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On experiences in monitoring molluscs (Mollusca) in the area of Duna-Dráva National Park

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HÉRA Z.: *On experiences in monitoring molluscs (Mollusca) in the area of Duna-Dráva National Park.*
Abstract: Researching Mollusc fauna forms part of biomonitoring investigation in the Duna-Dráva National Park aiming study of protected and invasive species, water and terrestrial fauna.
As a result of this investigation, the occurance of new protected species *Vertigo angustior* Jeffreys, 1830, *Vertigo moulinsiana* Dupuy, 1840 or their accurate habitat in this area have become known. Recording frequency circumstances of basic fauna and expansion of newly introduced species *Potamopyrgus antipodarum* (Gray, 1843), *Arion lusitanicus* Mabille, 1868, *Anodonta woodiana* (Lea, 1834) - is repeated every year.

Keywords: protected molluscs, invasive molluscs, biomonitoring

Introduction

Due to the coordination of DDNP started in 2000, biomonitoring investigation began in the river Dráva. 22 sampling sites were marked between Ortilos and Felsőszentmárton. The sampling sites are 5-50 m^2 in size. Investigations were implemented in the following projects: 1. protected species, 2. invasive species, 3. monitoring water fauna, 4. monitoring terrestrial fauna.

According to literature data (VARGA and UHERKOVICH 1998) the number of terrestrial and water Gastropods found in the areas along the Dráva is estimated to be about 100, out of which 90 species were identified during monitoring investigation. An average of 9000 individuals are entered in the database of the national park.

Material and method

1. Sampling applied in the project of protected species

Theodoxus danubialis, Amphimelania holandri - underwater counts of individuals in 10 sites (50x50 cm quadrates) twice a year.

Pomatias elegans, Ena montana - placing artificial hiding - place quadrate (5x1 m^2 surface covered with corrugated cardboard), twice a year and checkings after a month.

Cepaea hortensis - study of its absence by single individual sampling.

Helix pomatia - single individual sampling at an even pace for 20 minutes.

Unio crassus - sweep-netting the riverbed with a 0.5 wide scraping net of 1mm meshes and along a 2 m stretch, five times.

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2. Sampling applied in monitoring invasive species

Potamopyrgus antipodarum - collecting 3 m^3 deposit and underwater individual sampling in 4 (50x50 cm) quadrates.

Arion lusitanicus - single individual sampling counts on 10 m^2 site.

Dreissena polymorpha - collecting 5 dm^3 alluvial deposit (possibly float debris) once a year.

Anodonta woodiana - individual sampling from the riverbed to determine absence, once a year.

Helicella obvia - indivividual sampling to determine absence, once a year.

3. Monitoring water fauna

Collecting alluvial float debris three times a year, float debris from lakes once a year with skimming net, collecting 5 dm^3 material on each occasion.

Quadrate method: underwater counts of individuals on 10 sites of 50x50 cm quadrate, four times a year.

Sweep - netting on riverbed with a 0.5 mm wide scraping net of 1 mm meshes on a 2 m stretch five times a year.

Single individual sampling with a dipping - net or from plants picked out of water with a handle holder, once a year.

4. Monitoring terrestrial fauna

Collecting 25 dm^3 surface debris twice a year.

Single individual sampling of slugs for 20 minutes once a year.

Collecting fluvial float debris three times a year, collecting float debris from lakes once a year with a skimming - net, 5 dm^3 material is collected on each occasion.

Sampling of mollusc communities living in wood assemblages by hiding place - quadrate.

Results and conclusions

During monitoring protected species we managed to prove the presence of 10 mollusca and 2 bivalves species. Strictly protected species were not present among them (Fig. 1).

