CONSIDERATIONS REGARDING THE LAND SNAILS FROM THE UPPER TIMIȘ RIVER VALLEY (BANAT, ROMANIA)

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ABSTRACT

The paper focuses on land snail fauna from the upper Timiș River valley. The analyzed material originates from seven locations starting with the Trei Ape area (Semenic Mountains) and ending with Petroșnița (upstream Caransebeș). Samplings were made during one campaign in August 2012. A total of 24 species was identified, belonging to 14 families. The area analyzed exhibits a reduced diversity due to the type of substratum represented by crystalline schist, the conifer dominated vegetation in the mountain area, and the anthropogenic impact of tourism, intensive grazing, cutting of woody vegetation in meadows and waste storage. The presence in Sadova Veche of the species *Drobacia banatica*, listed on Annex II of the EU Habitats Directive, underlines the importance of riparian habitat preservation for the conservation and dispersion of land snail species.

RÉSUMÉ: Quelques considérations sur les gastéropodes terrestres de la rivière Timiș (Roumanie).

Le travail présente quelques aspects concernant la faune des gastéropodes terrestres du cours supérieur de la rivière Timiș (Banat, Romania). Le matériel analysé provient des sept points de prélèvement localisés entre Trei Ape (Montagne du Semenik) et Petroșnița (en amont de Caransebeș). Les prélèvements ont été réalisés au cours d'une seule campagne en août 2012. 24 espèces de gastéropodes terrestres appartenant à 14 familles ont été identifiées. La zone analysée possède une diversité très faible en gastéropodes terrestres, d'une part, en raison de la nature du substrat, représenté par des schistes cristallins dans la région montagneuse, et la végétation dominée par la présence de conifères, d'autre part, à cause de l'impact anthropique caractérisé par le tourisme, le pâturage intensif, la coupe de la végétation ligneuse des prairies et du stockage des déchets. La présence de *Drobacia banatica*, espèce de l'annexe II de la Directive Habitats, à Sadova Veche, souligne l'importance des habitats riverains pour la préservation et la dispersion des espèces de gastéropodes terrestres.

REZUMAT: Considerații privind moluștele terestre din valea râului Timiș (România).

Lucrarea prezintă aspecte privind fauna de gastropode terestre din bazinul Timișului superior. Materialul analizat provine din șapte puncte de colectare localizate în zona Trei Ape – Petroșnița, colectările fiind realizate în cursul unei campanii unice în 2012. În urma analizei materialului au fost identificate 24 specii de gastropode terestre, aparținând la 14 familii. Zona analizată prezintă o diversitate foarte scăzută, datorată tipului de substrat reprezentat de șisturi cristaline și vegetației din zona montană dominată de prezența coniferelor, dar și modificărilor de origine antropică - turism, pășunat intensiv, tăieri ale vegetației lemnoase din lunci, depozitare de deșeuri. Prezența speciei *Drobacia banatica*, specie din anexa II a Directivei Habitats la stația Sadova Veche, subliniază importanța conservării habitatelor ripariene pentru conservarea și dispersia speciilor de gastropode terestre.

INTRODUCTION

The humidity is one of the major factors affecting land snails, with essential effect on their distribution pattern. Some of the terrestrial gastropod species have developed physiological mechanisms to overcome desiccation, but most of them need large amounts of water in order to survive (Burton, 1983; Ward and Slotow, 1992). As they are animals with low mobility, the land snails are among the most vulnerable to the habitat fragmentation, process that has been rapidly accelerated by human activities (Nekola, 1999; Lindenmayer and Fischer, 2006; Mysák and Horsák, 2011). The development of agriculture has substantially reduced the extent of the habitats which are suitable for land snails especially in plains and plateau areas. Among these areas, the river valleys are between the habitats that are the most likely to preserve suitable conditions for land snails presence and therefore they are very important both for conservation and dispersion of land snail species.

The south western area of Romania has one of richest land snail faunas of Romania, due to the Mediterranean climatic influence. Nevertheless, the presence of extended limestone substratum, as in some areas like the Semenic Mountains, which are build on crystalline schist, offer different conditions to land snail development. The present study focuses on land snail fauna of the upper Timiș River valley (Banat, Romania).

MATERIAL AND METHODS

Samples were taken from seven sampling points, located in the upper course of the Timiș River, starting in Semenic Mountains near the spring (Trei Ape) at 870 m altitude and ending in Petroșnița (near Caransebeș), in the plateau area at 250 m altitude. The sampling points are represented in figure number 1.

