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# Sporadic data on the mollusc fauna of Rimetea and its environs (Trascău Mountains, Romania) with special reference to shell morphometry of *Alopia bielzii tenuis* (E. A. Bielz, 1861)

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**Abstract.** During a six-day fieldwork in 2006, 2007, 2009 and 2014, in the Eastern Apuseni mountains, I collected 50 terrestrial and one aquatic snail species, i.e., 151 new units altogether. Among them *Spelaeodiscus triaria* Rossmässler, 1839, *Alopia bielzii tenuis* (E. A. BIelz, 1861), *Bielzia coerulans* (M. Bielz, 1851), *Clausilia dubia f. gratiosa* Sajó, 1968, *Cochlodina orthostoma* (Menke, 1830), *Vestia elata* Rossmässler, 1836, *Discus perspectivus* (Mühlfeld,1818) are worth mentioning. In the investigated area, the number of Carpathian endemic species is 12 (24%). From malacological point of view, this area is characterized by *Alopia bielzii tenuis* (E. A. Bielz, 1861 – because of its distribution area) and *Euomphalia strigella* (Draparnaud, 1801 – in consequence of its constancy). The author points out that the shell sizes and the arithmetic mean values of the height of *Alopia bielzi tenuis* (E.A. Bielz, 1861) increase southwards, as well as the elongations of *Alopia bielzii tenuis* and *clathrata* decrease with the increase of shell widths. The series subspecies (Turda–*Alopia bielzii tenuis,* Zadiel–*Alopia bielzii clathrata*) shows a startling morphological resemblance.

**Keywords:** Carpathian endemism, elongation, frequency distribution, statistical calculation.

## Introduction

The Trascău Mountains (1200 km²) running north-east and south-west are situated on the south-eastern part of the Apuseni Mountains bordered by the Arieş River, the Ampoi River, the Metaliferi Mountains and the Câmpia Transilvaniei on the North on the South, on the West and on the East, respectively. Rimetea is on the northeast part of the mountains in Alba County (Fig. 1).

In the Trascău Mountains, Upper Jurassic limestone complex and a great variety of tectonic and exokarst formations (valleys, gorges, rock faces, cliffs and caves) were developed. Dâmbău (1368 m), Ardaşcheia (1250 m), Salaş (1148 m) and Piatra Secuiului (1129 m) etc. are the highest peaks. The annual rainfall in the Trascău Mountains ranges between 600 and 700 mm (at 400–500 m), while the snowfall in the region exceeds 1000 mm. The mean annual temperature is 7–8 °C in the basin (400–500 m) and 5 °C in the mountain region (about 1000 m). First of all, on the south and the north sides of the east-westward gorges the temperature may produce surprising differences (Dimap).

This area has not been investigated as thoroughly as Turda (Torda) and its periphery, in the first place the Turda Gorge ( =Tordai hasadék, Cheile Turzii) (Csiki 1906; Rotarides 1941; Soós 1943; Grossu 1955,1981a, 1981b, 1993; Bába & Kovács 1975; Váncsa 2006; Gagiu 2007). In his well-known summary work, Csiki (1906) enumerated the following taxa: *Alopia bielzii tenuis* including var. *intermedia*, var. *madensis* and var. *potaissanensis*, *Bulgarica vetusta, Campylea faustina, Cochlodina marisi, Discus perspectivus, Hygromia transsylvanica, Mastus bielzi, Pupilla muscorum, Pupilla triplicata, Pyramidula rupestris, Spelaeodiscus triaria trinodis, Vallonia pulchella* and *Vertigo pygmaea.* The genus *Alopia* is one among the many endemic taxa in the Carpathian Mountains. The previous taxonomical data about it come inter alia from Westerlund 1884, Kimakowicz 1894, Wagner 1922, Soós 1928, 1943, Grossu 1981b, Nordsieck 2008 and Fehér et al. 2013.

## Description of the sampling sites in chronological order

1. Rimetea (Torockó) – 4 km N of the village, scum of the Rimetea brook close to the bridge on the connecting road (Coll.: László Sarkadi) 11 September 2006

2. Rimetea (Torockó) – 4 km N of the village, hornbeam forest of the Rimetea brook close to the bridge on the connecting road (Coll.: László Sarkadi). The gleaning site is relatively a shady habitat covered with forest litter. 11 September 2006

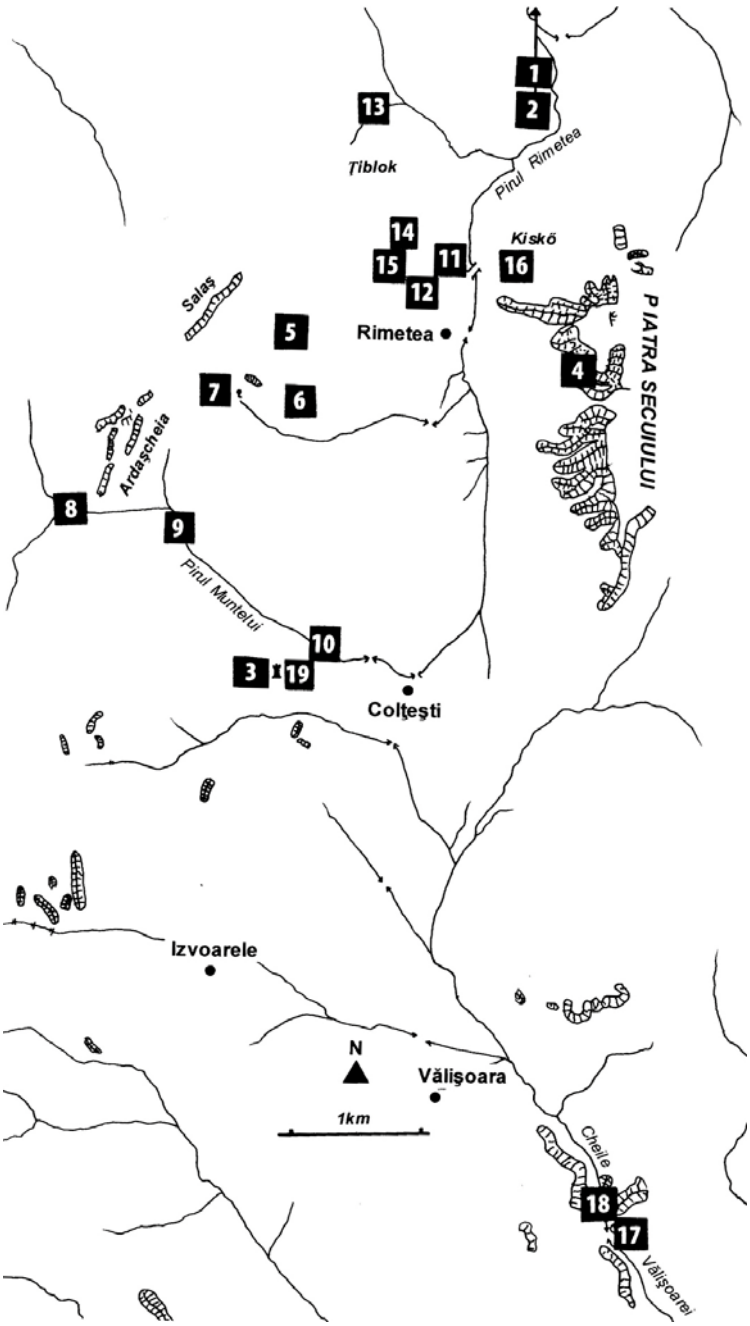


**Figure 1**. The hydrographic sketchmap of the studied area with the sampling sites in chronological order.

3. Colţeşti (Torockószentgyörgy) — Cetatea Trascăului castle ruin, 1 km W of the settlement. I took samples in the sunny foot of the fortress walls. The biotope faces the west and is covered with rock vegetation. 29 October 2007

4. Rimetea (Torockó) — Piatra Secuiului, 1.5 km SE of the commune, low cliff wall in the vicinity of a rock glacier on the western hillside. This biotope consists of outspread rock vegetation. 29 October 2007

