

Taxonomic revision of the genus *Alzoniella* (Mollusca, Gastropoda) in the Czech Republic and Slovakia

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The shell biometry of representatives of the crenobiotic genus *Alzoniella* from selected Czech and Slovak sites was analyzed. The three shell characters measured (height, width, aperture height) were mutually correlated and their variability ranges overlapped in the majority of the studied populations of all the taxa (subspecies or species). Discriminant analysis of the taxa *A. bojnicensis* and *A. slovenica komenskyi* confirmed their identity. Analysis of the shell biometry revealed that it was not possible to discriminate particular populations based on only the shell biometry characters that had been used to describe the taxa. The authors suggest using the name *Alzoniella slovenica* (Ložek et Brtek, 1964) concerning all the Czech and Slovak populations and to consider all the subsequently described taxa from the study area (*A. alticola*, *A. bojnicensis*, *A. kalasi*, *A. slovenica komenskyi*) as synonyms of *A. slovenica*. Formerly, the genus *Alzoniella* was known to occur only at three sites in the territory of the Czech Republic and more sites in Slovakia. Recently, the genus *Alzoniella* has been recorded in the Czech Republic from 18 sites.

Key words: *Alzoniella slovenica*, new synonymies.

Introduction

The genus *Alzoniella* Giusti et Bodon, 1984 is characterised by two receptacula seminis and, according to BOETERS (1998), it belongs to the subfamily Horatiinae Taylor, 1966. The shell is small (1–2 mm), oval to oval-conical, with more or less convex whorls. This genus is distributed not as widely as the genus *Belgrandiella* A. J. Wagner, 1927 (BOETERS, 1998), from which it was separated. The distribution range of *Alzoniella* covers only northern Italy, Austria, the eastern part of the Czech Republic, the western part

of Slovakia and recently the French Pyrenees (BOETERS, 1999). All known species of the genus are crenobiotic. They can be found in a large number in springs, wells, drainage systems and other subterranean waters.

One species and four subspecies of the genus *Alzoniella*: *A. slovenica* (Ložek et Brtek, 1964), *A. slovenica slovenica* (Ložek et Brtek, 1964), *A. slovenica alticola* (Ložek et Brtek, 1964), *A. slovenica bojnicensis* (Ložek et Brtek, 1964) and *A. slovenica kalasi* (Ložek et Brtek, 1964) (fossil only) have been described from the former Czechoslovakia (LOŽEK & BRTEK, 1964). These

subspecies were also described as the following species: *A. slovenica* (Ložek et Brtek, 1964), *A. alticola* (Ložek et Brtek, 1964), *A. bojnicensis* (Ložek et Brtek, 1964) and *A. kalasi* (Ložek et Brtek, 1964) (LOŽEK, 1964). These species were known to occur only in Slovakia. The sites are listed by LISICKÝ (1991). The first specimens of the genus *Alzoniella* from Czech Republic territory were found in 1966 and 1968 (HRUBÝ, 1969). Hrubý found 3 specimens at two sites: one is Uher-ský Brod, a spring in Vinohrady (incomplete localisation) and the other site is probably our loc. No. 31. Further 8 specimens were found by S. Krause and B. Hudcová (probably at our loc. No. 7) in 1971 (Hudec, 1972). HUDEC (1972) described the specimens from this area as a new subspecies *Alzoniella slovenica komenskyi* (Hudec, 1972). Until we found it, there had been no other records of the genus *Alzoniella* in the Czech Republic. All these subspecies (species) have been described based, in practise, upon shell biometry only. In 1997, we began a research study aimed at investigating the distribution of the genus *Alzoniella* in the Czech Republic. We also analyzed the shell biometry of selected material of all the mentioned taxa.

Material and methods

We studied the distribution of the genus *Alzoniella* within the territory of the Czech Republic. We visited areas in the SE Moravia, where there seemed to be good conditions for these snails to occur. The list of the study sites is given in Appendix 1.

Samples of the sediment were taken from springs, water wells and wells of the drainage systems. Some of the samples were sorted in the field using a sifter and others were dried, floated and sieved in the laboratory. Some samples, originating from the sites where *Alzoniella* were very abundant, were boiled in water and stored in 70 % ethanol to preserve the soft parts for anatomical study. The shells of snails from the following Czech and Slovak sites were selected for statistical analysis:

A. slovenica s. lat.: Zi (loc. No. 37, $n = 32$), Va (loc. No. 38, $n = 29$), Ko (loc. No. 11, $n = 31$), St (loc. No. 41, $n = 29$), Ka (loc. No. 40, $n = 29$), Za (loc. No. 10, $n = 30$), Or (loc. No. 12, $n = 29$), Pr - Pružina (Slovakia), Hluchá dolina, a spring between the mill and the village chapel, leg. J. Brtek, 19.IX.1964, coll. National Museum (NM) Prague, $n = 31$.

