River at Coronini, Cerna River flow in the Danube, close to Orşova.

55. *Pisidium personatum* Malm, 1855

(col. Grossu in „Grigore Antipa“ NMNH, leg. 1955): spring at Sasca Montană, from the Nera River Basin.

Original data: springs at Surduc Lake (Bega River Basin); rivulet close to Teregova (Timiş River Basin); Cerna River Valley, brooks and springs in the 7 Izvoare area, and in the Cerna River at its entrance in the Timiş-Cerna corridor; in the Danube Valley, rivulet upstream of Coronini and in the Mala tributary close to its flow into the Danube.

56.\* *Pisidium henslowanum* (Sheppard, 1823)

Original data: Bega River at Topolovăţu Nou; the Danube River upstream of Divici, close to the banks; in the Cazanele Mici area.

57.\* *Pisidium milium* Held, 1836

Original data: small canal covered with vegetation near the Timiş River at Hitiaş.

58.\* *Pisidium subtruncatum* Malm, 1855

Original data: Bega River at Topolovăţu Nou; Timiş Basin, Trei Ape Lake, rivulets in the Timiş - Cerna corridor at Teregova, puddles along the riverbank at Petroşniţa (upstream of Caransebeş); Caraş River at Grădinari; Nera River from the Gorges downstream to Socol; Cerna River downstream Topleţ, in fine sediments close to the riverbanks; the Cazanele Mici and in the Mraconia fluviatile bay.

59.\* *Pisidium moitessierianum* (Paladilhe, 1866)

Original data: Bega River at Chizătău.

## Familia Dreissenidae J. E. Gray, 1840

60. *Dreissena polymorpha* (Pallas, 1771)

(Grossu, 1962): the Danube in the Coronini - Turnu Severin sector; (Grossu & Grossu, 1968): Coronini, km 1042 and Orşova; (Buşniţa et al., 1970): the Danube in

the Porțile de Fier area (km 943-1055); and many other sources quoted it from the same sector.

Original data: the whole Danube's sector from Banat, from Baziaș downstream to Orșova, sampled from all depths, mainly from solid substratum (stones, wood, concrete, other species' shells, etc.).

#### 61. *Dreissena bugensis* (Andrusov, 1897)

Although up to the present this alien invasive species was not sampled in the Banat Danube's sector, it is almost impossible that it does not populate this stretch, being first sampled from the Danube at Cernavodă (Micu & Telembici, 2004), than it was found in 2005 close to the Banat's sector downstream edge, at Drobeta Turnu Severin (Popa & Popa, 2006 a, b). Soon afterwards Molloy et al. (2007) quoted it from The Netherlands and Imo et al. (2010) from Germany. All sources point out that its expansion in Europe occurred from East towards West, by means of the Danube - Main - Rhine canals. Therefore, finding this species in Banat is just a matter of time, thus we include it in this catalogue.

### DISCUSSION

Among the 61 freshwater mollusc species identified up to the present in Banat, 10 are reported for the first time by the authors of the present paper, while 10 species have not been found again after 1998, but their presence is still highly likely in this area. Probably the single taxa that went extinct is *Theodoxus transversalis*, due to environmental debasement and pollution, like it happened also in other areas, like Transylvania, Crișana, and the rest of the Danube's sector from Romania and other countries from Central Europe. A synthesis regarding the total number of species encountered in the researched rivers' basins from Banat is given in table 1 and plotted in figure 1.

Table 1

The freshwater mollusc species identified in Banat (past and present-day data).

