

# THE MOLLUSC FAUNA OF NATURA 2000 SITE „AUGŠDAUGAVA”

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This article presents new data about mollusc fauna in the Natura 2000 site “Augšdaugava” collected during 2002 - 2014. 81 mollusc species, almost half of all known in Latvia, representing 33 families are recorded there. The molluscs were collected in deciduous, mixed spruce and pine forests of slopes and ravines, as well as in wet meadows, in lakeshores and riversides. Among recorded species are two molluscs *Anisus spirorbis* and *Aegopinella nitidula* about whose distribution and occurrence in Latvia scarce data are available. New localities has been discovered for 16 protected species (*Ancylus fluviatilis*, *Bulgarica cana*, *Clausilia dubia*, *C. cruciata*, *C. pumila*, *Cochlicopa nitens*, *Cochlodina orthostoma*, *Helix pomatia*, *Isognomostoma isognomostomos*, *Merdigera obscura*, *Platyla polita*, *Ruthenica filograna*, *Segmentina nitida*, *Theodoxus fluviatilis*, *Vertigo angustior* and *Unio crassus*). Among protected species three- *Helix pomatia*, *Vertigo angustior* and *Unio crassus* are included in the Annex II, IV and V of the EU Habitats Directive 92-43-EEC.

Key words: molluscs, fauna, Augšdaugava, Natura 2000, Latvia.

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## INTRODUCTION

The Valley of Daugava River between settlements Piedruja and Krauja together with adjoining areas are known as Augšdaugava region. Nowadays it is declared as protected landscape area „Augšdaugava” and Natura 2000 site.

The first data on mollusc fauna of Augšdaugava region were collected and published by Haralds Pētersons in 1932 (Pētersons 1932). He participated in *the Daugava River expedition* from Krāslava city to the river mouth organized by the School Museum of Ministry of Education. In Augšdaugava region molluscs were collected in two sites: in Krāslava city and near Jezupova.

There H.Pētersons who was focussed on aquatic molluscs collected 19 mollusc species: 7 freshwater and 12 terrestrial species.

The next study period of mollusc fauna when studies were carried out by Digna Pilāte. lasted from 1991 to 1997. The research was carried out as part of expeditions organized by the Latvian Museum of Natural History (Pilāte 1997). Molluscs were collected in 11 places of Augšdaugava region. In total, 50 terrestrial mollusc species were collected. Among them was *Isognomostoma isognomostomos* - a new terrestrial snail species for Latvia (Pilāte et al. 1994). Data on freshwater molluscs were not published.

The third and ongoing period of mollusc fauna research in Augšdaugava region started in 2002. Several studies mainly by R.Cibuļskis, I.Gurčonoks, O.Korotkaja, I.Jakubāne, L.Landrāte and D.Pilāte focussing on rare species has been carried out during 12 year period. Here we are presenting the summarised data of all studies.

## MATERIAL AND METHODS

### Study sites

Nature 2000 site „Augšdaugava” covering the area of 52098 ha is located in SE part of Latvia (Fig. 1). Moderately warm climate governs this region. The main feature of the „Augšdaugava” is the Daugava River with its valley having steep slopes and large terraces as well as ravines of numerous streams which flows into the river.

During 2002-2014 molluscs were collected in 43 sites. Deciduous, mixed spruce and pine forests on valley slopes and in ravines, wet meadows, riversides and lakeshores are the main habitats where molluscs have been collected. The total

number of sites having data on presence of any mollusc species is 54 (Fig.1).

### Collection and determination of the material

The material for studies of rare mollusc species were collected in July 2002, June 2006 and 2010, in June, August and September 2012, August 2013. Several methods – a quantitative method, a semi-quantitative method of sifting leaf litter as well by picking molluscs by hand and hand net (Valovirta 1996, Dunger & Fiedler 1997, P. Glöer & C. Meier-Brook (2003) were used.

Samples were taken to the laboratory where they were dried at the room temperature and afterwards sieved with the sieve tube (meshes of 5 mm, 3 mm, 2.5 mm, 2 mm, 1 mm). Mollusc shells were picked out with pincers by looking through the laboratory magnifying glass.

Terrestrial species were identified according to the handbooks of M. P. Kerney et al. (1983) and M. Rudzīte et al. (2010) using a binocular microscope. Freshwater species were identified according to the handbook of P. Glöer & C. Meier-Brook (2003). The nomenclature follows M. Rudzīte et al. (2010).