A. slovenica komenskyi: Uh (loc. No. 7, $n = 29$).

A. bojnicensis: Du - Dubnica (Slovakia), a spring, leg. J. Brtek, 20.IV.1962, coll. NM Prague, $n = 15$; Bo - Bojnice (Slovakia), a spring in the moat, leg. J. Brtek, 21.VI.1962, coll. NM Prague, $n = 31$.

A. alticola: Ho - Homolka (Slovakia), a spring under the saddle between Homolka and the hill (870 m a.s.l.), leg. J. Brtek, 27.X.1963, coll. NM Prague, $n = 9$.

A. slovenica: Kl - Klačno (Slovakia), Kamenná dolina, sprig, leg. J. Brtek, 10.VIII. 1964, coll. NM Prague, $n = 29$.

All material used for analysis is deposited in the National Museum in Prague. Other shells are deposited in collections of both authors. The preparation of the dissected penis is deposited in the collection of M. Horsák.

The shell biometry of *Alzoniella* from selected Czech and Slovak sites was analyzed based on shell height, shell width and aperture height. Shell measurements were made using an Olympus BX 50 microscope and Micro Image 3.0.01.00 for Windows 95/NT; digital picture analysis software, at the Department of Systematic Zoology and Ecology, Faculty of Science, Masaryk University Brno. Discriminant analysis was used to select the best characters and make comparison between particular populations. The variability of particular populations is shown by Box & Whisker Plot. All photographs were taken by M. Horsák and F. Butula using a Tesla BS 340 scanning electron microscope.

Results and discussion

Shell biometry analysis

A preliminary study of variability of the shell biometry of *Alzoniella* snails on a sample of 199 shells from the Uh population revealed that measuring 30 randomly selected shells was sufficient to obtain median and mean values that did not statistically differ from the respective values for 199 shells ($P < 0.001$) (Fig. 1). Analysis of the shell biometry of *Alzoniella* snails from selected Czech and Slovak study sites showed that the characters measured (shell height, shell width and aperture height) were mutually correlated. The highest variability was found in shell height and in this character variability increased with the number of measured specimens more than it did in the other

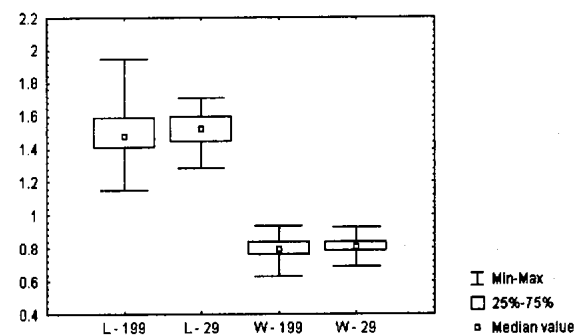


Fig. 1. Variability of *Alzoniella* population from the locality Uh. L - shell height (mm), W - shell width (mm), 199 and 29 - numbers of measured shells.

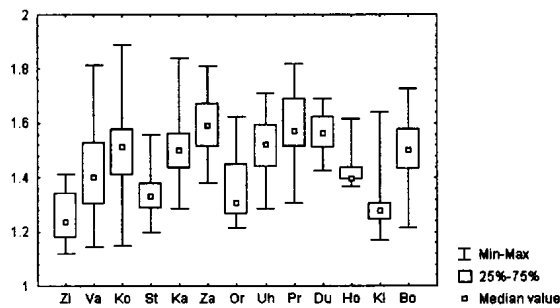


Fig. 2. Variability of particular *Alzoniella* populations based on shell height (mm). *A. slovenica* s. lat. (loc. Zi, Va, Ko, St, Ka, Za, Or, Pr), *A. slovenica komenskyi* (loc. Uh), *A. alticola* (loc. Ho), *A. slovenica* (loc. Kl), *A. bojnicensis* (loc. Bo, Du).

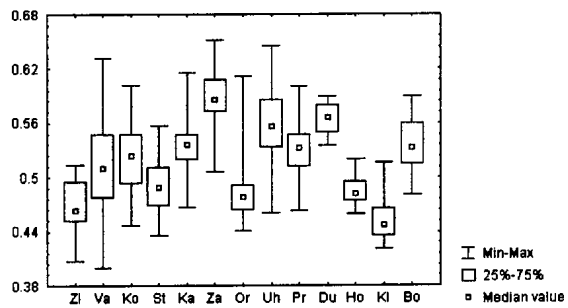


Fig. 4. Variability of particular *Alzoniella* populations based on aperture height (mm). *A. slovenica* s. lat. (loc. Zi, Va, Ko, St, Ka, Za, Or, Pr), *A. slovenica komenskyi* (loc. Uh), *A. alticola* (loc. Ho), *A. slovenica* (loc. Kl), *A. bojnicensis* (loc. Bo, Du).