5. Rimetea (Torockó) — Skirts of beech-wood (~750 m asl) under Salaş cliff 1.5 km W of the settlement. It is a typical stony and humid forest litter biotope. 15 Jun 2009

6. Rimetea (Torockó) — 2 km SW of the inhabited area, a slope with loess vegetation facing to the south. It is a sunny and dry biotope 15 June 2009

7. Rimetea (Torockó) — Marshy spot (*Mentha*, *Equisetum*, *Scirpus*) of the Hermit spring (3 $dm^3$/min, 800 m asl). I gleaned from broken vegetable fragments, small branches and twigs. 15 June 2009

8. Rimetea (Torockó) — Ardaşcheia, great burdock on the right-hand-side of the Muntelui/Havas/Snowy brook at the intersection of red tourist trail marking (red stripe and blue cross) and the brook (700 m asl). It is an open and shady biotope 4 km far from the settlement. 15 June 2009

9. Colţeşti (Torockószentgyörgy) — Alder spot on both side of the Muntelui/Snowy brook with marsh vegetation close to the bridge and 3 km far from the settlement. 15 June 2009

10. Colţeşti (Torockószentgyörgy) — Valea Muntelui. The sampling site is a rubbish reach of the brook, approximately 1 km far from the Presbyterian Church. 15 June 2009

11. Rimetea (Torockó) — This site is difficult to access, in a marshy area N of the settlement.
9 July 2014

12. Rimetea (Torockó) ─ a natural orchard (550 m asl) or a cultural ecosystem on the northern part of the inhabited area, a habitat with litter and fine woody debris. 10 July 2014

13. Rimetea (Torockó) ─ Northern slope of the Ţiblok hill, alder spot on both side of the Miner brook, along the tourist pathway of yellow triangle trail marking. It is a humid and shady woodland (beech, hornbeam, ash, robinia) biotope. The ground was covered with great burdock, forest litter, moss rubble and standing dead tree. 10 July 2014

14. Rimetea (Torockó) ─ The first couloir (about 4 m deep) by the side of Miner rout, about 0.5 km N of the settlement. This shrub-wooded sampling site is exposed to north. The soil was hidden under dead leaves of the forest (robinia, maple, willow). 10 July 2014

15. Rimetea (Torockó) ─ Dry and sunny, with loess vegetation, which is mowed from time to time. The biotope (575 m asl) is about 200 m north of the tourist bollard along the pathway marked with yellow triangle. 10 July 2014

16. Rimetea (Torockó) ─ Kiskő/Small rock (according to the residents), which is a cliff outcrop (~ 475 m asl) facing to the north, with white-red broken fragments of rocks vegetation. I took plotless sample via mass (only 1 $dm^3$). 10 July 2014

17. Vălişoara ─ Rezervaţia naturală Cheile Vălişoarei. The sampling site is at the foot of the rock wall and the ledge in the surroundings of the bridge. The examined biotope faced to the south-west and was covered with scum washed off the rock wall. Via mass (2 $dm^3$) and singling collection. 11 July 2014

18. Vălişoara ─ At the left-hand-side of the Vălişoarei brook, N of the bridge between Vălişoara and Poiana Aiudului.

19. Colţeşti (Torockószentgyörgy) ─ Cetatea Trascăului de la Colţesti, foot of the fortress wall, rock vegetation. Via mass (2 $dm^3$) and via singling representation sampling.
11 July 2014

## Material and methods

1. Collecting procedure

Snail specimens were collected by manual singling (30 minutes) as well as via mass (2–3 $dm^3$, vs. sampling sites 14, 15 and 16) from dry fallen leaves, parched grass and rock vegetation, scum, standing dead trees, litters, fine woody debris and rock ledges moreover one rock-glacier. After cleaning and drying, I selected out and identified the shells resulted from fieldworks. In order to determine the species, I used the taxonomic books and articles by Soós (1943), Grossu (1981a, 1983), Kerney et al. (1983), Nordsieck (2006, 2007 and 2008) and Welter-Schultes (2012). Then I took the specimens one by one and drew up a checklist of the molluscs according to Grossu (1993). My list does not take the subspecies and the different forms into consideration with the exception of clausiliid shells. In their case, I used the nomenclature of Nordsieck (2006, 2007 and 2008).

2. Shell morphometry of *Alopia bilelzii tenuis* and *clathrata*

I gleaned populations from stony biotope on different dates from the following sites:

●Turda, Cheile Turzii, stony biotope exposed to the north (1985: Munţii Gilăului-Muntele Mare). This sample can be found in the Mollusca collection of the Munkácsy Mihály Museum in Békéscsaba, Hungary.

●Colţeşti, Cetatea Trascăului, foot of the fortress wall, stony and partly shady biotope (2014: Munţii Trascău).

●Vălişoara, foot of wall rock, south-west exposition (2014: Munţii Trascău).

●Pietroasa, Piatra Bulzului, shaded slope beneath the SSW cliffs (2010: Munţii Bihor-Vlădeasa).

The sample sizes of the *Alopia bielzii tenuis* populations were 11, 38, 79 and 24, respectively (Tables 6 and 7). Between four elements of this group of samples, the distances were different. Colţeşti ~ 19 km (SSW), Vălişoara ~ 22 km (SSW), however Pietroasa ~ 80 km (W) from Cheile Turzii.

I used intact and matured shells for the measurements of the height (H) and width (W) of the shells with the help of a caliper with 0.1 mm accuracy. Sources of potential error of measuring were: read-off, relative elasticity of the shell,

crack of the shell, incorrect placing of the shell in the slide-gauge. Thereafter I drew the height as well as the width distribution curves of the preceding populations with 1 mm (H) and 0.1 (W) mm interclass intervals (Figs. 2–9), and made the tables with size distribution characteristics (Tables 2–7). In Fig. 8 and Fig. 9 I set the shell morphological parameters of *Alopia bielzii tenuis* (Romania, Cheile Turzii – dat.:1985, number of cases: 11) and *Alopia bielzii clathrata* (Slovakia, Zadiel, gorge – dat.: 2011, number of cases: 50) side by side. Fig. 8 and 9 show the height (11–15 mm) and width (3.2 - 3.9) distribution curves related to the three series of *Alopia bielzii clathrata* (number of cases: 1st: 50, 2nd: 44, 3rd: 42). Finally, I calculated the elongations (H/W) referred to two subspecies, i.e., to *Alopia bielzii tenuis* (Turda, Vălişoara) and *Alopia bielzii clathrata* (Zadiel) (Fig. 10).

## Results and discussion

1. Taxa

During this malacological survey, 51 Mollusc taxa (50 terrestrial and one freshwater snails) and 149 new units were found in the Trascău Mountains, in Rimetea and its environs (Tables 1/a, 1/b). Terrestrial malacofauna of the studied area includes 12 endemic Carpathian species (24%) as well as 12 clausiliid taxa (24%) similar to collecting locality Scărişa Belioara (Poşaga de Sus, Munţii Gilăului- Muntele Mare – Bába & Sárkány-Kiss 2001) situated approximately 15-20 km NW of my sampling sites. In the above-mentioned paper, Bába & Sárkány (2001) enumerated 48 taxa in spite of they used 10x25x25 cm quadrat plots and ethylene-glycol soil traps. Roughly sixty per cent of the taxa agrees with one another (Sørensen index ~ 0.49). 14 of the identified taxa (29%) are Carpathian endemic species or subspecies: *Alopia bielzii tenuis*, *Argna parreyssi, Balea/Pseudalinda stabilis, Campylea faustina, Clausilia dubia f. gratiosa,* Cochlodina marisi, *Deroceras rodnae, Helicigona/Drobacia banatica, Orcula jetschini, Pupilla bigranata, Spelaeodiscus triaria, Trichia bielzi, Vitrea transsylvanica, Vitrea subrimata* (Bába & Sárkány-Kiss 2001). Sørensen index of the Carpathian endemic species of Rimetea and Poşaga de Sus is ~ 0.44.