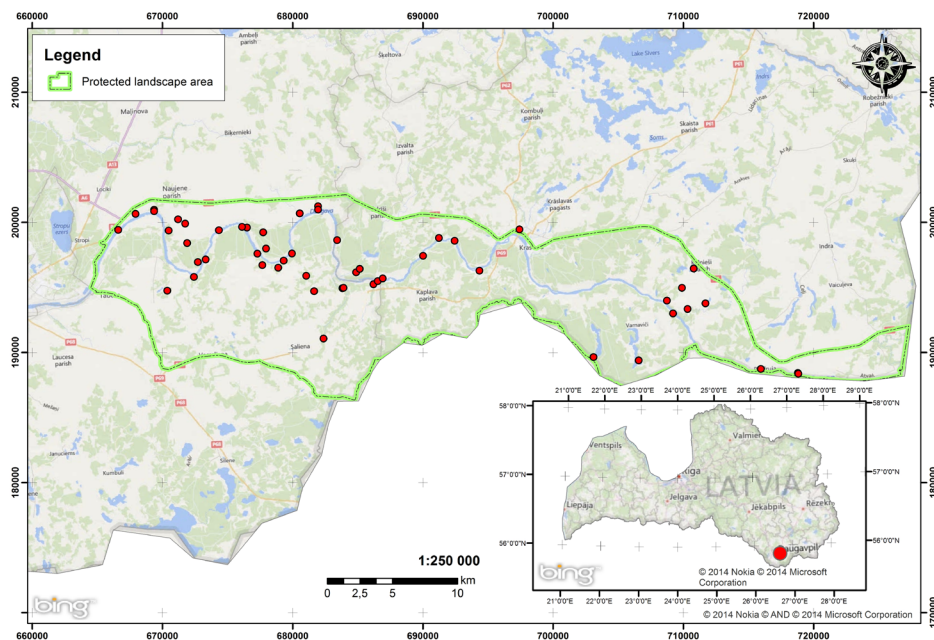


Fig.1. Study sites of molluscs in Natura 2000 site „Augšdaugava”.

The collected material is stored in the Institute of Life Sciences and Technologies at Daugavpils University.

## RESULTS AND DISCUSSION

### Summary of the recorded mollusc species

Summarizing the data of mollusc fauna in Augšdaugava, totally, 81 mollusc species were recorded (Table 1), which is almost half of all known species in Latvia (Rudzīte et al. 2010). 27 species of them are freshwater species while the other 54 are terrestrial species. The recorded mollusc species represent 33 families out of 39 freshwater and terrestrial mollusc families known in Latvia. It is possible that the number of terrestrial species could be greater if specific study of slugs would be done. The same refers to the number of freshwater mollusc species – it could become greater if specific study of freshwater mollusc fauna in lakes and rivers would be done.

Among species discovered in Augšdaugava two species – *Anisus spirorbis* and *Aegopinella nitidula* have scarce information on their distribution in Latvia (Table 1). In study area *Anisus spirorbis* was recorded for the first time in 2002 at the shore of Butišķu Lake. In 2006 species was found in a wet meadows near Vecpils, Sandarišķi and Ritāni. In Latvia it is occurring in various freshwater habitats (Rudzīte et al. 2010). Other authors point out that the species can be found only in small and periodically drying out waterbodies with standing water, more rarely at shores of swampy lakes (Glöer 2002, Glöer & Meier-Brook 2003; Zetler et al. 2006).

Terrestrial species *Aegopinella nitidula* was found in deciduous forests of ravine of Lupandu brook (Pilāte 1997), in the ravine of Lazdukalns brook, in Naujene (Jezupova) ravine, in the ravine of Stirna brook in 2012, in Veckaplava ravine and Baznīcas grāvis ravine in 2013. The species is included in the 4th category of the Red Data Book of Latvia (Spuris 1998).

Pilāte (1997) has reported about discovery of *Balea biplicata*, *Macrogastrea borealis* and *Vertigo geyeri* in the Naujene (Jezupova) ravine. Nevertheless during the subsequent studies in the Naujene ravine as well as in other localities of the Augšdaugava these species were not found repeatedly. It is assumed that misidentification has occurred and mentioned species are not included in the current list (Table 1).

Most of species (49) are found in deciduous forests of ravines (Table 1). Also in mixed spruce and pine forests on slopes more snail species has been found than on average in corresponding flat forests of Latvia (Pilāte 2010). As shown in other studies in Latvia (Pilāte, Greke 2002, Pilāte 2003a,b) forests of slopes and ravines are most rich with snail species compared with other habitats. Usually these habitats are associated with natural watercourses. They in turn maintain a stable and permanently moist microclimate, which is very significant for snails (Ehnström, Walden 1986).