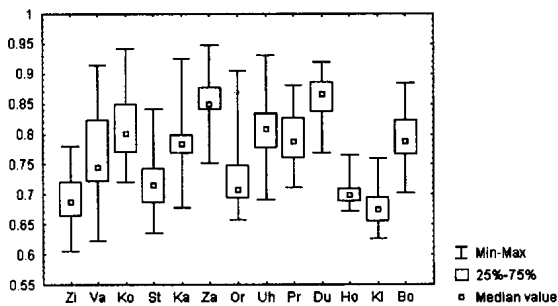


Fig. 3. Variability of particular *Alzoniella* populations based on shell width (mm). *A. slovenica* s. lat. (loc. Zi, Va, Ko, St, Ka, Za, Or, Pr), *A. slovenica komenskyi* (loc. Uh), *A. alticola* (loc. Ho), *A. slovenica* (loc. Kl), *A. bojnicensis* (loc. Bo, Du).

Table 1. Discriminant analysis between *Alzoniella slovenica komenskyi* (A.s.k.) (specimens from the type locality) and *A. bojnicensis* (A.b.) (specimens from the localities Du and Bo).

	Predicted group membership			Total
	A.s.k.	A.b.		
Original	A.s.k.	18	11	29
count	A.b.	13	32	45
%	A.s.k.	62.1	37.9	100
	A.b.	28.9	71.1	100

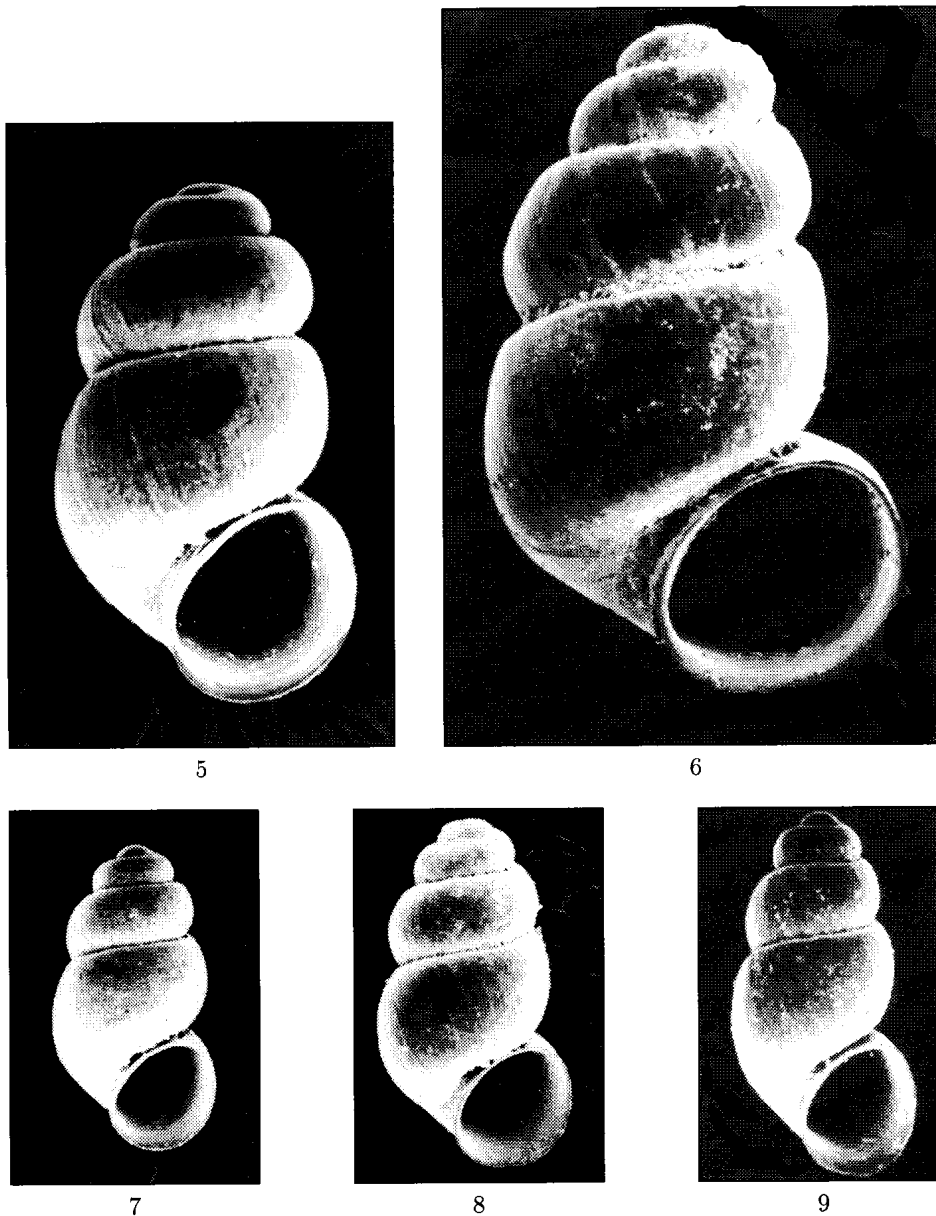
Note: 67.6% of original grouped cases correctly classified.