Hydrographic basin Species	Danube's sector from Banat	Cerna River Basin	Nera River Basin	Caraș River Basin	Timiș River Basin	Bega River Basin	Mureș sector from Banat
1. <i>Theodoxus transversalis</i>	•		•				•
2. <i>Theodoxus fluviatilis</i>	▲						
3. <i>Theodoxus danubialis</i>	▲		▲	▲		•	
4. <i>Viviparus contectus</i>						•	•
5. <i>Viviparus acerosus</i>	▲		▲	⊕	⊕	⊕	▲
6. <i>Fagotia esperi</i>	▲		▲	⊕	•		
7. <i>Fagotia d. acicularis</i>	▲		▲	⊕	•		
8. <i>Holandriana holandrii</i>			▲	▲			
9. <i>Bithynia tentaculata</i>	▲		▲	▲		•	▲
10. <i>Bithynia troschelii</i>						▲	•
11. <i>Potamopyrgus antipodarum</i>		▲					





Table 1 (continued)

Hydrographic basin Species	Danube's sector from Banat		Cerna River Basin		Nera River Basin		Caraş River Basin		Timiş River Basin		Bega River Basin		Mureş sector from Banat	
	▲	●	▲	●	▲	●	▲	●	▲	●	▲	●	▲	●
52. <i>Musculium lacustre</i>	▲												▲	●
53. <i>Pisidium amnicum</i>	▲		▲		▲		▲		▲		▲			
54. <i>Pisidium casertanum</i>	▲				▲				▲		▲			
55. <i>Pisidium personatum</i>	▲		▲			●			▲		▲			
56. <i>Pisidium henslowanum</i>	▲										▲			
57. <i>Pisidium milium</i>									▲					
58. <i>Pisidium subtruncatum</i>	▲		▲		▲		▲		▲		▲			
59. <i>Pisidium moitessierianum</i>											▲			
60. <i>Dreissena polymorpha</i>	▲	●												
61. <i>Dreissena bugensis</i>		?	●											
Total by column	37	34	11	2	22	11	19	9	24	5	29	32	9	14
TOTAL BY BASIN	48		11		25		21		25		45		18	
New identified in the river basin	13		9		14		12		21		13		4	

Used codes: ▲ - identified by the authors, beginning with 1998 up to the present; ● - reported by other authors before 1998 or present in older collections from Sibiu and Bucharest; ? - doubtful status or report; ⊕ - only empty shells have been found by the authors.

Among the rivers' basins from Banat the highest number of species (48, among them 37 recently found by the authors) is sheltered by the Danube's River sector, followed by the Bega River Valley, while in the Cerna River the lowest range of taxa was encountered. The rest of the researched basins are characterized by intermediate aquatic Mollusca fauna richness. Diversity of the fauna is linked to the basin's surface, range of altitudes and habitats' categories and heterogeneity, environmental state and degree of pollution.

Regarding the uncertain systematical status, we highlight that of *Lithoglyphus apertus*, which has to be solved in the future. Some subspecific taxa were critically discussed in the literature, like it happened with the *Holandriana holandrii* subspecies considered by Grossu (1986, 1993), but put under question by Sîrbu (1998), being most likely morphs or ecological forms, without systematical significance. The status of the endemic *Bythinella dacica* Grossu, 1946 was confirmed by recent molecular studies (Falniowski et al., 2009 a, b), while the presence in Romania of *Bythinella austriaca* (reported from Banat, Crişana, Transylvania and Maramureş) was invalidated, i.e. the spring-snails sampled from these areas were assigned to other 6 species, among them four being new to science (idem). In Banat the most distinctive freshwater mollusc communities are the extremely abundant prosobranchs from Nera and Caraş rivers (belonging to *Holandriana*, *Fagotia* and *Theodoxus* genera). These communities are unique in Romania and one of the very seldom encountered in Europe as well. A recent molecular phylogeny research concerning some Melanopsidae, including *Fagotia acicularis* from Răbăgani (the species living also in Banat) and *Melanopsis parreysii* from Ochiul Mare, Băile 1 Mai [1 May Resort] (both in Bihor county,