31 species (23 terrestrial and 8 freshwater species) were found in the wet meadows. Two of them (*Segmentina nitida* and *Vertigo angustior*) are not found in other habitats. Wet meadow is one of the little-studied mollusc habitats in Latvia (Pilāte 2013).

### Protected mollusc species

Altogether 16 mollusc species protected in Latvia were found in Augšdaugava. They constitute 42% of all protected mollusc species of Latvia (LR MK Noteikumi 2000, 2004). *Vertigo angustior* and *Unio crassus* are included in the Annex II of the EU Habitats Directive 92-43-EEC (Council Directive 92/43/EEC). *U. crassus* is also included in the Annex IV, but *Helix pomatia* is included in the Annex V of the EU Habitats Directive 92-43-EEC.

*Theodoxus fluviatilis* – in Augšdaugava *T. fluviatilis* was found in the Daugava River at following sites: Krāslava distr., near Lupandi, X715953 Y6188735, 16.07.1996., leg. D.Pilāte; Daugavpils distr., near Naujene, 55°55'23N

Table 1. Mollusc species recorded in Natura 2000 site „Augšdaugava”

№	Species	Habitat					
		Riverside	Lakeshore	Deciduous forest in ravine	Mixed spruce forest in ravine	Pine forest on slope	Wet meadow
	<b>Neritidae</b>						
1.	<i>Theodoxus fluviatilis</i> (Linnaeus, 1758)	x					
	<b>Viviparidae</b>						
2.	<i>Viviparus contectus</i> (Millet, 1813)	x	x				
3.	<i>Viviparus viviparus</i> (Linnaeus, 1758)	x	x				
	<b>Aciculidae</b>						
4.	<i>Platyla polita</i> (Hartmann, 1840)DL			x	x		
	<b>Bithyniidae</b>						
5.	<i>Bithynia tentaculata</i> (Linnaeus, 1758)	x					
6.	<i>Bithynia leachii</i> (Sheppard, 1823)	x					
	<b>Hydrobiidae</b>						
7.	<i>Lithoglyphus naticoides</i> (C. Pfeiffer, 1828)	x					
	<b>Valvatidae</b>						
8.	<i>Valvata piscinalis</i> (O.F.Müller, 1774)	x					
	<b>Acroloxiidae</b>						
9.	<i>Acroloxus lacustris</i> (Linnaeus, 1758)		x				
	<b>Lymnaeidae</b>						
10.	<i>Radix ampla</i> (W. Hartmann, 1821)		x				
11.	<i>Radix labiata</i> (Rossmässler, 1838)		x				
12.	<i>Stagnicola fuscus</i> (C. Pfeiffer, 1821)		x				
13.	<i>Galba truncatula</i> (O.F.Müller, 1774)						x
14.	<i>Lymnaea stagnalis</i> (Lamarck, 1758)	x	x				
	<b>Physidae</b>						
15.	<i>Aplexa hypnorum</i> (Linnaeus, 1758)						x
	<b>Planorbidae</b>						
16.	<i>Anisus spirorbis</i> (Linnaeus, 1758)	x	x				x
17.	<i>Gyraulus albus</i> (O.F.Müller, 1774)						x
18.	<i>Gyraulus crista</i> (Linnaeus, 1758)						x
19.	<i>Planorbarius corneus</i> (Linnaeus, 1758)	x	x				x