two. For all the characters, the variability ranges between most of the measured populations overlapped (Figs 2-4). This overlap was not significant between the population of Ho (*A. alticola*) and Du (*A. bojnicensis*). The probable explanation of this phenomenon was the low number of specimens (9 and 15) and non-random selection. *A. kalasi* specimens were not available, but the proportions of the holotype were within the variability ranges of at least five different populations.

Discriminant analysis of the taxa *A. bojnicensis* and *A. slovenica komenskyi* (Tab. 1) (numerous specimens) confirmed the identity of these taxa - 67.6% of correctly classified specimens formerly used to find the discriminant function is definitely too few. The variability of particular populations is also presented in Figs 5-15 and the penis shape of *A. slovenica* is shown in Fig. 16.

Shell biometry analysis showed that it was impossible to discriminate between particular po-

pulations based on the shell biometry alone, contrary to the opinion shared by LOŽEK (1964), LOŽEK & BRTEK (1964) and HUDEC (1972). The same authors postulated the description of many different species or subspecies on the assumption that particular populations are isolated and thus no gene flow between them is possible. This also concerns the study area where nearly all the local populations are isolated due to the geological structure. A new species or subspecies should be described based upon other character sets than shell biometry (probably the anatomy and morphology of copulatory organs or radula), because differences in shell biometry are probably produced by different local abiotic, biotic or genetic (e.g. founder effect, genetic drift) factors. This is also confirmed by same or similar patterns of variability being observed in different Czech and Slovak populations. We conclude that it is not possible to make a taxonomic analysis of particular



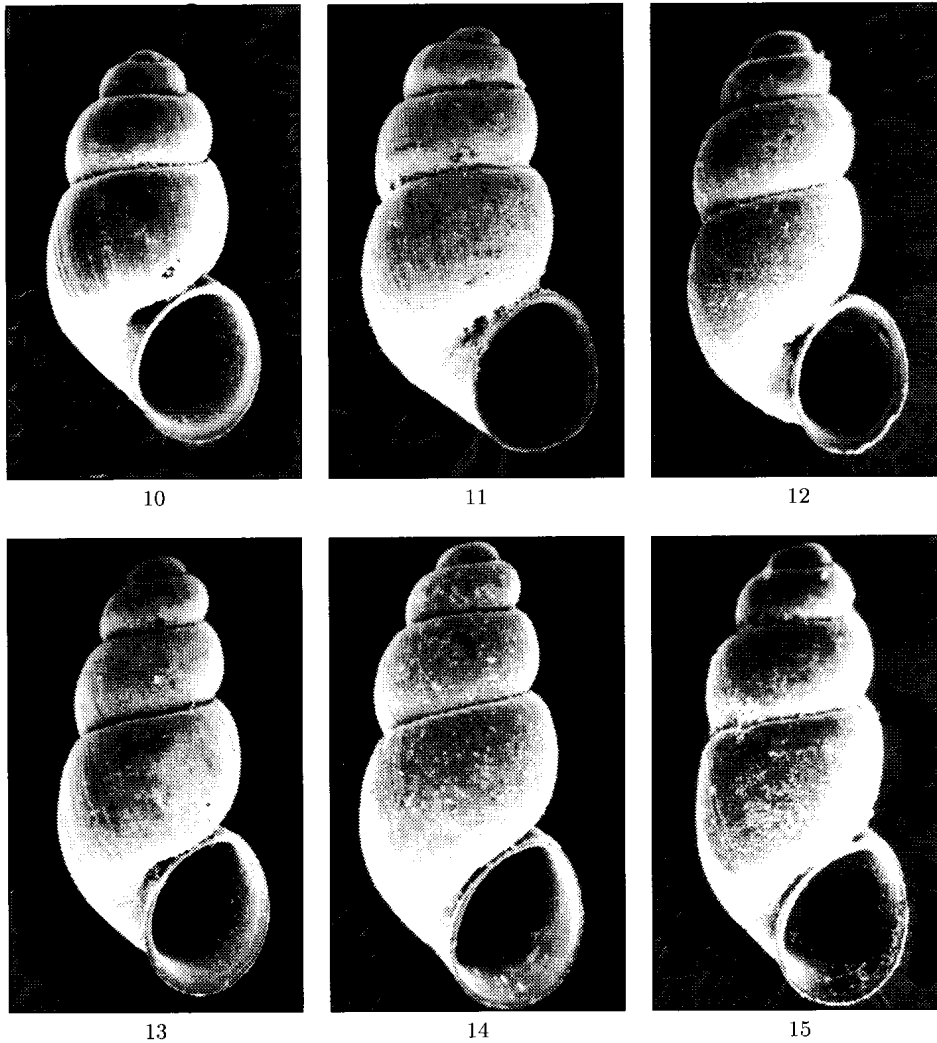
Figs 5-9. *Alzoniella slovenica* (Ložek et Brtek, 1964) with former determination according LOŽEK & BRTEK (1964) and HUDEC (1972): 5 - *Alzoniella slovenica* s. lat., loc. No. 37, 122×, 1.20:0.66 mm; 6 - *A. slovenica komenskyi*, type locality Uherský Brod, loc. No. 7, 110×, 1.63:0.87 mm; 7 - *A. slovenica* s. lat., loc. No. 37, 60×, 1.24:0.67 mm; 8 - *A. slovenica komenskyi*, type locality Uherský Brod, loc. No. 7, 60×, 1.31:0.72 mm; 9 - *A. slovenica* s. lat., loc. No. 12, 60×, 1.24:0.67 mm.