In the comments of the checklist (see below) there are some taxonomic, zoogeographical, bibliographical and interspecific association (constancy, dominance) information relating to the individual species to be detailed.

Because of arid weather as well as sampling method, some riparian ubiquists and hygrophilous forest dwellers are absent in the studied area.

2. Biometrical investigation of Alopia subspecies

First of all I met success with repeated measurement of parameters resulted from different series of various biotopes (Colţeşti, Zadiel) (Figs. 2–5).
The differences between M-formed frequency curves of the width (W) are significant. M-formed curves refer to the fact that the Colţeşti sample originated from a biotope with mixed microclimate (Fig. 3).

I measured surprisingly low values of height (H) and width (W) in consequence of colder microclimate in the Cheile Turzii, which is directed to east-west (Figs. 6, 7).

Figures 6, 7 and Tables 6 and 7 illustrate that the arithmetic mean values increase, however the height (H) curves shift towards larger values head for south in the Trascău Mountains. Pietroasa series collected on the western part of the Bihor Mountains shows the highest mean values of shell width and height. Width (W) values of Colţeşti and Vălişoara sampling sites present a not decided difference.

As it is seen in Figs. 8 and 9, the subspecies (Turda – *Alopia bielzii tenuis* and Zadiel – *Alopia bielzii clathrata*) series shows a startling morphological resemblance.

Morphometric and statistical properties show trifling small differences, only height (H) mode of Colţeşti series presents about 3% difference (Tables 2–5). On the other hand,the difference among modes of Zadiel series may be just like 10% too.

Because of the breakdown of apex, many individuals of Zadiel series show declining tendency (Tables 4, 5).

End values:

Colţeşti→ Min–Max: 13.3–17.7 X 3.7–4.3 mm (Soós 1943; 11.4–18.5 X 3.3–4.5 mm).

Zadiel → Min–Max: 11.0–14.6 X 3.2–4.0 mm (Soós 1943; 11.6–14.8 X 3.4–4.0).

Deviation in case of H is only 1-2 mm (Colţeşti) respectively some millimetres (Zadiel), in case of W is merely some 0.1 mm/ tenth millimetres (to a few tenths of a millimetre).

Comparison of shell height (H) and width (W) of Turda and Zadiel series as well as elongation (H/W) of Turda, Zadiel and Vălișoara can be found in Fig. 8–10. The most interesting one is the relationship between elongation and width (Fig.10).The elongation of *Alopia bielzii tenuis* and *clathrata* decreases with the increasing shell width, distribution/regression of *Alopia bielzii tenuis* (Vălişoara) and *Alopia bielzii clathrata* (Zadiel) well differentiates from one other, against this

Turda H/W and W values of shell take one's place among values of Zadiel (Fig. 10).Therefore there is a need for the approval of the shell sculpture/ribs. According to Grossu (1993) in the Cheile Turzii *Alopia bielzii clathrata* is found.

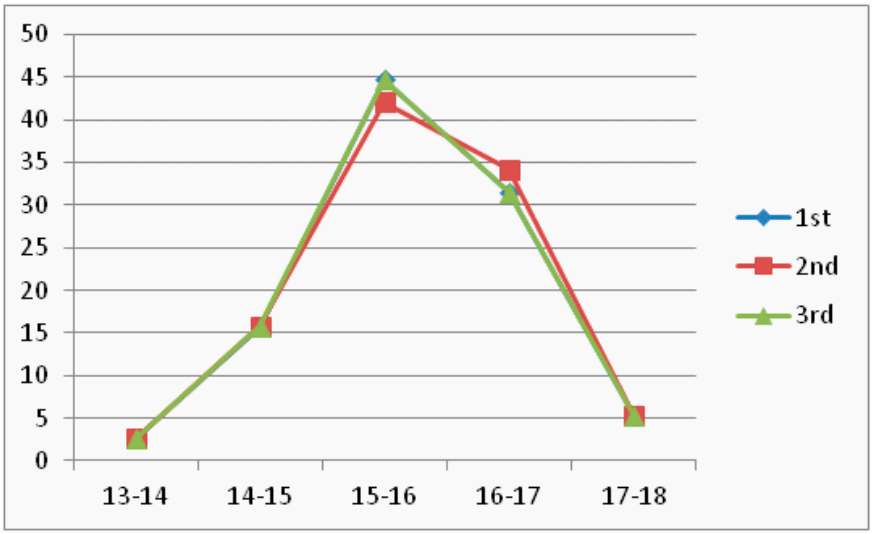


**Figure 2.** Frequency (0→50%) distribution curves of height (13—18 mm) of *Alopia bielzii tenuis* in Colţeşti (Three series resulted by way of repetition).

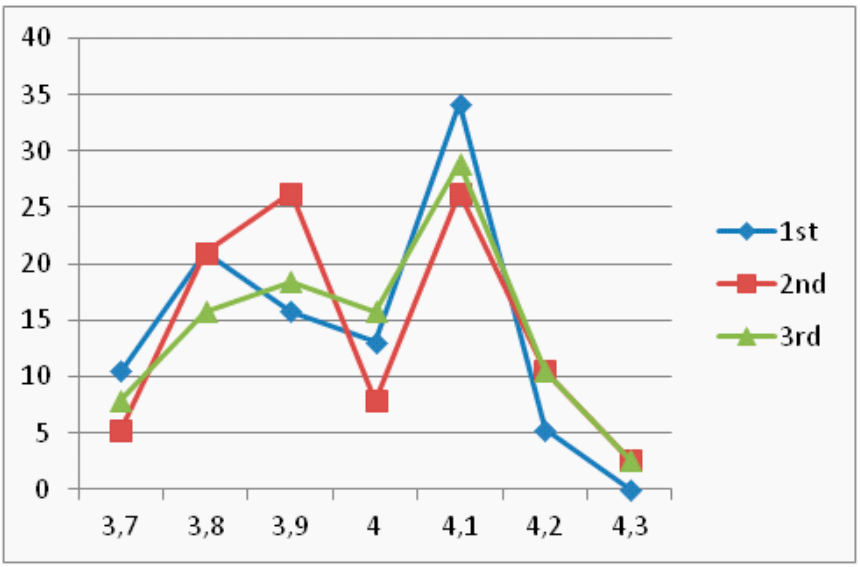


**Figure 3.** Frequency (0→40 %) distribution curves of width (3.7— 4.3 mm) of *Alopia bielzii tenuis* in Colţeşti (Three series resulted by way of repetition).