№	Species	Habitat					
		Riverside	Lakeshore	Deciduous forest in ravine	Mixed spruce forest in ravine	Pine forest on slope	Wet meadow
20.	<i>Planorbis planorbis</i> (Linnaeus, 1758)		x				
21.	<i>Segmentina nitida</i> (O.F.Müller, 1774)						x
	<b>Ancylidae</b>						
22.	<i>Ancylus fluviatilis</i> Müller, 1774	x					
	<b>Elobiidae</b>						
23.	<i>Carychium minimum</i> O.F.Müller, 1774			x	x	x	x
24.	<i>Carychium tridentatum</i> (Risso, 1826)			x	x	x	x
	<b>Succineidae</b>						
25.	<i>Oxyloma elegans</i> (Risso, 1826)			x			
26.	<i>Succinea putris</i> (Linnaeus, 1758)			x		x	x
27.	<i>Succinella oblonga</i> (Draparnaud, 1801)			x	x	x	x
	<b>Cochlicopidae</b>						
28.	<i>Cochlicopa lubrica</i> (O.F.Müller, 1774)			x	x	x	x
29.	<i>Cochlicopa lubricella</i> (Rossmässler, 1834)			x	x	x	x
30.	<i>Cochlicopa nitens</i> (M.von Gallenstein, 1848)		x				
	<b>Valloniidae</b>						
31.	<i>Vallonia excentrica</i> (Sterki, 1893)						x
32.	<i>Vallonia costata</i> (O.F.Müller, 1774)			x	x	x	x
33.	<i>Vallonia pulchella</i> (O.F.Müller, 1774)		x	x		x	x
	<b>Pupillidae</b>						
34.	<i>Pupilla muscorum</i> (Linnaeus, 1758)			x		x	
	<b>Vertiginidae</b>						
35.	<i>Columella edentula</i> (Draparnaud, 1805)			x	x	x	x
36.	<i>Columella aspera</i> Walden, 1966			x	x	x	
37.	<i>Vertigo pusilla</i> O.F.Müller, 1774			x	x	x	x
38.	<i>Vertigo alpestris</i> (Alder, 1838)			x		x	x
39.	<i>Vertigo ronnebyensis</i> (Westerlund, 1871)					x	
40.	<i>Vertigo pygmaea</i> (Draparnaud, 1801)		x	x		x	x
41.	<i>Vertigo angustior</i> (Jeffreys, 1830)			x			x

№	Species	Habitat					
		Riverside	Lakeshore	Deciduous forest in ravine	Mixed spruce forest in ravine	Pine forest on slope	Wet meadow
42.	<i>Vertigo antivertigo</i> (Draparnaud, 1801)						x
43.	<i>Vertigo substriata</i> (Jeffreys, 1833)		x		x		x
	<b>Enidae</b>						
44.	<i>Merdigera obscura</i> (O.F.Müller, 1774)			x			
	<b>Clausiliidae</b>						
45.	<i>Cochlodina laminata</i> (Montagu, 1803)			x	x		
46.	<i>Cochlodina orthostoma</i> (Menke, 1830)			x			
47.	<i>Clausilia pumila</i> (C. Pfeiffer, 1828)			x			
48.	<i>Clausilia dubia</i> (Draparnaud, 1805)			x			
49.	<i>Clausilia cruciata</i> (S.Studer, 1820)			x			
50.	<i>Macrogastera ventricosa</i> (Draparnaud, 1801)			x	x		
51.	<i>Macrogastera plicatula</i> (Draparnaud, 1801)			x	x		
52.	<i>Bulgarica cana</i> (Held, 1836)			x			
53.	<i>Lacinaria plicata</i> (Draparnaud, 1801)			x	x		
54.	<i>Ruthenica filograna</i> (Rossmässler, 1836)			x			
	<b>Punctidae</b>						
55.	<i>Punctum pygmaeum</i> (Draparnaud, 1801)			x	x	x	x
	<b>Discidae</b>						
56.	<i>Discus ruderatus</i> (O.F.Müller, 1774)			x	x		
	<b>Pristilomatidae</b>						
57.	<i>Vitrea crystallina</i> (O.F.Müller, 1774)			x	x		x
	<b>Euconulidae</b>						
58.	<i>Euconulus fulvus</i> (O.F.Müller, 1774)			x	x	x	
	<b>Gastrodontidae</b>						
59.	<i>Zonitoides nitidus</i> (O.F.Müller, 1774)			x			x
	<b>Oxychilidae</b>						
60.	<i>Aegopinella pura</i> (Alder, 1830)			x		x	x
61.	<i>Aegopinella nitidula</i> (Draparnaud, 1805)			x			
62.	<i>Nesovitrea hammonis</i> (Ström, 1765)			x	x	x	x