populations of the genus *Alzoniella* from the Czech Republic and Slovakia based on shell biometry only. Until a more detailed research study is carried out, using anatomical or genetic characters in particular, it will be most appropriate to use the

name *A. slovenica* for all the populations in the Czech Republic and Slovakia.

Distribution in the Czech Republic

The data on *Alzoniella* distribution in the Czech



Figs 10–15. *Alzoniella slovenica* (Ložek et Brtek, 1964) with former determination according LOŽEK & BRTEK (1964) and HUDEC (1972): 10 – *A. bojnicensis*, loc. Bo, 60x, 1.42:0.82 mm; 11 – *A. bojnicensis*, loc. Du, 60x, 1.52:0.88 mm; 12 – *A. slovenica* s. lat., loc. No. 11, 60x, 1.51:0.82 mm; 13 – *A. slovenica* s. lat., loc. No. 10, 60x, 1.58:0.84 mm; 14 – *A. slovenica* s. lat., loc. No. 10, 60x, 1.66:0.85 mm; 15 – *A. slovenica* s. lat., loc. No. 40, 60x, 1.67:0.85 mm.

Republic are sorted according to the codes of the squares for faunistic mapping by PRUNER & MÍKA (1996). The occurrence of *A. slovenica* within the study sites is presented in Fig. 17.

1966–1971: 6774 – Pulčín, 600 m a.s.l., a spring under Pulčínské stěny National Nature Reserve, June 1968, leg. I. Hrubý, 1 specimen (HRUBÝ, 1969), this site was visited in 1999, but the occurrence of *Alzoniella* was not confirmed; 6971 – Uherský Brod, 280 m a.s.l., a spring in “Vinohrady” near Uherský Brod (probably sur-

roundings of locs No. 6–8), July 1966, leg. I. Hrubý (HRUBÝ, 1969), Uherský Brod, 275 m a.s.l., a drainage near the spring of a small brook in the “Amerika” valley about 1500 m to north-west from Uherský Brod (type locality, probably loc. No. 7), 7.VII.1971, leg. S. Krause & B. Hudcová, 8 specimens (HUDEC, 1972).

1997–2000: 6874 – loc. No. 17, 4 specimens; 6971 – loc. No. 6, 1 specimen, loc. No. 7, ca 300 specimens (4 live individuals), loc. No. 8, 7 specimens, loc. No. 9, 3 specimens; 6972 – loc. No. 10,

ca 80 specimens (26 live individuals); 6974 – loc. No. 47, ca 50 specimens; 7071 – loc. No. 40, 95 specimens (5 live individuals); 7072 – loc. No. 11, 144 specimens (9 live individuals), loc. No. 12, 96 specimens, loc. No. 43, 15 specimens, loc. No. 45, 34 specimens; 7073 – loc. No. 13, 1 specimen, loc. No. 37, ca 1200 specimens, loc. No. 44, 2 specimens; 7170 – loc. No. 46, 1 specimen; 7171 – loc. No. 38, 58 specimens; 7172 – loc. No. 41, 94 specimens (5 live individuals).

The former occurrence of the genus *Alzoniella* has only been shown at three sites of the Czech Republic. Out of 47 study sites in the Czech Republic visited between 1998 and 2000, *Alzoniella* were recorded from 18 sites (locs No. 6–13, 17, 37, 38, 40, 41, 43, 44, 45, 46, 47). All the sites where the genus *Alzoniella* has recently been confirmed are situated between $48^{\circ}51'29.96''$ – $49^{\circ}02'11.78''$ N ($49^{\circ}13'36.47''$ of a former site of HRUBÝ, 1969) and $17^{\circ}24'41.73''$ – $18^{\circ}05'41.08''$ E. The number of specimens found at particular sites varied from 1 to 1,200. Except for locs No. 7, 10, 11, 40 and 41, where living molluscs were found, only empty shells were recorded.