Amphimelania holandri (Pfeiffer, 1828) a tertiary fossil species with an East and West Balkan distribution, lives in the Dráva and the Sava water system. In the Hungarian waters this species lives in the Dráva, the Zala, the Kerka and the Mura. Its habitat in the section between Bolhó and Őrtilos is on pebbly sandbanks, but it also settled on spurs and protective paving of the bank. On the sampling site near Vízvár, according to the investigation data, it lives in a density exceeding 300 individuals/m^2. Among concomitant fauna members *Ancylus fluviatilis* (Müller, 1774) can be found. In case the planned Croatian power station near Novo Virje is constructed, this habitat and the undelying pebbly sandbank would be destroyed or severly damaged due to the drastic changes in the course of the river. After half a century *Theodoxus danubialis* (C. Pfeiffer, 1828) is present on the national stretch of the Dráva. The first report about its presence comes from SOÓS (1933), formerly it was collected in Légrád (now on Croatian territory). In 1997 one shell was found in the float debris (VARGA and UHERKOVICH 1997). In the autumn of 2001 it was present in mass with an individual density exceeding 200 specimens/m^2 at the mouth of the Mura in Őrtilos at various times (HÉRA 2002). Colonization may have come from the Mura as it occurs in the upper section.

Pomatias elegans (C. Pfeiffer, 1828) lives on the slopes overlooking the Dráva in the environs of Őrtilos hills. Once it may have been more widespread in the country. At present it can be found on the Tihany Peninsula, in the Zala hills and in some parts of the

Fig. 1.: Juvenile induvidual of *Ena montana* (Draparnaud, 1801)

Fig. 2.: *Pseudanodonta complanata* (Rossmassler, 1835) occuring in some parts of smooth granular riverbed sections

Fig. 3.: *Potamopyrgus antipodarum* (Gray, 1843) already settled in the gravelpit lake of Gyékényes

Fig. 4.: *Anodonta woodiana* (Lea, 1834) intensively spreading in the Dráva as well

Mecsek Mountains. This Mediterranean species with West-European distribution has a density of 20 individuals/m^2 on the humid and cool soil of Őrtilos mixed beech woods. In some places this species can be found in the same habitat with a species, *Ena montana* (Drapernaud, 1801) of Alpine - Carpathian distribution and a preference for mountainous climate (HÉRA and VARGA 2001).The latter is a rare species even in our mountainous regions.

In the Zákány-Őrtilos hilly range 2 isolated species were recorded during monitoring investigation. The expansion of grapeyards and orchards on the account of beech woodlands endangers the survival of this species. On the basis of the investigation the estimated number of individuals is 200.

The population of *Cepaea hortensis* (O. F. Müller, 1774) living in the upper cemetery of the village of Zákány is also isolated. The size of the population is about 500 individuals, so far only with yellow shells, either plain or streaked genetical variants have been found. Its habitat is bordered by intensively treated areas, so its dispersion is unlikely. Mollusc species generally spread in groves along the Dráva are *Perforatella bidentata* (Gmelin, 1788) and *Cepaea nemoralis* (O. F. Müller, 1774). Their empty shells are usually present in the float debris of the river. *Helix pomatia* (Linnaeus, 1758) can be frequently found in the woods and in the weeds.

Vertigo angustior (Jeffreys, 1830) and *Vertigo moulinsiana* (Dupuy, 1849) are snail species with unknown habitat and population size. These small molluscs settle on vegetation close to the soil in humid habitats, their empty shells were found in floating debris.

We managed to reveal the presence of individuals belonging to 2 protected bivalve species, *Pseudanodonta complanata* (Rossmässler, 1835) (Fig. 2.) and *Unio crassus* (Philipsson, 1788) in the Dráva and its tributaries. The methods applied do not make possible to estimate population size. It is certain that, compared to other large-bodied Gastropods, both species proved to be rather scarse on slow - flowing sections of the riverbed along the bank and also in the temporary dry and muddy branches.