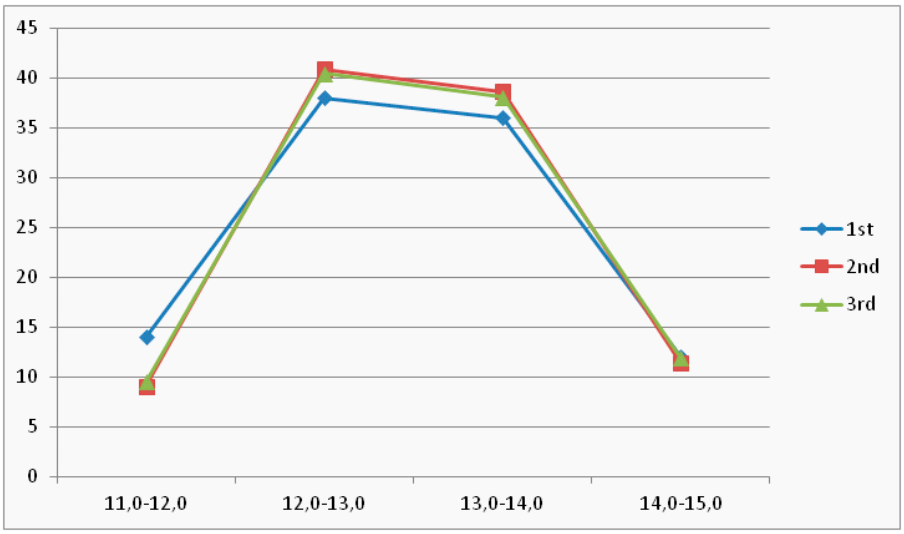


**Figure 4.** Frequency (0→45%) distribution curves of height (11—15 mm) of *Alopia bielzii tenuis* in Zadiel.

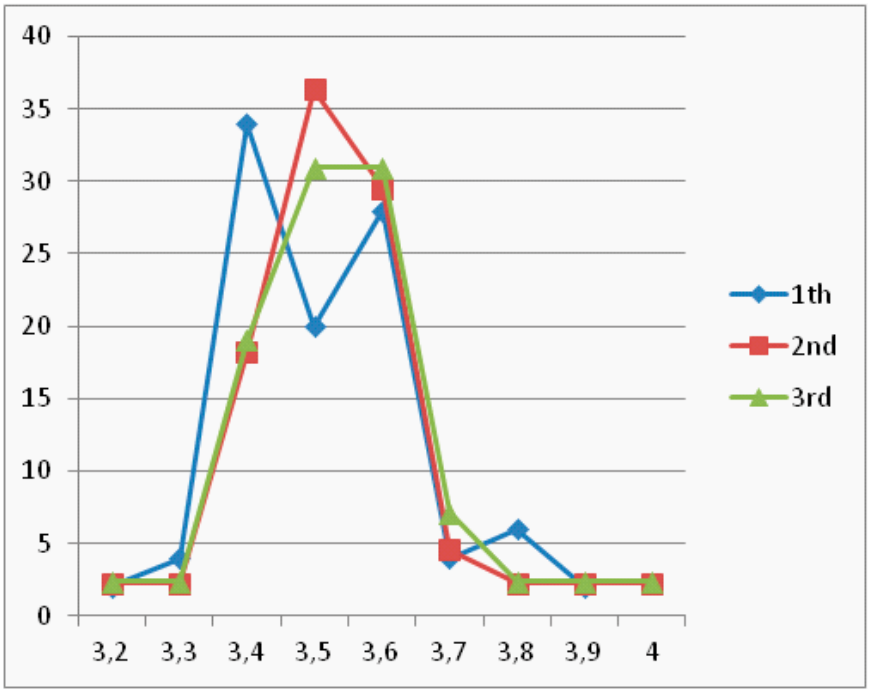


**Figure 5.** Frequency (0→40 %) distribution curves of width (3.2—4.0 mm) of *Alopia bielzii tenuis* in Zadiel.

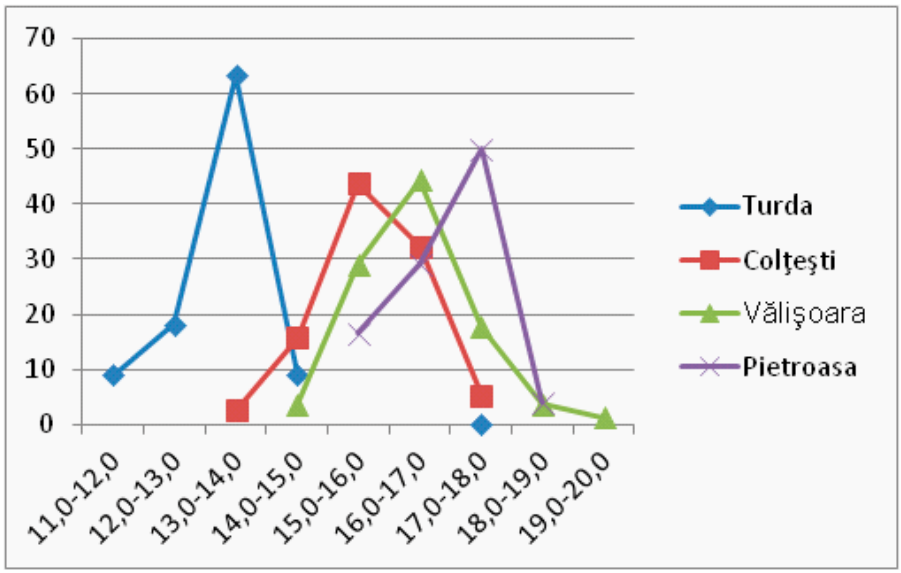


**Figure 6.** Frequency (0→70 %) distribution curves of height (11—20 mm) of *Alopia bielzii tenuis.*

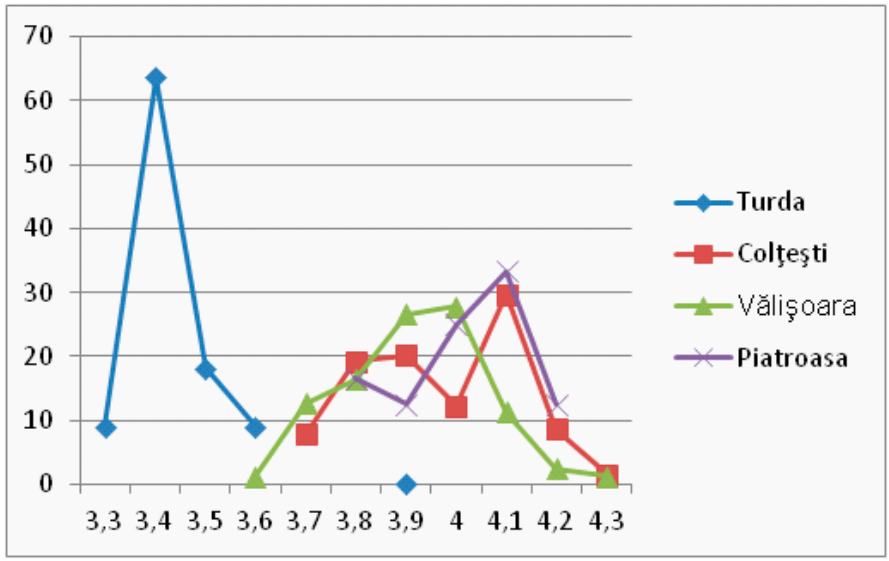


**Figure 7.** Frequency (0→70 %) distribution curves of width (3.3—4.3 mm) of *Alopia bielzii tenuis.*

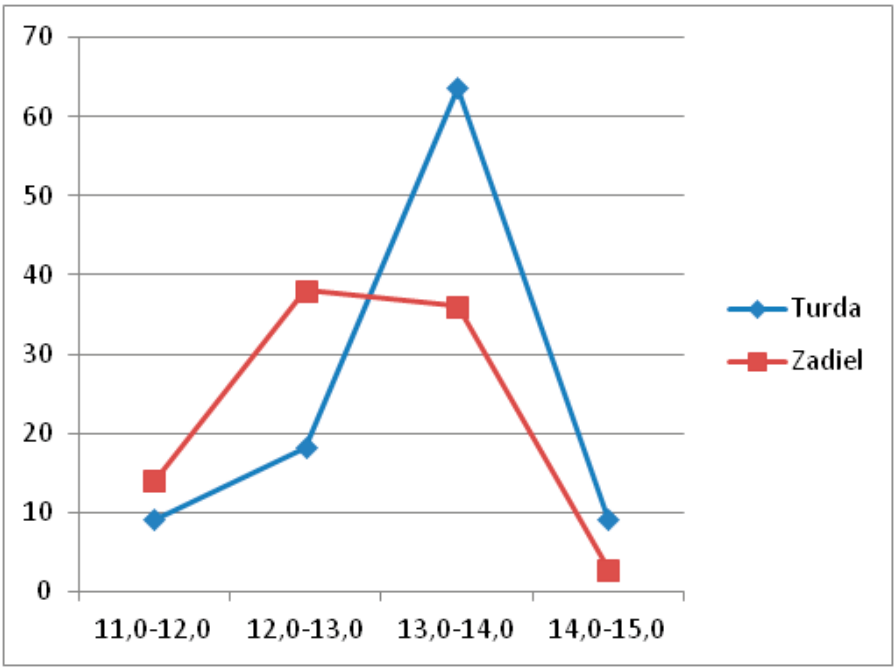


**Figure 8.** Frequency (0→70 %) distribution curves of height (11—15 mm) of *Alopia bielzii tenuis* and *clathrata.*

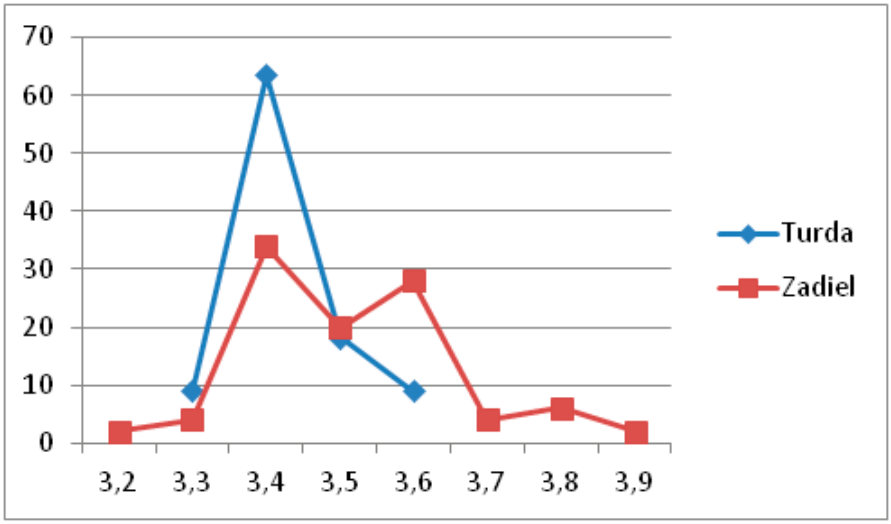


**Figure 9.** Frequency (0→70) distribution curves of width (3.2—3.9 mm) *Alopia bielzii tenuis* and *clathrata.*

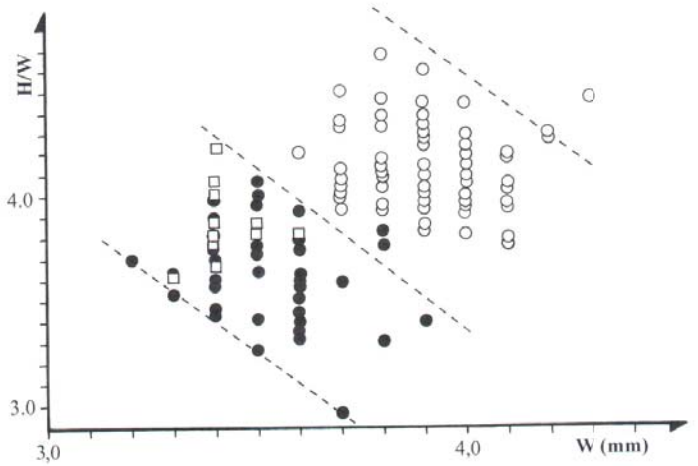


**Figure 10.** Elongation (H/W) as a function of shell width (3.2→4.3 mm) for the different collection sites and subspecies ( ● = Slovakia, Zadiel ─ *Alopia bielzii clathrata*; □ = Romania, Turda, Cheile Turzii ─ *Alopia bielzii tenuis;*○ = Romania, Vălişoara, Cheile Vălişoarei ─ *Alopia bielzii tenuis*).

**Check list in systematic order of the mollusks (Grossu 1993)**

Class Gastropoda
Subclass Pulmonata
Familia Planorbidae Rafinesque, 1815

●*Anisus leucostoma* (Millet, 1813)

**Comments**: It is found only in scum on sampling site No.1.

Familia Succinaeidae Beck, 1857

●*Oxyloma elegans* (Risso, 1826)

**Comments:** In this area, it is difficult to tell *Succinea putris* or *Oxyloma elegans* apart based on shell morphology.

Familia Cochlicopidae Pilsbry, 1900

●*Cochlicopa lubrica* (O.F. Müller, 1774)

**Comments:** This species is rare in the studied area.

Familia Orculidae Pilsbry, 1913

●*Sphyradium doliolum* (Bruguière, 1792)

Familia Pyramidulidae Wenz, 1923

●*Pyramidula rupestris* (Draparnaud, 1801)

Familia Valloniidae, Morse, 1864

●*Vallonia costata* (O.F. Müller, 1774)

●*Vallonia pulchella* (O.F. Müller, 1774)

Familia Spelaeodiscidae Zilch, 1960

●*Spelaeodiscus triaria* Rossmässler, 1839

**Comments:** It was collected only in Rezervaţia naturală Cheile Vălişoarei.

Familia Vertiginidae Fitzinger, 1833

●*Truncatellina cylindrica* (Férussac, 1822)

Familia Pupillidae Turton, 1821

●*Pupilla muscorum* (Linnaeus, 1758)

●*Pupilla triplicata* (Studer, 1820)

**Comments:** I collected only from the sampling site No.19 (Rezervaţia naturală Cheile Vălisoarei).

Familia Chondrinidae Steenberg, 1925

●*Granaria frumentum* (Draparnaud, 1801)

●*Chondrina clienta* (Westerlund, 1883)