№	Species	Habitat					
		Riverside	Lakeshore	Deciduous forest in ravine	Mixed spruce forest in ravine	Pine forest on slope	Wet meadow
63.	<i>Nesovitrea petronella</i> (L.Pfeiffer, 1853)			x	x		
	<b>Vitrinidae</b>						
64.	<i>Vitrina pellucida</i> (O.F.Müller, 1774)			x	x	x	x
	<b>Arionidae</b>						
65.	<i>Arion subfuscus</i> (Draparnaud, 1805)			x			
66.	<i>A.circumscriptus</i> Johnston, 1828			x			
	<b>Bradybaenidae</b>						
67.	<i>Fruticicola fruticum</i> (O.F.Müller, 1774)			x	x	x	
	<b>Hygromiidae</b>						
68.	<i>Euomphalia strigella</i> (Draparnaud, 1801)			x	x	x	
69.	<i>Perforatella bidentata</i> (Gmelin, 1791)			x	x	x	
70.	<i>Trochulus hispidus</i> (Linnaeus, 1758)			x	x		
71.	<i>Pseudotrichia rubiginosa</i> (Rossmässler, 1838)			x	x	x	x
	<b>Helicidae</b>						
72.	<i>Arianta arbustorum</i> (Linnaeus, 1758)			x			
73.	<i>Cepaea hortensis</i> (O.F.Müller, 1774)			x			
74.	<i>Isognomostoma isognomostomos</i> (Schröter, 1784)			x	x		
75.	<i>Helix pomatia</i> (Linnaeus, 1758)			x			
	<b>Unionidae</b>						
76.	<i>Unio tumidus</i> (Philipsson, 1788)	x	x				
77.	<i>Unio pictorum</i>	x					
78.	<i>Unio crassus</i> (Philipsson, 1788)	x					
79.	<i>Pseudanodonta complanata</i> (Rossmässler, 1834)	x					
	<b>Sphaeriidae</b>						
80.	<i>Pisidium sp.</i>	x	x				x
	<b>Dreissenidae</b>						
81.	<i>Dreissena polymorpha</i> (Pallas, 1771)	x					
		17	16	49	28	24	31

26°42'37E, 24.07.2002., leg. R.Cibuļskis; X669369 Y6200860, 24.04.2012., leg. D.Pilāte; Daugavpils distr., near Elkšņi, 55°53'13Z 26°45'43A, 11.06.2006., leg. R.Cibuļskis; Daugavpils distr., near Mozoliški, 55°53'19Z 026°46'17A, 18.06.2010., leg. R.Cibuļskis; Daugavpils distr., near Mozoliški, at mouth of the river Muravku, Z, 55°53'19Z 026°46'17A, 18.06.2010., leg. R.Cibuļskis; Daugavpils distr., near Vecsikelī „Rozališki”, 55°54'36Z 26°49'04A, leg. R.Cibuļskis; Daugavpils distr., near Vecsikelī, 55°53'28Z 26°50'07A, leg. R.Cibuļskis; Daugavpils distr., near Orehovka, 26°50'36E 55°53'80N, 29.07.2002., leg. R.Cibuļskis; Daugavpils distr., near Geitviniški, 55°53'08Z 26°52'02A, leg. R.Cibuļskis; Daugavpils distr., Krauja, X666606 Y6199423, 24.04.2012., leg. K.Sokolovskis; Krāslava distr., near Noviki, 55°53'53Z 26°56'01A, 29.07.2002., leg. R.Cibuļskis; Krāslava distr., near Augustiniški, 30.07.2002., leg. R.Cibuļskis; Daugavpils distr., near Lielborne, 55°52'07Z 26°58'53A, 30.07.2002., leg. R.Cibuļskis; Krāslava distr., near Kaplava, opposite Užingorska, 55°53'06Z 27°02'18A, 30.07.2002., leg. R.Cibuļskis; Krāslava distr., near Užinkolns, 55°53'46Z 27°03'32A, 26.07.2002., leg. R.Cibuļskis; Krāslava distr., near Vilmaņi, 55°53'39Z 27°04'40A, 30.07.2002., leg. R.Cibuļskis; Krāslava distr., near ravines Sproģu, X6935669 Y6196392, 19.09.2014., leg. V.Pilāts.

The species is common throughout the Daugava River, which flows through Augšdaugava region. *Theodoxus fluviatilis* is occurring mostly in rivers, more rarely in lakes. It is distributed all over Latvia and is found relatively frequently (Rudzīte et al. 2010).

*Ancylus fluviatilis* – in Augšdaugava was found in River Rudņa: Krāslava distr., near Tartaks, 55°52'40Z 26°57'36A, 29.07.2002., leg. R.Cibuļskis.

The species inhabit mostly rivers, more rarely lakes. It is distributed all over Latvia but rather rarely (Rudzīte et al. 2010).

*Platyla polita* – in Augšdaugava the species was found in deciduous forests and mixed spruce forests of slopes and ravines in following sites: Daugavpils distr., near Orehovka, in the ravine of Lazdukalnu brook, 55°53'31N26°50'26E, 29.07.2002., leg. R.Cibuļskis; X677682 Y6196718, 22.08.2012., leg. I.Gurčonoks; Daugavpils distr., near Naujene 55°55'26N 26°42'43E, Naujene (Jezupova) ravine, 17.07.2006., leg. R.Cibuļskis; X669368 Y6200973, 22.08.2012., leg. I.Gurčonoks; Daugavpils distr., ravine Geitviniški brook, X678901 Y6196514, 09.09.2012., leg. I.Gurčonoks; Krāslava distr., Veckaplava ravine, 55°51'59,939N 26°58'33,642E, 28.08.2013., leg. I.Jakubāne.