Table 1.: The protection state of species recorded during monitoring investigation

Species	Protected status	Year of protected status	Corine Biotopes Program	Natura 2000	IUCN Red List 2004
Pomatias elegans	protected	1982			
Ena montana	protected	1993			
Helix pomatia	protected	1993	X	V.	
Theodoxus danubialis	protected	1993			
Amphimelania holandri	protected	2001			
Cepaea hortensis	protected	2001			
Cepaea nemoralis	protected	2001			
Perforatella bidentata	protected	2001			
Pseudanodonta complanata	protected	2001			LR/nt
Unio crassus	protected	2001		II., IV.	LR/nt
Vertigo angustior	protected	2001		II.	LR/cd
Vertigo moulinsiana	protected	2001		II.	LR/cd

In the region of DDNP respectively in its narrower area, several molluscs with ability to quickly spread their area are known to be potentially and factually invasive. In order to protect the natural habitats it is extremely important to monitor the presence and spreading of invasive molluscs even if at present we do not have effective means for slowing it down.

In 2001 *Potamopyrgus antipodarum* (Gray, 1843) (Fig. 3.) was found in a gravel pit lake. A wide range of similar habitats stretch along the Dráva, besides this animal is able to settle even in very small surface water bodies. It is a very resistant species which can endure temporary dry habitats lasting for shorter periods. It produces very high individual density level in detritus.

Its dispersion would determinally affect the mollusc fauna of natural waters.

A new offender of terrestrial ecosystems is *Arion lusitanicus* (Mabille, 1868), a slug, which has been proved to be present in the country since 1986 (VARGA, BÁNKÚTI and KOVÁCS 1995). In 1996 it appeared in great mass in the inner area of Zákány and the Csurgó area.

Since the beginning of monitoring investigation the number of the infested sites has doubled. It spreads in weed assemblages and groves. It requires high humidity and leads a hiding way of life feeding mainly on plants. In the years of higher rainfall its population increases in a noticeable way. At present it does not reach the maximum individual density on any of the sampling sites as it would be expected according to literature data.

The most common member of bivalves *Dreissena polymorpha* (Pallas, 1771). First we came to know about its presence in the holocene from Lake Balaton (1932), since then it has been spreading continuously in lakes and rivers. In the Dráva it has been present since 1997 (VARGA and UHERKOVICH 1998) and has found its way into gravel pits as well. As it leads an immovable way of life it characteristically settles on shells of larger bivalves, but it can also be found on protective paving and vegetal material. According to the surveys it is commonly spread in rivers and lives in masses; its population size has not changed in a traceable manner during investigation.

Anodonta woodiana (Lea, 1834) (Fig. 4.) a bivalve species, originates in East-Asia and it was imported into Europe with different fish species (*Ctenopharyngodon idella, Hypophthalmichthys molitrix*). In 1990 it was already present in the Danubian water system and it is spreading towards the south. It also settled in Lake Balaton and some parts of our larger fishponds. In the Dráva it was identified during water fauna monitoring in 2002. It has been recorded in three of the sampling sites in the river, but also in oxbows and pit lakes. The increase in species area is a fact, the present sampling data do not provide accurate dispersion data.

When monitoring water fauna in float debris 20 water snail shells were found, one of them is a protected species. Table 2. contains the average density data of species in the float debris from three sampling sites over a 5 - year period. Due to the characteristic features of sampling methods, species whose shell does not retain gas bubbles sink to the bottom of the bed, so they are not present in the float debris. This causes the striking contradiction which explains why *Amphimelania holandri* (Pfeiffer, 1828) for example, is of occasional occurance, while in the solid parts of the sampling site its density exceeds 95%.

Table 3. contains species found in float debris of gravel pit lakes in the vicinity of Bélavár. Malacologically this area is valueless, investigation in this area was mainly aimed at monitoring the potential dispersion of invasive and protected species. No such occurance was recorded during the years in question. Species frequency in the sampling sites has considerably changed. The main reason is the fast succession in the lake, which strongly modifies snail population size.