●*Chondrula tridens* (O.F. Müller, 1774)

**Comments:** This is a very variable species in the Trascău Mountains: on sampling site No. 1: 13.4x5.4 mm, No. 4: 10.2x3.3 mm, Cheile Turzii: 12.4– 6.7x5.5–3.3 mm (scum!). A revision of this species is required.

●*Merdigera obscura* (O.F. Müller, 1774)

Familia Clausiliidae Schmidt, 1857

●*Alopia bielzii tenuis* (E.A.Bielz, 1861)

**Comments:** Among clausiliids this species has the greatest abundance.

●*Cochlodina laminata* (Montagu, 1803)

●*Cochlodina orthostoma* (Menke, 1830)

**Comments:** This species is known only from sampling site No. 5 (under Salaş cliff).

●*Cochlodina marisi* A. Schmidt, 1857

**Comments:** According to Grossu (1993): ”*C. marisi* is only in the Southern Carpathians: Deva, Cheile Turzii and northern Oltenia.” Bába & Sárkány-Kiss 2001 prognosticated from Scariţa Belioara (Poşaga de Sus). I found it on the southern part of Mţii Apuseni, from Şiria to Vălişoara (Domokos 2014).

●*Ruthenica filograna* (Rossmässler, 1836)

**Comments:** It is frequent in the Western Carpathian Mountains. The dimension of shells is very varied. I agree with Paál-Gergely 2009–2010 that *Ruthenica gallinae* (Bielz, 1861) is an invalid species. In my opinion, this taxon is only one of the many forms.

●*Clausilia dubia* Draparnaud, 1805

●*Clausilia dubia f. gratiosa* Sajó, 1968

**Comments:** New localities: Rimetea Kiskő (No. 16) and Rezervaţia naturală Cheile Vălişoara (No. 17).

●*Laciniaria plicata* Draparnaud, 1805

●*Balea biplicata* (Montagu, 1803)

**Comments:** This genus is in Grossu's catalogue (Grossu, 1993) as *Balea biplicata*. According to Nordsiek's opinion (2007) it is *Alinda biplicata.*

●*Balea stabilis* (L. Pfeiffer, 1847)

**Comments:** According to Nordsiek's view (2007) it is *Pseudalinda stabilis.*

●*Vestia elata Rossmässler, 1836*

**Comments:** During my field trip unique samples (No. 13) were collected.

●*Bulgarica vetusta* (Rossmässler, 1836)

**Comments:** It is very rare in the environs of Rimetea, but relatively common on the western part of Apuseni Mountains (Domokos & Lennert 2007; Domokos et al. 2010; Deli & Domokos 2011).

Familia Ferussaciidae Bruguière, 1883

●*Cecilioides acicula* (O.F. Müller, 1774)

**Comments:** From scum turned up only (On the sampling site No. 1).

Familia Endodontidae Pilsbry, 1894

●*Discus perspectives* (Mühlfels, 1818)

**Comments:** It is a unique occurrence in hornbeam forest (Sampling site No. 2, 13.) in the Munţii Apuseni (Bába & Kovács 1975; Bába & Sárkány-Kiss 2001; Deli & Domokos 2011; Domokos & Váncsa 2005; Domokos & Lennert 2007; Domokos et al. 2010; Domokos 2014; Lengyel & Paál-Gergely 2009–2010).