The species inhabit mostly damp deciduous and mixed natural woodland. It is distributed all over Latvia but rarely (Rudzīte et al. 2010).

*Segmentina nitida* – in Augšdaugava *S.nitida* was found in three localities with wet meadows: Daugavpils distr., near Vecpils, 55°55'01Z 26°44'23A, 17.07.2006., leg. R.Cibuļskis; Daugavpils distr., near Sandariški, 55°54'50Z 26°44'53A, 17.07.2006., leg. R.Cibuļskis; Daugavpils distr., near Ritāni, 55°52'28Z 26°53'38A, 22.07.2006., leg. R.Cibuļskis.

The species lives in freshwater habitats all over Latvia, but is rare (Rudzīte et al. 2010). It is typical species of small, overgrown and muddy water bodies – shallow pools and ditches. It occurs also in ponds and lakes (Glöer 2002, Glöer & Meier-Brook 2003; Zetler et al.2006).

*Cochlicopa nitens* was found in three localities: Krāslava distr., near Ritāni, 55°52'40Z 26°53'43A, wet meadow, 18.07.2006., leg. R.Cibuļskis; Krāslava distr., Lake Šterenberga, X710806 Y6196450, lakeshores, 28.06.2012., leg. D.Zviedrāne; Krāslava distr., Lake Lukštānu, X711702 Y6193775, lakeshores, 29.06.2012., leg. D.Kapustina; Krāslava distr., Veckaplava ravine, 55°51'59,939N 26°58'33,642E, 28.08.2013., leg. I.Jakubāne.



*C.nitens* is wetland species. The species inhabit calcareous fens and marshes, sometimes wet calcareous woodland (Rudzīte et al. 2010). *C.nitens* occurs across the country, but is found rather rarely.

*Vertigo angustior* was found in two localities with wet meadow: Daugavpils distr., near Sandariški, 55°54'50Z 26°44'53A, 17.072006., leg. R.Cibuļskis; Daugavpils distr., near Jaunborne, 55°51'49Z 26°54'10A, 25.07.2006., leg. R.Cibuļskis.

Pilāte (1997) has reported about discovery of *V.angustior* in the Naujene (Jezupova) ravine. Nevertheless during the subsequent studies in the Naujene ravine these species were not found repeatedly. *V.angustior* is wetland species, which is found in open habitats: wet grassland, floodplains, calcareous fens and marshes (Rudzīte et al. 2010, Pilāte 2013). *V.angustior* occurs across the country, but is found rather rarely.

*Cochlodina orthostoma* – some specimens was found in two localities with deciduous forest of ravines: Daugavpils distr., near Orehovka, in the ravine of Lazdukalnu brook, X677682 Y6196718, 22.08.2012., leg. I.Gurčonoks; Daugavpils distr., near Naujene, X669368 Y6200973, Naujene (Jezupova) ravine, 22.08.2012., leg. I.Gurčonoks.

*C. orthostoma* is woodland species. The species occurs all over in Latvia, but is found rarely (Rudzīte et al. 2010).

*Clausilia pumila* was found in deciduous forest of ravines in following sites: Daugavpils distr., near Karļinova, Lielbornes forest, 55°49'35N; 26°57'28E, leg. 2008., R.Cibuļskis; Daugavpils distr., near Naujene, X667941 Y6200658, 05.05.2011., leg. D.Pilāte; Krāslava distr., the ravine of Stirna river, X709893 Y6194971, 26.08.1997., 26.06.2012., leg. D.Pilāte; Krāslava distr., the ravine of Indrica river, X710326 Y6193346, 28.06.2012., leg. D.Pilāte; Daugavpils distr., near Naujene, X669368 Y6200973, Naujene (Jezupova) ravine, 22.08.2012., leg. I.Gurčonoks; Daugavpils distr.,

near Orehovka, in the ravine of Lazdukalnu brook, X677682 Y6196718, 22.08.2012., leg. I.Gurčonoks; Krāslava distr., Veckaplava ravine, 55°51'59,939N 26°58'33,642E, 28.08.2013., leg. I.Jakubāne.

The species occurs across the country, but is found rather rarely (Rudzīte et al. 2010).