Semi quantitative samples were taken by collecting all the snails found in one hour (Cameron and Pokrysko, 2005). All the living snails and fresh shells were considered. The biologic material was identified using Grossu (1981, 1983 and 1987). The results were used to build the list of land snail species. Nomenclature follows Fauna Europaea v. 2.4 (Bank, 2011). Cluster analysis was performed using SYSTAT v 12.0 (Systat Software, 2009).

Figure 1: Sampling: S1 - Trei Ape upstream the lake; S2 - Trei Ape downstream the lake; S3- Teregova; S4 - Armeniș; S5 - Sadova Veche; S6 - Buceșnița; S7 - Petroșnița.

RESULTS AND DISCUSSION

A number of 24 land snail species were found in the seven sampling stations, their occurrence is presented in table number 1. The seven analyzed sampling stations can be grouped considering their geographic location in three distinct groups.

Table 1: The distribution in the area, ecology, and zoogeography of the terrestrial gastropods from Upper Timiș River valley. Abbreviation: humidity preferences: H - hygrophylous, MH - mesohygrophylous, M - mesophylous; *old empty shells.

Taxa	zoogeography	humidity preferences	sampling stations
Fam. Carychiidae Jeffreys, 1830			
<i>Carychium tridentatum</i> (Risso, 1826)	European	H	1, 2, 4
Fam. Cochlicopidae Pilsbry, 1900			
<i>Cochlicopa lubrica</i> (O. F. Müller, 1774)	Holarctic	H	4
Fam. Valloniidae Morse, 1864			
<i>Acanthinula aculeata</i> (O. F. Müller, 1774)	European	M	4
Fam. Punctidae Morse, 1864			
<i>Punctum pygmaeum</i> Draparnaud, 1801	European	M	3,4
Fam. Clausiliidae A. Schmidt, 1857			
<i>Cochlodina laminata</i> (Montagu, 1803)	European	MH	3,4
<i>Alinda viridana</i> (Rossmässler, 1836)	Endemic	MH	1
<i>Alinda biplicata</i> (Montagu, 1803)	European	MH	4
Fam. Arionidae Gray, 1841			
<i>Arion circumscriptus</i> Johnston, 1828	European	MH	2
Fam. Vitrinidae Fitzinger, 1833			
<i>Vitrina pellucida</i> (O. F. Müller, 1774)	Holarctic	M	1
Fam. Gastrodontidae Tryon, 1866			
<i>Zonitoides nitidus</i> (O. F. Müller, 1774)	Holarctic	H	4
Fam. Pristilomatidae Cockerell, 1891			
<i>Vitrea diaphana</i> (Studer, 1820)	European	MH	3
<i>Vitrea crystallina</i> (O.F. Müller, 1774)	European	MH	1, 2
Fam. Oxychilidae Hesse, 1927 (1879)			
<i>Aegopinella pura</i> (Alder, 1830)	European	M	1
<i>Aegopinella minor</i> (Stabile, 1864)	Central-South E	MX	4
<i>Morlina glabra</i> (Rossmässler, 1835)	European	MH	1
<i>Carpathica langi</i> (Pfeiffer, 1846)	Carpathic	MH	1
Fam. Euconulidae H. B. Baker, 1928			
<i>Euconulus fulvus</i> (O. F. Müller, 1774)	Holarctic	MH	4
Fam. Bradybaenidae Pilsbry, 1939			
<i>Fruticicola fruticum</i> (O. F. Müller, 1774)	Paelearctic	MH	3, 5, 6, 7
Fam. Hygromiidae Tryon 1866			
<i>Euomphalia strigella</i> Draparnaud, 1801	European	M	3, 4, 5, 6, 7
<i>Monachoides incarnatus</i> (O. F. Müller, 1774)	European	M	1, 2
Fam. Helicidae Rafinesque, 1815			
<i>Arianta arbustorum</i> (Linnaeus, 1758)	European	M	2
<i>Drobacia banatica</i> (Rossmässler, 1838)	Central-Eastern European	M	1*, 2*, 5
<i>Cepaea vindobonensis</i> (Pfeiffer, 1828)	European	MX	3, 5, 6, 7
<i>Helix pomatia</i> Linnaeus, 1758	Central-Eastern European	M	2, 3, 4, 5, 6, 7

The first two sampling points are located in the Semenice Mountains (a subdivision of the Banat Mountains), near Trei Ape Lake. The area is built on crystalline schist, with a complex system of crevices that in the clay absence allow the rapid runoff of rainwater. The presence of spruce forests considerably decreases the occurrence of land snails. The area is the subject of a strong anthropogenic pressure represented by tourism and infrastructure construction, as well. The land snail fauna of this area is much poorer than it generally is in this type of habitat. A number of 12 species were present. Some species occurring most often in forests were found only in the area of the first two sampling points, as is the case of *Alinda viridana*, *Vitrea crystalina*, *Aegopinella pura*, *Morlina glaber*, *Carpathica langi*, *Monachoides incarnatus*, *Arianta arbustorum*. There were also found empty shells of *Drobacia banatica*, in an advanced state of degradation that cannot confirm the presence of the species in the area. These shells might have been carried by water or they can simply be the evidence of its previous presence in the area, probably before the increase of anthropogenic pressure.