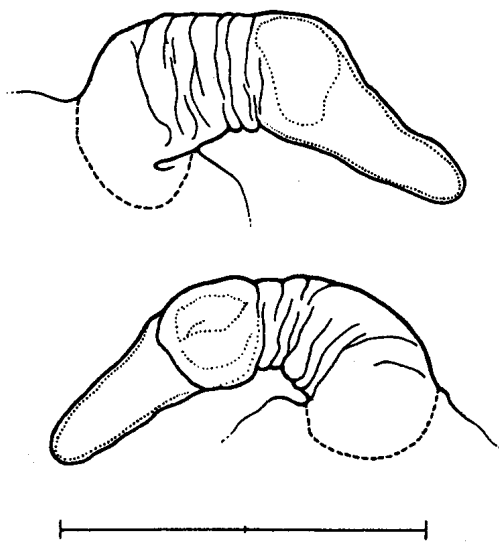


Fig. 16. *Alzoniella slovenica* (Ložek et Brtek, 1964), penis, length: 0.453 mm, 1 segment = 0.2 mm (loc. No. 41).

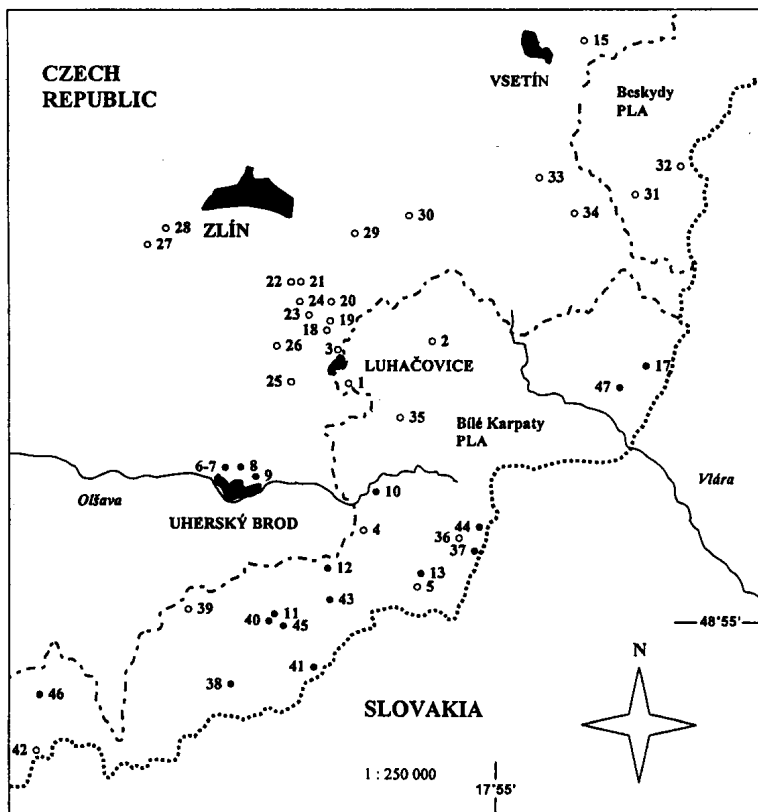


Fig. 17. Map of investigated localities (● – with occurrence of *Alzoniella slovenica*, ○ – without occurrence of *A. slovenica*).

Conclusions

As the described taxa were defined on the basis of shell biometry, which does not allow their unequivocal differentiation, these results allow us to synonymize them with the priority name *Alzoniella slovenica* (Ložek et Brtek, 1964).

Belgrandiella alticola Ložek et Brtek, 1964 syn. nov.

Belgrandiella bojnicensis Ložek et Brtek, 1964 syn. nov.

Belgrandiella kalasi Ložek et Brtek, 1964 syn. nov.

Belgrandiella slovenica komenskyi Hudec, 1972 syn. nov.

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Appendix 1. Survey of investigated localities.

The localities with the occurrence of *A. slovenica* are in italics. Data in the survey are as follows: number of the locality (bold), geographical co-ordinates (N, E) (Geobáze digital map of the Czech Republic 1:100,000), code of the mapping square for faunistic mapping according to PRUNER & MÍKA (1996), elevation (m a.s.l., approximately), description of the locality, date of investigation, name of investigator (LB – Luboš Beran, MH – Michal Horsák, LB+MH – both authors, MH+VL – Michal Horsák & Vojen Ložek, MH+JH – Michal Horsák & Jaroslav Hlaváč). All localities where genus *Alzoniella* was looked for are listed. The occurrence of other molluscs is not mentioned.