*Clausilia dubia* – small number of snails was found in two localities with a deciduous forest of ravines: Daugavpils distr., near Orehovka, in the ravine of Lazdukalnu brook, X677682 Y6196718, 24.08.2009., leg. L.Landrāte, 22.08.2012., leg. O.Korotkaja; Daugavpils distr., ravine of Poguļanka brook, X683818 Y6194935, 24.08.2009., leg. L.Landrāte.

*C.dubia* occurs across the country, but is found rather rarely (Rudzīte et al. 2010).

*Clausilia cruciata* some specimens are found in three localities with deciduous forest of ravines: Daugavpils distr., near Naujene, 55°55'26N 26°42'43E, Naujene (Jezupova) ravine, 17.072006., leg. R.Cibuļskis; Daugavpils distr., near Orehovka, in the ravine of Lazdukalnu brook, X677682 Y6196718, 22.08.2012., leg. I.Gurčonoks, 29.08.2012., leg. O.Korotkaja; Krāslava distr., Veckaplava ravine, 55°51'59,939N 26°58'33,642E, 28.08.2013., leg. I.Jakubāne.

*C. cruciata* occurs across the country, but is found rarely (Rudzīte et al. 2010).

*Ruthenica filograna* is found in deciduous forest of ravines in following sites: Krāslava distr., ravine of Stirna river, X709893 Y6194971, 26.06.2012., leg. I.Svilāne; Daugavpils distr., near Orehovka, in the ravine of Lazdukalnu brook, X677682 Y6196718, 29.08.2012., leg. O.Korotkaja; Krāslava distr., Veckaplava ravine, 55°51'59,939N 26°58'33,642E, 28.08.2013., leg. I.Jakubāne; Krāslava distr., Veckaplava ravine, 55°51'59,939N 26°58'33,642E, 28.08.2013., leg. I.Jakubāne; Daugavpils distr., ravine Baznīcas grāvis, 55°52'5,509N 26°43'22,664E, 28.08.2013., leg. I.Jakubāne.

H.Pētersons (1932) had found *R.filograna* in Naujene (Jezupova) ravine. D.Pilāte (1997) had found also in Naujene ravine and in deciduous forest of slope near Sloboda. *R.filograna* occurs across the country, but is found rather rarely (Rudzīte et al. 2010).

*Bulgarica cana* are found in a deciduous forest of ravines in following sites: Daugavpils distr., near Orehovka, in the ravine of Lazdukalnu brook, X677682 Y6196718, 22.08.2012., leg. I.Gurčonoks; 22.09.2012., leg. O.Korotkaja; Daugavpils distr., near Naujene, X669368 Y6200973, Naujene (Jezupova) ravine, 22.08.2012., leg. I.Gurčonoks; Daugavpils distr., ravine Baznīcas grāvis, 55°52'5,509N 26°43'22,664E, 28.08.2013., leg. I.Jakubāne.

*B.cana* occurs across the country, but is found rather rarely (Rudzīte et al. 2010).

*Merdigera obscura* – in Augšdaugava is found only once in the ravine of Lazdukalnu brook in deciduous forest (Daugavpils distr., near Orehovka, X677682 Y6196718, 22.08.2012., leg. I.Gurčonoks).

*M.obscura* is woodland species. The species occurs across the country and is found relatively frequently in deciduous forests of river valleys (Rudzīte et al. 2010).

*Isognomostoma isognomostomos* was discovered for the first time in Naujene (Jezupova) ravine in 1991 (Pilāte et al. 1994). In July 1999 entomologist R.Cibuļskis found this species also in the ravine of Lazdukalnu brook nearby the Naujene ravine but on the opposite site of the Daugava River. In 2012 I.Gurčonoks found *I. isognomostomos* in third locality – in mixed spruce forest in ravine of Geitviniški brook (Daugavpils distr., X678901 Y6196514, 09.09.2012., leg. I.Gurčonoks).

*I. isognomostomos* is alpine-carpathic species which belongs to ecological type of forest species. In Europe it is distributed in hilly and mountainous areas 300 - 1800 m above sea level of the Alps, the Carpathians, the Pyrenees

and the Sudetes. There are some few isolated populations outside mountains in Belgium, Poland and Lithuania (Kerney et al. 1983; Lithuanian moliusku katalogas 2010). In Estonia the species hasn't been found. Its most northern locality probably is situated in Latvia.