Table 2.: Average density of water snail species in fluvial float debris

Species	Mean frequency
Anisus septemgyratus (Rossmässler, 1832)	2,9
Anisus spirorbis (Linnaeus, 1758)	8,4
Aplexa hypnorum (Linnaeus, 1758)	0,9
Bathyomphalus contortus (Linnaeus, 1758)	3
Bithynia leachi (Sheppard, 1823)	0,4
Bithynia tentaculata (Linnaeus, 1758)	26,6
Gyraulus albus (Müller, 1774)	0,6
Lithoglyphus naticoides (C. Pfeiffer, 1828)	2,7
Lymnaea auricularia (Linnaeus, 1758)	0,7
Lymnaea palustris (Müller, 1774)	2,4
Lymnaea peregra agg. (Müller, 1774)	13,2
Lymnaea truncatula (Müller, 1774)	14,9
Physa acuta (Draparnaud, 1805)	0,1
Physa fontinalis (Linnaeus, 1758)	0,3
Planorbarius corneus (Linnaeus, 1758)	2,3
Planorbis planorbis (Linnaeus, 1758)	6,2
Valvata cristata Müller, 1774	0,9
Valvata piscinalis (Müller, 1774)	7
Viviparus contectus (Millet, 1813)	4,2

Table 3. Average frequency of species in lake float debris

Species	Mean frequency
Anisus septemgyratus (Rossmässler, 1832)	2,9
Anisus spirorbis (Linnaeus, 1758)	8,4
Aplexa hypnorum (Linnaeus, 1758)	0,9
Bathyomphalus contortus (Linnaeus, 1758)	3
Bithynia leachi (Sheppard, 1823)	0,4
Bithynia tentaculata (Linnaeus, 1758)	26,6
Gyraulus albus (Müller, 1774)	0,6
Lithoglyphus naticoides (C. Pfeiffer, 1828)	2,7
Lymnaea auricularia (Linnaeus, 1758)	0,7
Lymnaea palustris (Müller, 1774)	2,4
Lymnaea peregra agg. (Müller, 1774)	13,2
Lymnaea truncatula (Müller, 1774)	14,9
Physa acuta (Draparnaud, 1805)	0,1
Physa fontinalis (Linnaeus, 1758)	0,3
Planorbarius corneus (Linnaeus, 1758)	2,3
Planorbis planorbis (Linnaeus, 1758)	6,2
Valvata cristata Müller, 1774	0,9
Valvata piscinalis (Müller, 1774)	7
Viviparus contectus (Millet, 1813)	4,2

Table 4.: Average frequency of terrestrial snail shells in fluvial float debris

Species	Mean frequency
Aegopinella ressmanni (Westerlund, 1883)	7.5
Aegopis verticillus (Férussac, 1822)	1
Bradybaena fruticum (Müller, 1774)	4.1
Carychium minimum Müller, 1774	5.4
Carychium tridentatum (Risso, 1826)	0.01
Cecilioides acicula (Müller, 1774)	0.3
Cepaea nemoralis (Linnaeus, 1758)	1.8
Cepaea vindobonensis (Férussac, 1821)	1.2
Clausilia pumila Pfeiffer, 1828	9.5
Cochlicopa lubrica (Müller, 1774)	11.8
Cochlicopa lubricella (Porro, 1838)	0.1
Cochlodina laminata (Montagu, 1803)	0.6
Columella edentula (Draparnaud, 1805)	0.1
Euconulus fulvus (Müller, 1774)	1.3
Helicigona arbustorum (Linnaeus, 1758)	3.2
Helicigona planospira (Lamarck, 1822)	0.4
Helix pomatia Linnaeus, 1758	0.8
Macrogastra ventricosa (Draparnaud, 1801)	0.01
Oxyloma elegans (Risso, 1826)	0.1
Perforatella bidentata (Gmelin, 1788)	7.1
Perforatella incarnata (Müller, 1774)	4.3
Perforatella rubiginosa (A. Schmidt, 1853)	2.9
Perforatella umbrosa (Pfeiffer, 1828)	1.9
Punctum pygmaeum (Draparnaud, 1801)	0.7
Pupilla muscorum (Linnaeus, 1758)	0.5
Semilimax semilimax (Férussac, 1802)	0.4
Sphyradium doliolum (Bruguiére, 1792)	0.01
Succinea oblonga Draparnaud, 1801	0.8
Succinea putris (Linnaeus, 1758)	2
Trichia hispida (Linnaeus, 1758)	0.2
Truncatellina cylindrica (Férussac, 1807)	0.01
Vallonia pulchella (Müller, 1774)	7.7
Vertigo angustior Jeffreys, 1830	0.01
Vertigo antivertigo (Draparnaud, 1801)	0.1
Vertigo moulinsiana (Dupuy, 1849)	0.01
Vertigo pygmaea (Draparnaud, 1801)	0.5
Vitrea crystallina (Müller, 1774)	14.6
Zonitoides nitidus (Müller, 1774)	6.8