The second sector is located in the Timiș-Cerna corridor with a broad range of landscapes and a larger number of human settlements. Two sampling points were located in this area, S3 Teregova and S4 Armeniș. The first one is located upstream Teregova Gorges in a hilly area. A number of seven land snail species were found here, most of them ubiquitous like *Helix pomatia*, *Cepaea vindobonensis*, *Fruticicola fruticum*, *Euomphalia strigella*, but also *Cochlodina laminata*. This low diversity is most probably caused by grazing activities. The second sampling station of this sector was located in Teregova Gorges (upstream Armeniș), near the road but in a relatively isolated area. Remnants of the road development activities are present, but covered by vegetation able to preserve a certain degree of humidity and to serve as a food source for phytophagous species. Species like *Carychium minimum*, *Cochlicopa lubrica*, *Punctum pygmaeum*, *Cochlodina laminata*, *Alinda biplicata*, *Zonitoides nitidus* were found here, bringing this community more closely to the typical ones found in valleys from Transylvania (Gheoca 2005, 2007), yet presenting a relatively low diversity (nine species).

The third sector is located in the Caransebeș Plateau where the Timiș River has dug a broad valley with floodplain and well-developed terraces. This area has numerous human settlements with major impact on the river valley. The last three sampling points are located in this area near villages, with strongly modified river sides by tree cutting and waste deposits. The snail diversity in this area is very low, only some ubiquitous species being present, as is the case of *Helix pomatia*, *Fruticicola fruticum*, *Euomphalia strigella* and *Cepaea vindobonensis*. Among them, some species develop large populations, considering the microhabitat conditions. Therefore *Fruticicola fruticum* and *H. pomatia* are dominant in habitats in which humidity is most likely to be preserved, while in habitats with large variations of humidity a mixed snail community is present including the mentioned species and *C. vindobonensis*, as well.

One specimen of *Drobacia banatica* and several fresh empty shells were found in S5 – Sadova Veche, despite the strong anthropogenic pressure produced by the fact that the station is located in the vicinity of a waste storage. A cluster analysis was carried out using the relative abundance of land snail species in each one of them (Fig. 2).

Four of the clusters make evident the heterogeneity of the studied area. The most similar are the sampling stations located in the plateau area in highly perturbed habitats (S5, S6 and S7). A second one groups two sampling locations: one from the mountain area (S2) and the second from Teregova Gorges (S4), while the remaining two stations are independent, with a particular land snail community structure in Semenice Mountains (S1), and a disturbed condition by pasture in S3.

Figure 2: Cluster analysis based on the relative abundance of land snail species in the seven sampling stations (S1- S7).

CONCLUSIONS

The geology, vegetation and also the extent of the human impact shape the diversity of malacofauna in the area. The reduced diversity underlines the degree of perturbation and the absence of suitable conditions for snail presence. The most common species in the area are ubiquities, like *Helix pomatia*, *Fruticicola fruticum* and *Euomphalia strigella*.

The Banat area is considered the distribution center for *Drobacia banatica*, a distribution that covers Transylvania, Banat, Crișana, Maramureș (Grossu, 1983; Gheoca et al., 2008; Cameron et al., 2011), eastern Hungary (Fintha et al., 1993; Szabó and Fintha, 1999; Solymlos and Feher, 2005) and western Ukraine (Pelbárt, 1999). The species is generally present in moderated humid forests starting the mountain area up to 1000-1100 m altitudes, but also in lowlands. Regarding this species, we can notice two distinct aspects. First its absence in an area from its distribution center is most likely caused by the increasing human pressure during the recent years. On the other hand we find its presence in the vicinity of a village, near waste deposits, which is quite unexpected. The species presence in such highly anthropized area is probably an evidence of the river's contribution to the land snails dispersion. Such dispersed specimens can survive if they find appropriate conditions, which makes improbable the species long-term survival in the mentioned area.

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