*Helix pomatia* are found not only in a deciduous forest, but also in parks, gardens, at the riverside and in meadows: Krāslava distr., Piedruja, X715953 Y6188735, the riverside, 25.06.1996., leg. D.Pilāte; Krāslava distr., Krāslava, X697420 Y6199464, the park, 17.04.2012., leg. A.Orupe; Krāslava distr., Kalnieši, 28.06.2012., lawn, leg. K.Volodina; Krāslava distr., near Lake Jablonkas, X706578 Y6189391, meadow, 19.09.2014., leg. D.Pilāte.

*H.pomatia* is mezophyllous woodland species. The species occurs across the country, and is found relatively frequently (Rudzīte et al. 2010).

*Unio crassus* was found in River Daugava in following sites: Daugavpils distr., near Mozoliški, 55°53'19Z 026°46'17A, 18.06.2010., leg. R.Cibuļskis; Daugavpils distr., near Geitviniški, 55°53'25Z 026°52'39A, 18.06.2010., leg. R.Cibuļskis; Daugavpils distr., near Naujene, 55°55'23N 26°42'37E, 24.07.2002., leg. R.Cibuļskis; Daugavpils distr., near Elkšņi, 55°53'13Z 26°45'43A, 11.06.2006., leg. R.Cibuļskis; Daugavpils distr., near Lesovščizna, 55°54'30Z 26°47'21A, 24.07.2002., leg. R.Cibuļskis; Daugavpils distr., near Vasargeliški, 55°54'33Z 26°49'23A, 25.07.2002., leg. R.Cibuļskis; Daugavpils distr., near Orehovka, 26°50'36E 55°53'80N, 29.07.2002., leg. R.Cibuļskis; Daugavpils distr., near Židina, 55°55'11N 26°54'43E, at the mouth of the River Puniška, 25.07.2002., leg. R.Cibuļskis; Krāslava distr., near Noviki, 55°53'53Z 26°56'01A, 29.07.2002., leg. R.Cibuļskis; Daugavpils distr., near Lielborne, 55°52'07Z 26°58'53A, 30.07.2002., leg. R.Cibuļskis; Krāslava distr., near Kaplava, 55°53'06Z 27°02'18A, 30.07.2002., leg. R.Cibuļskis; Krāslava distr., Užinkolns, 55°53'46Z 27°03'32A, 26.07.2002., leg. R.Cibuļskis; Krāslava distr., near Vilmaņi, 55°53'39Z 27°04'40A, 30.07.2002., R.Cibuļskis.

It is found also in River Poguļanka: Daugavpils distr., near Fal̄topi, 55°51'54Z 26°56'19A, 30.07.2002., leg. R.Cibuļskis; Daugavpils distr., X682375 Y6191075, 19.09.2014., leg. V.Pilāts; in River Rudņa: Krāslava distr., near Tartaks, 55°52'40Z 26°57'36A, 29.07.2002., leg. R.Cibuļskis; In River Indrica: Krāslava distr., River Indrica valley, X710326 Y6193346, 28.06.2012., leg. D.Pilāte.

*U. crassus* inhabit mostly rivers, more rarely lakes. It is distributed all over Latvia, however, in some places its populations die out (Rudzīte et al. 2010).

Among protected species of Latvia *Lithoglyphus naticoides* also is listed. Besides, it is included in the 2rd category of the Red Data Book of Latvia (Spuris 1998, LR MK Noteikumi 2000, 2004). It is first recorded in 19<sup>th</sup> century (Schlesch 1942). H.Pētersons (1932) had found *L. naticoides* in Daugava River at Krāslava in 1932. *L. naticoides* should be regarded as alien species as it originates from the Ponto-Caspian region (Glöer & Meier-Brook 2003). In other countries it is recognized as invasive species (Mastitsky & Samoilenko 2006). The species should be excluded out of lists of protected and rare species.

## CONCLUSIONS

The mollusc fauna of the Natura 2000 site “Augšdaugava” can be characterized as rich. These results almost completely characterize the terrestrial snail fauna while additional studies are still necessary for slugs and freshwater mollusc fauna.

The most significant habitats for terrestrial mollusc fauna diversity are forests of ravines and slopes not only in the Augšdaugava region, but in the country as a whole. Forests of ravines and slopes harbor a large part of protected land snail species. The protected landscape area “Augšdaugava” is the only place in Latvia where the *Isognomostoma isognomostomos* can be found.

Natura 2000 site “Augšdaugava” is an important area for *Unio crassus*. This species is found in the River Daugava and in its major tributaries in 17 different sites. It might be the largest *U. crassus* populations in Latvia.

The next studies of mollusc fauna must be carried out in wet meadows which is insufficiently studied habitat until now. There rare and protected wetland species whose distribution and occurrence in Latvia is poorly known might be found.

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