The aim of sampling water snails by sweep netting is to study fauna living on the side of the river bed. Each sampling was taken on the gravel-free parts of the river bed. Comparing sample results to ones by quadrate sampling, frequency differences are quite striking due to different ground-base preferences. On Vízvár sampling site, when monitoring *Amphimelania holandri* (Pfeiffer, 1828) on species level, this species revealed an outstanding dominance (an average of 94%) on solid ground-base (the protective paving of the spurs), while this value, studied by sweep netting on a site rich in sediment only 2 m away, is only around 30%. The occurance frequency of *Lithoglyphus naticoides* reached 50% from former 4%.

On the Bolhó sampling site the current is strong and has steep sideway bed. The occurance of *Amphimelania holandri* (Pfeiffer, 1828) is accidental, it has not occurred in the last few years due to the weaker tolerance of ground-base quality. One of the possible causes may have been the perturbation brought about by enforcement of gravel depositing bankside. The low species number of this sampling site is also characteristic.

To get a clearer picture of the fauna, underwater individual sampling of water snails found on vegetation is carried out. Its purpose is to record species with a stable way of life whose presence is characteristically linked to vegetation and rarely found in float debris. In the course of samplings none of the species typically living on water plants were detected.

Investigation of terrestrial snail fauna is also made up of several components. It is part of investigation carried out in alder woods of Lankóci woodland belonging to Gyékényes and data yielded by investigation of terrestrial fauna (12 species) are complemented by those of individual sampling (9 species). No changes in the frequency of dominant species *Aegopinella ressmanni* (Westerlund, 1833), *Zonitoides nitidus* (Müller, 1774), *Perforatella incarnata* (Müller, 1774) were found. Due to the nearness of Dombó Canal phytofag species requiring high humidity appear in this area on the borderline of assemblages. Rich slug fauna inhabits the biomass of tree trunks. Characteristic species are *Arion circumscriptus* (Joston, 1828), *Arion subfuscus* (Draparnaud, 1805), *Deroceras agreste* (Linnaeus, 1758), *Limax cinereoniger* (Wolf, 1803).

An important component in the study of terrestrial snail species along the Dráva refers to water float debris. Table 4. contains average species frequency data collected during the five-year investigation. So far individuals of 38 species have been recorded, among them the occurance along the river of 2 protected species *Vertigo angustior* (Jeffreys, 1803) and *Vertigo moulinsiana* (Dupuy, 1849) have become known. In the float debris of Lake Bélavár we could determine 18 species. The vegetation and the ground surface are severely disturbed by dredging. The swept - in snail shells come from the surrounding weeds and soft-wood groves. Some of them are supposed to be subfossil.

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A Duna-Dráva Nemzeti Park térségében végzett puhatestű (Mollusca) monitoring tapasztalatai

HÉRA ZOLTÁN

A Duna-Dráva Nemzeti Park területén illetve térségében 2000 óta 4 projektben folynak puhatestű biomonitoring vizsgálatok. A kutatások során a korábbi adatokhoz képest 5 védett faj jelenléte, pontszerű előfordulása vagy populációjának areája vált ismertté. A vízi és a szárazföldi fauna monitorozása feltárta a Drávában és a hatásterületén élő puhatestű fauna alapvonásait, jellemző gyakorisági viszonyait, ami egy esetleges vízügyi beavatkozás esetén jó összehasonlítási alapot nyújt a bekövetkező változások kimutatására. A terület életközösségeit számos invázív faj terjedése veszélyezteti. Populációik areájának figyelemmel kísérése, az egyedsűrűség alakulásának regisztrálása rendszeres.