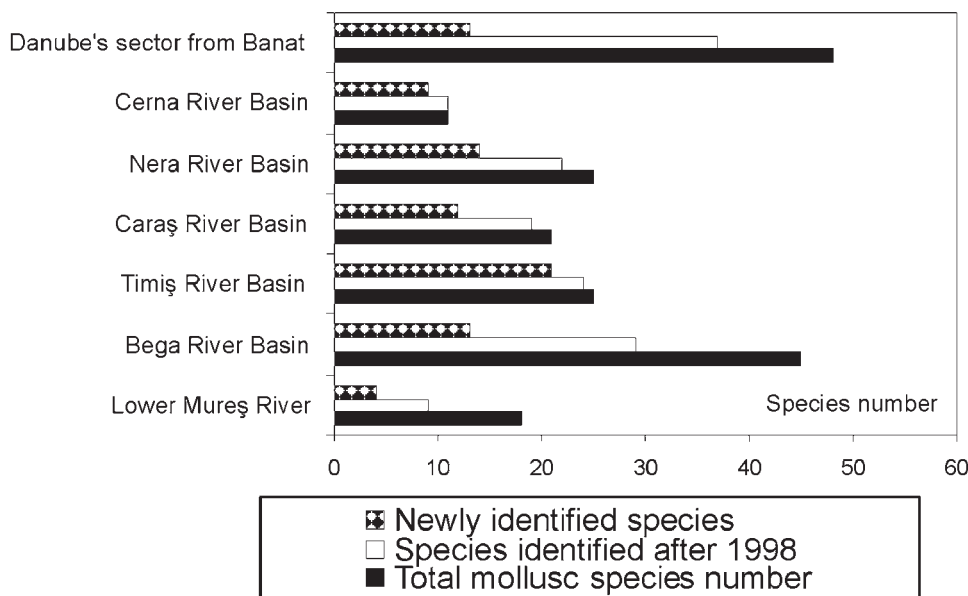


Fig. 1 - Distribution of freshwater mollusc species in the researched rivers' basins from Banat.

Crișana region, Romania) was published by Smoleń & Falniowski (2009). According to the maximum likelihood trees based on sequences of ribosomal 18S confirm the placement of the Melanopsidae within the Cerithioidea, as well as the monophyly of the latter group, while the sequences of mitochondrial COI-based tree confirms the placement of the Melanopsidae within the Cerithioidea, but does not confirm the monophyly of either Melanopsidae or Cerithioidea. The results suggest that *Fagotia* should be synonymised with *Melanopsis*, while *Holandriana* is a distinct genus. The application of molecular clock, with one point calibration for COI for the Hydrobiidae, estimated the times of divergence as  $2.53 \pm 0.56$  Mya for *M. parreyssii* and *F. acicularis*,  $9.49 \pm 1.67$  Mya for *M. parreyssii* and *H. holandrii*, and  $10.71 \pm 1.88$  Mya for *F. acicularis* and *H. holandrii*. 2.5 Mya coincides with the beginning of the glacial period in Europe, and 8–12 Mya was the time when the Pannonian Lake covered the largest area.

Questions have to be raised also for the Unionidae. Along the time, several subspecies, varieties or forms have been described or recognized by several authors (Kobelt & Haas, 1911; Grossu, 1962 etc.) which we consider today morphs or ecological forms, without systematic status. The hystorical data, regarding the problematic discrimination between *Anodonta cygnaea* and *Anodonta antina*, are also doubtful until further evidence.

Besides the systematic uncertainties, there are also some species for which we do not have the evidence of their presence, yet, like *Anisus leucostoma* and *Dreissena bugensis*.

The quagga mussel *Dreissena rostriformis bugensis*, native to the Dnieper and the northern Black Sea, has become a major invasive species both in the Volga River and the North American Great Lakes since the early 1990's (Popa, 2008; Imo et al., 2010). Most likely it already inhabits scattered sectors along the Danube, Main and Rhine rivers, as several sources indicate (Micu & Telembici, 2004; Popa

& Popa, 2006 a, b; Molloy et al., 2007; Popa, 2008; Imo et al., 2010). Its East towards West expansion occurred through the Danube - Main canal, a pathway that is becoming increasingly recognized as a southern corridor for the potential movement of non-indigenous aquatic species between Eastern and Western Europe (Molloy et al., 2007). In the present, its alien range in Central and Eastern Europe includes the Rhine river and the Delta (idem), the Main and the Main-Danube canal in Germany (Imo et al., 2010). Several genetic analysis were made, pointing the high population diversity, the lack of funder effect, the low differentiation between the German, North American and the Southeast Danube populations (Popa & Popa, 2006 a, b; Popa et al., 2007; Popa, 2008; Imo et al., 2010). According to Imo et al. (2010) the genetic data suggest that the invasive populations from Germany derive from a common and rapidly expanding source. Based on the non-continuous distribution and shell size differences of Rhine harbour and Main populations, their results indicate that expansion in Germany involved at least two independent settling events, one of which happened before 2005, and most likely was caused by jump dispersal (idem).