Familia Vitrinidae Fitzinger, 1833

●*Phenacolimax/ Vitrina pellucida* (O.F. Müller, 1774)

●*Phenacolimax annularis* Studer, 1820

Familia Arionidae Gray, 1841

●*Arion subfuscus* Draparnaud, 1801

**Comments:**It is determined based on the specimens' morphology and colour.

Familia Zonitidae Mörch, 1864

●*Zonitoides nitidus* (O.F. Müller, 1774)

●*Vitrea transsylvanica* (Clessin, 1877)

●*Vitrea diaphana* (Studer, 1820)

●*Vitrea crystallina* (O.F. Müller, 1774)

●*Aegopinella minor* (Stabile, 1864) or *Aegopinella epipedostoma* (Fagot, 1869).

**Comments:** The systematic status of all two *Aegopinella* species is doubtful due to the lack of anatomical investigation. *Aegopinella epipedostoma* was mentioned by Lengyel & Páll-Gergely (2009–2010) from Bihor Mountains.

●*Aegopinella pura* (Adler, 1830)

Familia Limacidae Rafinesque, 1815

●*Bielzia coerulans* (M. Bielz, 1851)

**Comments:** It is collected from rock-glacier at Piatra Secuiului (Sampling site No. 4).

Familia Bradybaenidae Pilsbry, 1939

●*Bradybaena fruticum* (O.F. Müller, 1774)

Familia Helicidae Refinesque, 1815

●*Helicella obvia* (Menke, 1828)

●*Perforatella dibothrion* (M. Kimakowicz, 1890)

●*Monachoides vicina* (Rossmässler 1842)

**Comments:** This species is absent from the Munţii Codru-Moma. (Domokos & Lennert, 2007) The young *Monachoides vicina* individuals are easily confused with *Hygromia/Lozekia transsylvanica* (Westerlund, 1876) or *Hygromia/Kovacsia ko-*

*vacsi* Varga & Pintér, 1972 individuals.

●*Zenobiella rubiginosa* (A. Schmidt, 1853)

●*Euomphalia strigella* (Draparnaud, 1801)

**Comments:** Widespread in the investigated area.

●*Lozekia transsylvanica* (Westerlund, 1876)

**Comments:** The second clad (k-2) of the *Kovacsia kovacsi* can be found in the Pădurea Craiului, Codru-Moma and Zărand Mountains (Fehér et al, 2008). In the studied area its presence is doubtful due to lack of anatomical investigation.

●*Drobacia/Helicigona banatica* (Rossmässler, 1838)

**Comments:** This species is widespread in the Apuseni Mountains (Domokos & Lennert, 2007; Domokos et al. 2010).

●*Campylea faustina* (Rossmässler, 1835)

●*Cepaea vindobonensis* (Férussac, 1821)

●*Helix pomatia* Linnaeus, 1758

●*Helix lutescens* (Rossmässler, 1837)

**Comment:** In the studied area and in the Apuseni Mountains it is rare and absent in the Codru-Moma Mountains (Domokos & Lennert, 2007).

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**Table 1/a** Sampling sites and terrestrial snail taxa of the study area. Endemic Carpatian species are pressed from list with bold tipe (Bába 1982, Walter-Schultes 2012)

| No | Taxa | Sampling sites | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 1 | *Aegopinella minor* | ● | ● | | ● | | | ● | | | |
| 2 | *Aegopinella pura* | | | | | | | | | | |
| 3 | *Alinda biplicata* | | | | | | | | ● | ● | |
| **4** | ***Alopia bielzii tenuis*** | | | ● | ● | | | | | | |
| 5 | *Arion subfuscus* | | | | | | | | | ● | |
| **6** | ***Bielzia coerulans*** | | | | ● | | | | | | |
| 7 | *Bradybaena fruticum* | ● | | | ● | | | | | | |
| 8 | *Bulgarica vetusta* | | | | ● | | | | | | |
| **9** | ***Campylea faustina*** | | | | ● | | | | ● | | |
| 10 | *Cecilioides acicula* | ● | | | | | | | | | |
| 11 | *Cepaea vindobonensis* | | | ● | ● | | | | | | |
| 12 | *Chondrina clienta* | | | ● | ● | | | | | | |
| 13 | *Chondrula tridens* | ● | | ● | ● | | | | | | |
| 14 | *Clausilia dubia* | | | | | | | | | | |
| **15** | ***Clausilia dubia f. cratiosa*** | | | | | | | | | | |
| 16 | *Cochlicopa lubrica* | ● | | | | | | | | | |
| 17 | *Cochlodina laminata* | | ● | | | ● | | | | ● | |
| **18** | ***Cochlodina marisi*** | | | ● | ● | | | ● | | | |
| 19 | *Cochlodina orthostoma* | | | | | ● | | | | | |
| 20 | *Discus perspectivus* | ● | ● | | | | | | | | |
| 21 | *Euomphalia strigella* | ● | ● | ● | ● | ● | | | | | |
| 22 | *Granaria frumentum* | | | ● | | | ● | | | | |
| 23 | *Helicella obvia* | | | ● | | | ● | | | | |
| **24** | ***Helicigona/Drobacia banatica*** | ● | | | | ● | | | ● | ● | |
| 25 | *Helix lutescens* | ● | | | | | | | | | ● |
| 26 | *Helix pomatia* | | | ● | | | ● | | | | |
| 27 | ***Hygromia/Lozekia f. transsylvanica*** | ● | | | | | | | | | |
| **28** | *Laciniaria plicata* | | | | | ● | | | | ● | |
| 29 | *Merdigera obscura* | | | | | ● | | | | | |
| 30 | *Monachoides vicina* | | | | | | | | ● | | |
| 31 | *Oxyloma elegans* | ● | | | | | | | | | |
| **32** | ***Perforatella dibothrion*** | | ● | | | ● | | | | | |
| 33 | *Phenacolimax /Vitrina pellucida* | | ● | | ● | ● | | | | ● | |
| 34 | *Phenacolimax annularis* | | | | ● | | | | | | |
| 35 | *Pupilla muscorum* | ● | | | ● | | | | | | |
| 36 | *Pupilla triplicata* | | | | | | | | | | |
| 37 | *Pyramidula rupestris* | | | | | | | | | | |
| 38 | *Ruthenica filograna* | ● | | | ● | | | | ● | | |
| **39** | ***Pseudalinda stabilis*** | | ● | | ● | ● | | | | | |
| **40** | ***Spelaeodiscus triaria*** | | | | | | | | | | |
| 41 | *Sphyradium doliolum* | ● | | | ● | ● | | | ● | ● | |
| 42 | *Tuncatellina cylindrica* | | | | ● | | | | | | |
| 43 | *Vallonia costata* | | | | | | | | | | |
| 44 | *Vallonia pulchella* | ● | | | | | | | | | |
| **45** | ***Vestia elata*** | | | | | | | | | | |
| 46 | *Vitrea crystallina* | | | | | | | | ● | | |
| 47 | *Vitrea diaphana* | | | | | ● | | | | | |
| **48** | ***Vitrea transsylvanica*** | | | | | | | | | | |
| 49 | *Zenobiella rubiginosa* | ● | | | | | | | | | |
| 50 | *Zonitoides nitidus* | ● | | | | | | | | | |
| Number of taxa | | 17 | 7 | 9 | 18 | 11 | 3 | 2 | 7 | 7 | 1 |