1 – 49°05'36.76", 17°46'26.16", 6972, 253 m, Luhačovice, springs in forest between the Ovčírna hill (429 m a.s.l.) and Solné hill (451 m a.s.l.), 16.VI.1997,

LB; 2 – 49°07'05.29", 17°51'44.40", 6873, 427 m, Lipová, a spring to the west from Nad Loštím hill (469 m a.s.l.), 17.VI.1997, **LB; 3** – 49°07'03.37", 17°45'49.82", 6872, 253 m, Luhačovice, a spring to the west from the Velká kamenná hora hill (385 m a.s.l.), 17.VI.1997, **LB; 4** – 49°00'31.28", 17°47'18.82", 6972, Komňa, a spring near the Modrá voda pool, 18.VI.1997, **LB; 5** – 48°57'13.97", 17°49'13.63", 7073, Vápenice, springs at southern border of Vápenice, 19.VI.1997, **LB; 6** – 49°02'11.78", 17°38'08.20", 6971, 238 m, *Uherský Brod, a well in exercising ground for dogs in the "Amerika" valey to the north from Uherský Brod, 9.VII.1998, LB+MH; 7* – 49°02'11.78", 17°38'08.20", 6971, *Uherský Brod, 238 m, a drainage well in the "Amerika" valey to the north from Uherský Brod, about 700 m to the north-east from a farm in Habříce, 9.VII.1998, LB+MH, 26.VII.1998,*

MH; **8** – 49°02'32.54", 17°39'11.22", 6971, 238 m, Uherský Brod, a well in a colony of cottages on northern border of Uherský Brod near a spring of the Vinohradský potok brook, 9.VII.1998, LB+MH; **9** – 49°02'11.78", 17°40'13.27", 6971, 217 m, Těšov, a well in a colony of cottages on northern border of Těšov near a brook, 9.VII.1998, LB+MH; **10** – 49°01'14.03", 17°47'00.91", 6972, 249 m, Záhorovice, a well on eastern border of Záhorovice in a slope above Olšava River, 10.VII.1998, LB, 22.VII.1999, LB+MH; **11** – 48°55'12.98", 17°40'41.43", 7072, Korytná, 240 m, a well about 2 km from Korytná near the road from Strání, 26.VII.1998, MH; **12** – 48°57'23.95", 17°44'19.49", 7072, Bystřice pod Lopeníkem, a well in forest 1 km to the south from the Ordějov water reservoir, 27.VII.1998 MH+VL; **13** – 48°57'24.80", 17°49'24.85", 7073, 460 m, Vápenice, Rubaniska – a well near last bus station, 13.IX.1998, LB+MH; **14** – 49°22'47.92", 18°02'06.50", 6674, 342 m, Vsetín, village Putýrka to the north from Vsetín, a spring, 1.VII.1999, MH (missing in map); **15** – 49°20'52.39", 18°01'50.57", 6674, 342 m, Vsetín, a well near the last house in the valley Velký Skalník, 1.VII.1999, MH; **16** – 49°23'33.62", 18°03'21.76", 6674, 342 m, Vsetín, a well on the eastern border of Malenov, 1.VII.1999, MH (missing in map); **17** – 49°06'01.85", 18°05'41.08", 6874, 405 m, Nedašov, springs in the western part of the Jaloučová stráž Nature Reserve, 3.VII.1999, MH; **18** – 49°08'19.10", 17°43'54.80", 6872, 432 m, Pradlisko, a well in eastern part of Pradlisko, 19.VII.1999, LB+MH; **19** – 49°08'17.75", 17°43'59.74", 6872, 432 m, Pradlisko, a spring in Pradlisko, 19.VII.1999, LB+MH; **20** – 49°08'49.10", 17°44'17.15", 6872, 380 m, Provodov, a well near Svatý František, 19.VII.1999, LB+MH; **21** – 49°09'25.57", 17°42'33.20", 6872, 349 m, Březůvky, a drainage on a field about 1 km under a pond, 19.VII.1999, LB+MH; **22** – 49°09'27.35", 17°42'27.66", 6872, Březůvky, 349 m, a well near a road about 1 km under a pond, 17.VII.1999, LB+MH; **23** – 49°08'30.03", 17°42'52.10", 6872, 349 m, Březůvky, a well near a road under the Kamenná hill (482 m a.s.l.), 19.VII.1999, LB+MH; **24** – 49°08'59.51", 17°42'22.38", 6872, 349 m, Březůvky, a well on southern border of Březůvky, 19.VII.1999, LB+MH; **25** – 49°05'38.61", 17°41'58.29", 6872, 235 m, Biskupice, a drainage in meadow near the road Biskupice – Kaňovice about 1 km north of Biskupice, 20.VII.1999, LB+MH; **26** – 49°07'15.53", 17°41'10.31", 6872, 272 m, Hřivínův Újezd, a drainage near Svatý Antonín at eastern border of Hřivínův Újezd, 20.VII.1999, LB+MH; **27** – 49°11'17.88", 17°35'20.88", 6871, 315 m, Karlovice, a well about 1.3 km from Karlovice on the green tourist mark, 20.VII.1999, LB+MH; **28** – 49°12'01.03", 17°36'16.46", 6871, 208 m, Malenovice, wells in a colony of gardens above the swimming pool, 20.VII.1999, LB+MH; **29** – 49°10'50.53", 17°46'24.26", 6872, 380 m, Provodov, wells in a colony of cottages about 1 km south of Drdol hill (540 m a.s.l.), 21.VII.1999,