*Corbicula fluminea*, also an alien invasive species, used the same way (Rhine - Main - Danube), but vice-versa, namely from West towards East (Popa, 2008). In Romania it was first encountered at Berzasca, in the Porțile de Fier area in 1997 (Skolka & Gomoiu, 2001), two years later it was found downstream, at Vadu Oii (Bij De Vaate & Hulea, 2000). In the present, it inhabits the whole length of the Danube. Other non-indigenous species, which invaded during the last decades the waters from Banat, are *Sinanodonta woodiana* (its dispersal history was established in several papers, like Sîrbu & Sîrbu, 1998; Sárkány-Kiss et al., 2000; Sîrbu et al., 2006; Popa, 2008 etc.), *Potamopyrgus antipodarum*, found in Cerna River downstream Băile Herculane, being confined to the natural thermal water outflows, and *Physella acuta*.

Concerning the ecological characteristics and categories, Bănărescu & Sîrbu (2002) classified the species from Banat in 5 categories, namely: (1) inhabitants of small mountain brooks, (2) rheo-oxyphilic species, inhabiting flowing waters, (3) species inhabiting mainly lowland rivers, on soft (sandy and muddy) substratum, (4) species inhabiting stagnant or slow-flowing waters, pools, ponds or marshes, being found mainly on plants, sometimes on muddy or sandy substratum and (5) ubiquitous euribiont species, inhabiting all kind of waters, prevailing in eutrophised habitats. The peculiar features of the Banat Mollusca fauna are the evenness of these categories, which are all well represented, and the extremely abundant and widely distributed prosobranchs, which in the rest of the country are scarce, scattered, with a low number of species per site. The Nera Gorges appear to be still one of the last river sectors with pristine conditions, close to the natural state, but these conditions become increasingly altered downstream.

Once there were encountered rich prosobranch communities both in lower sectors of the Nera and Caraș rivers, as was stated by Bănărescu & Oprescu (1971), Bănărescu & Arion-Prunescu (1981, 1982, 1983). In the present, the former communities are almost absent or severely damaged because of organic pollution (especially discharges of household wastewaters), but also from local industries and hydrotechnical plants. For instance during the last years in the Nera River close to Latina and downstream of Naidăș, as well as in the Caraș River upstream of Mercina towards Vrani, there have been found only scattered individuals of some few

prosobranchs, instead of the former rich and abundant community, quoted by several sources in the 20<sup>th</sup> century. These sectors show a high load of organic matter.

Riverbanks damming and other hydro technical works are extremely aggressive along the Timiș River's course and on the Bega, especially in the last decades. The Bârzava River is the most polluted because of industrial wastewater discharges.

Thus, although rich and in some areas very abundant, the freshwater mollusca fauna from Banat is increasingly endangered because of anthropogenic environmental changes, desiccation and draining of wetlands, sediments' exploitation, debasement of the flood areas and both industrial and - during the last decade especially raised - household pollution. To all these threats the invasion of alien species has to be added.

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#### MOLUȘTELE ACVATICE DULCICOLE DIN BANAT (ROMÂNIA)

##### REZUMAT

Fauna moluștelor acvatice din Banat cuprinde 61 de specii (dintre care 41 de gastropode și 20 specii de bivalve). 10 specii sunt nou identificate în această arie de către autori. Această lucrare prezintă catalogul sistematic și chorologic al malacofaunei dulcicole, evidențierea elementelor cele mai caracteristice și semnificative, a amenințărilor reprezentate de impactul antropic asupra apelor din zonă și a comunităților de moluște din acestea.

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