**Table 1/b** Sampling sites and terrestrial snail taxa of the study area. Endemic Carpatian species are pressed from list with bold tipe (Bába 1982, Walter-Schultes 2012)

| | Taxa | Sampling sites | | | | | | | | | 1 -19 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | |
| 1 | *Aegopinella minor* | | ● | ● | | | | | | | 6 |
| 2 | *Aegopinella pura* | | | ● | | | | | | | 1 |
| 3 | *Alinda biplicata* | | | ● | | | | | | | 3 |
| **4** | ***Alopia bielzii tenuis*** | | | | | | | ● | | ● | 4 |
| 5 | *Arion subfuscus* | | | | | | | | | | 1 |
| **6** | ***Bielzia coerilans*** | | | | | | | | | | 1 |
| 7 | *Bradybaena fruticum* | ● | | | | | | | ● | | 4 |
| 8 | *Bulgarica vetusta* | | | | | | | | | | 1 |
| **9** | ***Campylea faustina*** | | | | | | | | | | 2 |
| 10 | *Cecilioides acicula* | | | | | | | | | | 1 |
| 11 | *Cepaea vindobonensis* | | ● | | | | | ● | | ● | 5 |
| 12 | *Chondrina clienta* | | | | | | ● | ● | | ● | 5 |
| 13 | *Chondrula tridens* | | | | | | | ● | | | 4 |
| 14 | *Clausilia dubia* | | | | ● | | | | | | 1 |
| **15** | ***Clausilia d. f. cratiosa*** | | | | | | ● | ● | | | 2 |
| 16 | *Cochlicopa lubrica* | | | | | | | | | | 1 |
| 17 | *Cochlodina laminata* | | | ● | | | | | | | 4 |
| **18** | ***Cochlodina marisi*** | | ● | | ● | | ● | ● | | | 7 |
| 19 | *Cochlodina orthostoma* | | | | | | | | | | 1 |
| 20 | *Discus perspectivus* | | | ● | | | | | | | 3 |
| 21 | *Euomphalia strigella* | ● | ● | ● | | | | ● | | ● | 10 |
| 22 | *Granaria frumentum* | | | | | ● | ● | ● | | ● | 6 |
| 23 | *Helicella obvia* | | ● | | | | ● | ● | | ● | 6 |
| **24** | ***Drobacia banatica*** | | | ● | | | | | | | 5 |
| 25 | *Helix lutescens* | | | | | | | | | | 2 |
| 26 | *Helix pomatia* | ● | ● | ● | | | ● | ● | | ● | 8 |
| 27 | *Laciniaria plicata* | | ● | | ● | | | | | | 4 |
| **28** | ***Lozekia f. transsylvanica*** | | | | | | | | | | 1 |
| 29 | *Merdigera obscura* | | | | | | | | | | 1 |
| 30 | *Monachoides vicina* | | | | | | | | | | 1 |
| 31 | *Oxyloma elegans* | | | | | | | | ● | | 2 |
| **32** | ***Perforatella dibothrion*** | | | ● | | | | | | | 3 |
| 33 | *Phenacolimax pellucida* | | | ● | | | | ● | | | 6 |
| 34 | *Phenacolimax annularis* | | | | | | | ● | | | 2 |
| 35 | *Pupilla muscorum* | | | | | | | ● | | ● | 4 |
| 36 | *Pupilla triplicata* | | | | | | | | | ● | 1 |
| 37 | *Pyramidula rupestris* | | | | | | ● | | | ● | 2 |
| 38 | *Ruthenica filograna* | | | ● | | | ● | ● | | | 6 |
| **39** | ***Pseudalinda stabilis*** | | | ● | | | | | | | 4 |
| **40** | ***Spelaeodiscus triaria*** | | | | | | | ● | | | 1 |
| 41 | *Sphyradium doliolum* | | | | | | | | | | 4 |
| 42 | *Tuncatellina cylindrica* | | | | | | | | | ● | 2 |
| 43 | *Vallonia costata* | | | | | ● | | | | | 1 |
| 44 | *Vallonia pulchella* | | | | | | ● | ● | | ● | 4 |
| **45** | ***Vestia elata*** | | | ● | | | | | | | 1 |
| 46 | *Vitrea crystallina* | | | | | | | | | | 1 |
| 47 | *Vitrea diaphana* | | | | | | | | | | 1 |
| **48** | ***Vitrea transsylvanica*** | | | ● | | | | | | | 1 |
| 49 | *Zenobiella rubiginosa* | | | | | | | | | | 1 |
| 50 | *Zonitoides nitidus* | | | | | | | | ● | | 2 |
| Number of taxa | | 3 | 7 | 14 | 3 | 2 | 9 | 16 | 3 | 12 | 151 |

**Table 2.** Size distribution parameters of H (height) of the measured *Alopia bielzii tenuis* population (s: sunny biotope, sh: shady biotope, m: sunny and shady biotope: N: number of cases, AM: arithmetic mean, MO: mode, Min: minimum value, Max: maximum value, d: range of measuring, σ: standard deviation, V: variance).

| S. sites | Series H | N | AM | Mo | Min | Max | d | σ | V |
|---|---|---|---|---|---|---|---|---|---|
| Colţeşti | 1. st. | 38 | 15,66 | 15,2 | 13,3 | 17,7 | 4,4 | 0,86 | 0,75 |
| | 2. nd. | 38 | 15,66 | 15,7 | 13,4 | 17,7 | 4,3 | 0,86 | 0,74 |
| | 3. rd | 38 | 15,68 | 16,1 | 13,4 | 17,7 | 4,3 | 0,86 | 0,74 |

**Table 3.** Size distribution parameters of W (width) of the measured *Alopia bielzii tenuis* population (For list of abbreviations see Table 2).

| S. site | Series W | N | AM | Mo | Min | Max | d | σ | V |
|---|---|---|---|---|---|---|---|---|---|
| **Colţeşti** | 1. st. | 38 | 3,95 | 4,1 | 3,7 | 4,2 | 0,5 | 0,15 | 0,02 |
| | 2. nd. | 38 | 3,97 | 4,1 | 3,7 | 4,3 | 0,6 | 0,15 | 0,02 |
| | 3. rd | 38 | 3.98 | 4,1 | 3,7 | 4,3 | 0,6 | 0,15 | 0,02 |

**Table 4.** Size distribution parameters of H (height) of the measured *Alopia bielzii clathrata* population (For list of abbreviations see Table 2).

| S. site | Series H | N | AM | Mo | Min | Max | d | σ | V |
|---|---|---|---|---|---|---|---|---|---|
| Zadiel | 1.st. | 50 | 12,8 | 12,5/13,3 | 11,0 | 14,6 | 3,6 | 0,83 | 0,67 |
| | 2.nd. | 44 | 12,9 | 12,5/13,3 | 11,0 | 14,6 | 3,6 | 0,78 | 0,61 |
| | 3.rd | 42 | 12,9 | 12,5-13,3 | 11,0 | 14,6 | 3,6 | 0,79 | 0,63 |

**Table 5.** Size distribution parameters of W (width) of the measured *Alopia bielzii clathrata* population (For list of abbreviations see Table 2).

| S. site | Series W | N | AM | Mo | Min | Max | d | σ | V |
|---|---|---|---|---|---|---|---|---|---|
| Zadiel | 1. st. | 50 | 3,51 | 3,4 | 3,2 | 3,9 | 0,7 | 0,14 | 0,02 |
| | 2. sd. | 44 | 3,53 | 3,5 | 3,2 | 4,0 | 0,8 | 0,14 | 0,02 |
| | 3. rd | 42 | 3,54 | 3,5/3,6 | 3,2 | 4,0 | 0,8 | 0,14 | 0,02 |

**Table 6.** Comparison of shell height (H) of from *Alopia bielzii tenuis* populations of different habitats (For list of abbreviations see Table 2).

| S. sites | Exposure | N | AM | Mo | Min | Max | d | σ | V |
|---|---|---|---|---|---|---|---|---|---|
| Turda | E–W (sh.) | 11 | 13,26 | 13–14 | 12,0 | 14,4 | 2,4 | 0,67 | 0,45 |
| Colţeşti | W–SW (m.) | 38 | 15,66 | 15–16 | 13,4 | 17,7 | 4,3 | 0,86 | 0,74 |
| Vălişoara | W (s.) | 79 | 16,33 | 16–17 | 14,6 | 19,3 | 4,7 | 0,88 | 0,78 |
| Pietroasa | S–SW (sh.) | 24 | 16,82 | 17–18 | 15,7 | 18,1 | 2,7 | 0,67 | 0,44 |