LB+MH; **30** – 49°11'55.83", 17°50'23.83", 6873, 296 m, Vizovice, wells in the valley of Želechovický potok brook about 1.5 km south of Janova Hora hill (439 m a.s.l.), 21.VII.1999, LB+MH; **31** – 49°13'36.47", 18°04'44.74", 6774, 675 m, Pulčín, a well under Pulčinské stěny National Nature Reserve, 21.VII.1999, LB+MH; **32** – 49°14'25.59", 18°07'41.12", 6774, 540 m, Valašská Senice, a well on the northern border of Valašská Senice, 22.VII.1999, LB+MH; **33** – 49°14'35.21", 17°57'34.99", 6773, 414 m, Prlov, a well near crossways in Prlov, 22.VII.1999, LB+MH; **34** – 49°13'28.91", 17°59'14.60", 6773, 490 m, Pozděchov, a well in Trubiska, 22.VII.1999, LB+MH; **35** – 49°04'28.90", 17°49'16.98", 6972, 370 m, Rudimov, a well on the southern border of Rudimov near the Třešňůvka brook, 23.VII.1999, LB+MH; **36** – 48°58'52.21", 17°52'50.94", 7073, 590 m, Žitková, a well near a farm, 23.VII.1999, LB+MH; **37** – 48°58'28.60", 17°54'03.28", 7073, 590 m, Žitková, a well on the riverbank of the Lešňanský potok brook on the Czech-Slovak boundary about 300 m south of small pond, 23.VII.1999, LB+MH; **38** – 48°52'29.33", 17°38'01.21", 7171, 453 m, Vápenky, a well on the eastern border of Vápenky (Nová Lhota) near the Velička brook, 6.VIII.1999, LB+MH; **39** – 48°57'20.31", 17°33'14.36", 7071, 298 m, Boršice u Blatnice, a well near Boršický potok brook in a colony of cottages between Boršice and Hluk, 6.VIII.1999, LB+MH; **40** – 48°55'07.34", 17°39'25.64", 7071, 240 m, Korytná, Kadlečkova – springs area of Korytnice, a well, 15.VIII.1999 MH+VL; **41** – 48°52'42.53", 17°42'08.14", 7172, 418 m, Strání, springs in valley of Svinárský potok brook near Strání, 15.VIII.1999, MH+VL; **42** – 48°49'27.54", 17°24'17.17", 7170, 236 m, Radějov, a spring under Kněží hory hills, 18.VIII.1999, MH+VL; **43** – 48°56'08.27", 17°44'37.81", 7072, 433 m, Březová, a well about 400 m from a football stadium, 9.IV.2000, MH; **44** – 48°59'24.44", 17°54'22.77", 7073, 590 m, Žitková, springs in Hutě Nature Reserve, 20.V.2000, MH; **45** – 48°54'31.93", 17°40'38.61", 7072, 418 m, Strání, a well in the north-western corner of Hrnčárky Nature Monument, 11.VI.2000, MH+JH; **46** – 48°51'29.96", 17°24'41.73", 7170, 207 m, Tvarožná Lhota, a spring in the north-western part of the Čertoryje National Nature Reserve, 28.VI.2000, MH; **47** – 49°04'26.89", 18°03'21.86", 6974, 420 m, Brumov-Bylnice, a spring in the meadow downstream of the confluence of both small brooks forming the Bylnička rivulet, 10.VIII.2000, MH.

Slovak localities are mentioned in LOŽEK & BRTEK (1964) and LISICKÝ (1991). Only localities of material used for shell biometry analysis are mentioned in Material and Methods. Numerous places of occurrence may be situated on the Slovak site of the White Carpatians Mts (Biele Karpaty Protected Landscape Area), where this species has not been systematically investigated. For instance, the species was recorded in the calcareous meadow seepage in the Grůň Nature Reserve, 8.VIII.2000, leg. M. Horsák.