**Table 7.** Comparison of shell width (W) of from *Alopia bielzii tenuis* populations of different habitats (For list of abbreviations see Table 2).

| S. sites | Exposure | N | AM | Mo | Min | Max | d | σ | V |
|---|---|---|---|---|---|---|---|---|---|
| Turda | E–W (sh.) | 11 | 3,42 | 3,4 | 3,3 | 3,6 | 0,3 | 0,08 | 0,00 |
| Colţeşti | W–SW (m.) | 38 | 3,97 | 4,1 | 3,7 | 4,3 | 0,6 | 0,16 | 0,25 |
| Vălişoara | W (s.) | 79 | 3,91 | 4,0 | 3,6 | 4,3 | 0,7 | 0,14 | 0,02 |
| Pietroasa | S–SW (sh.) | 24 | 4,01 | 4,1 | 3,8 | 4,2 | 0,4 | 0,13 | 0,01 |

## References


Bába, K. & Kovács, Gy. 1975 – Adatok a Királyhágó környéke, a révi szurdokvölgy és a Tordai-hasadék Mollusca-faunájához (Román Szocialista Köztársaság). – *Soosiana* **3:** 27-34.

Bába,K. & Sárkány-Kiss, A. 2001 ─ The malacofauna of the Bélavára ─ Scăriţa Belioara mountain (Bihar Mountains, Romania). ─ *Nachrichtenblatt der Ersten Vorarlberger Malakologischen Gesellschaft,* **9:** 21─25.

Csiki, E. 1906 – Mollusca. In: Fauna Regni Hungariae, II. (Mollusca). Királyi Magyar Természettudományi Társulat, **6**: 1─44. Budapest.

Deli,T. & Domokos, T. 2011 ─ An isolated occurrence of *Alopia bilzii tenuis* (E.A. Bielz) (Mollusca, Gastropoda, Clausiliidae) in the Bihor-Vlădeasa Mountains (Romania). ─ *Nymphaea*, **38:** 129─136.

Domokos, T. & Váncsa, K. 2006 ─ Malacofaunistical and ecological data from the Troaş Valley. ─ *Tiscia*, 35. 17─26.

Domokos, T. & Lennert, J. 2007 – Standard faunistical work on the mollusks of Codru-Moma Mountains (Romania). – *Nymphaea*, **34:** 67-96.

Domokos, T., Lennert, J. & Venczel, M. 2010 ─ Data on the Mollusc fauna of Pădurea Craiului Mountains (Romania). ─ *Nymphaea* **37:** 103─170.

Domokos, T. 2014 ─ Malacofaunistical, ecological and shell morphometrical observations at two castle ruins (Cetatea Şiria and Cetatea Şoimos) in the Zărand Mountains, Romania. ─ *Nymphaea,* **41**: 87─102.

Fehér, Z., Varga, A., Deli, T., Domokos, T., Szabó, K., Bozsó, M. & Pénzes, Zs. 2008 – Filogenetikai vizsgálatok védett puhatestűeken. In: Forró, L. (Ed.): A Kárpát-medence állatvilágának kialakulása. 183─200. Budapest

Fehér, Z.,Németh, L., Nicoara, A. & Szekeres, M. 2013 ─ Molecular phylogeny of the land snail genus *Alopia* (gastropoda: Clausiliidae) reveals multiple inversions of chirality. ─ *Zoological journal of the Linnean Society* **167:** 259─272.

Gagiu, A. 2007 – The mollusks collection of Alexandru V. Grossu in Ţării Crişurilor Museum, Oradea – *Nymphaea* **34**: 97─122.

Grossu, A. V. 1955 ─ Fauna Republici Populare Romîne. Mollusca,Gastropoda, Pulmonata **III**/1. Bucureşti.

Grossu, A. V. 1981a – Gastropoda Romaniae. Vol. **3.** Bucureşti.

Grossu, A. V. 1981b – Caracteristica gastropodelor din Munţii Apuseni. ─ Nymphaea **8-9:** 428─431.

Grossu, A. V. 1983 – Gastropoda Romaniae. Vol. **4.** Bucureşti.

Grossu, A. V. 1993 – The catalogue of the Mollusks from Romania. – *Travaux du Museum d'Histoire naturelle „Grigore Antipa"* **33**: 291-366.

Kimakowicz,M. 1894 ─ Prodromus zu einer Monographie des *Clausilia*-Subgenus Alopia H. et A. Adams. Beitrag zur Mollusken-Fauna Siebenburgens III. ─ Verhanlungen und Mitteilungen des Siebenbürgischen Verein für Naturwissenschaften zu Hermannstadt, **43**: 19─ 58. Hermannstadt/Sibiu.

Kerney, M. P., Cameron, A. D. & Jungbluth, J. H. 1983 – Die Landschnecken Nord- und Mitteleuropas. – Verlag Paul Parey, Hamburg und Berlin

Lengyel, G. D.& Páll-Gergely, B. 2009─2010 ─ Notes on the landsnail (Gastropoda) and harvestman (Opiliones) fauna of Bihor and Vlădeasa Mountains, Romania. ─ *Studii şi Comunicări Seria Ştiinţele Naturii* **9─11:** 91─11. Satu Mare

Nordsieck, H. 2006 – Systematics of the genera *Macrogastra* Hartmann 1841 and *Julica* Nordsieck 1963, with the description of new taxa. – *Archiv für Molluskenkunde* **135:** 49–71.

Nordsieck, H. 2007 – *Balea* Gray 1824 and *Alinda* H & A. Adams are separated as genera (Gastropoda, Stylommatophora: Clausiliiidae). ─ *Mitteilungen der Deutschen Malakozoologischen Gesellschaft* **77/78**: 27─30.

Nordsieck, H. 2008 ─ The systematics of the genus *Alopia* H. & A. Adams 1855 (Gastropoda, Stylommatophora: Clausiliiidae). ─ *Mitteilungen der Deutschen Malakozoologischen Gesellschaft* **79/80**: 7─18.

Pelbárt, J. 2000 – Magyarország recens Mollusca faunájának tudományos név szótára. – Grafon Kiadó, Nagykovácsi.

Rotarides, M. 1941 ─ Erdély csigafaunájának állatföldrajzi érdekességei.Tiergeographische Charakterzüge der Schnekenfauna Siebenbürgens ─ *Állattani Közlemények* **38:** 92─112.

Soós, L. 1928 – Az *Alopia*-nem. ─ *Annales Histirico-Naturales Musei Nationalis Hungarici* **25:** 261─426.

Soós, L. 1943 – A Kárpát-medence Mollusca-faunája. – In: Magyarország természetrajza, I. Állattani rész. Magyar Tudományos Akadémia. Budapest.

Váncsa, K. 2006. – A Magyar Természettudományi Múzeum Mollusca-gyűjteményében található Kovács Gyula-féle kollekció romániai vonatkozásai. – *A Békés Megyei Múzeumok Közleményei* **28:** 41-60.

Wagner, A. 1922 ─ Systematisches Verzeichnis der mir heute bekannten Arten und Formen der Clausiiliden. ─ *Annales Zoologici Musei Polonici Historae Naturalis* **1(2-3)**: 77─95.

Welter-Schultes, F. 2012 ─ European non-marine mollusks, a guide for species identification. Planet Poster Editions, Göttingen.

Westerlund, C. A. 1884 ─ Fauna der in der paläarctische Region (Europa, Kaukasien, Sibirien, Turan, Persien, Kursistan, Armenien, Mesopotamien, Kleiasien, Syrien, Arabien, Egypten, Tripolis,Tunesien, Algerien, und Marocco) lebenden Binnenconchylien. IV.Gen. *Balea* Prid.& *Clausilia* Dr. Karlskrona.