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OVERWINTERING OF SPIDERS IN TERRESTRIAL MOLLUSCS SHELLS IN THE WIDER AREA OF VRANOV NAD TOPĽOU (SLOVAKIA)

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Abstract

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Overwintering of spiders in empty snail shells is a little studied topic and in Slovakia similar research has not been carried out yet. Collecting shells was carried out in the eastern part of Slovakia, in winter at the turn of 2012/2013 and 2013/2014. The study was conducted both at the steppe like and post-industrial habitats. A total of 1085 shells were collected with a spider occupation rate 10.69%. All acquired 116 spiders were classified in ten families. The most abundant spider family was the Salticidae, with a dominant species *Pellenes tripunctatus* (Walckenaer, 1802). Significant records include *Cheiracanthium montanum* (L. Koch, 1877) which is considered as vulnerable and *Sitticus penicillatus* (Simon, 1875) with a lower risk thread according to Red List of Slovakian spiders.

Keywords: spiders, overwintering, shells, habitat, eastern Slovakia

INTRODUCTION

Despite overwintering of spiders in land gastropod shells is an interesting phenomenon, it is not well studied. There is just a few studies dealing with faunistic data, however, ecological information are just rare and scattered. One of the first notices came from Mikulska (1961) who found strong affinity of a jumping spider *Pellenes nigrociliatus* (Simon, 1875) to the shells of *Xerolenta obvia* (Menke, 1828), which uses these shells for maternal care and defence of its offspring. Horn (1980) reported overwintering of the species in shells of *Zebrina detrita* (O. F. Müller, 1774). Besides typical spider web in the entrance of the shell, the spiders mask the entrance with sand, pine needles and moss. The topic of overwintering was also studied by Bauchhenss (1995).

Most of spiders overwintering in shells belong to the family Salticidae, the most often recorded species are *P. tripunctatus*, *P. nigrocilliatus* and *S. penicillatus* (Horn, 1980; Hula *et al.*, 2009; Niedobová *et al.*, 2013; Michálková 2012; Szinetár *et al.*, 1998). The main study in this topic is work of Szinetár *et al.* (1998), who found several species with some affinity to the shells; namely *Euryopis quinqueguttata* (Thorell, 1875) and common occurrence of different species of genera *Heliophanus* and *Cheiracanthium*. Later, it was confirmed specific affinity of *P. tripunctatus* to the shells of *Caucasotachea* (formerly *Cepaea*) *vindobonensis* (Férussac, 1821) and found out the incidence of other important species such as *Myrmarachne formicaria* (De Geer, 1778), *Micaria formicaria* (Sundevall, 1831), *Cheiracanthium pennyi* (O. P.-Cambridge, 1873), *C. montanum* (Hula *et al.*, 2009; Niedobová *et al.*, 2013). Similar results also recorded Michalková (2012) in her study. Regarding the territory of Slovakia, there is no mention of any work and research dealing with this topic, even though this method can confirm some really interesting and rare spider species.

MATERIALS AND METHODS

Method of research

Collecting of land snail shells was carried out in winter, at the turn of 2012/2013 and 2013/2014.

Suitable localities, with a larger amount of shells were identified. These were quarries, slopes, dry and warm habitats with low and sparse vegetation, railway embankments, which has received considerable attention because of the high abundance of shells and thus acquisition higher quantity of collected material. Other observed habitats were also gardens, road embankments, forests edges or the urban built-up areas. The research was aimed at collecting shells of three gastropod species – *X. obvia*, *C. vindobonensis* and *Helix pomatia* (Linnaeus, 1758). Collected shells were stored at laboratory conditions with a constant temperature of 23°C. After a while, spiders became active due to increased temperature. Spiders capture was carried out with a soft entomological tweezers. Spiders were then inserted into test tubes with 70% alcohol, where they were fixed. The specimens were identified according to Nentwig *et al.* (2017), juveniles were identified base on general appearance (all these species are very characteristic). Material of spiders is stored in the collection of second author.

Description of study area

24 localities were visited in the surroundings of Vranov nad Topľou town during the study (Fig 1). The area, where the collecting of shells was carried out, comprises two regions, Prešov and Košice, and falls under the four districts – Vranov nad Topľou, Humenné, Michalovce and Trebišov. Most of the localities fall under the peripheral area of Vranov nad Topľou town; some collections took place directly in the intravilan of the town. The farthest point, representing two locations in the Malé Ozorovce village, is situated about 31 km south from the center of the Vranov nad Topľou town.

Locality 1 – Sačurov village, Vranov nad Topľou district (48°49,386′ N, 21°42,201′ E)
Site characteristics: A railway embankment, a place relatively preserved, without higher vegetation of vascular plants, vegetation is mowed regularly, presence of stones and gravel.
Date of collecting: 2.11.2012
Altitude: 119 m a. s. l.

Locality 2 – Sačurov village, Vranov nad Topľou district (48°49,359′ N, 21°42,227′ E)
Site characteristics: A sloping part of the territory, presence of larger rocks, shaded place under growing *Syringa vulgaris* L., with no significant vegetation.
Date of collecting: 2.11.2012
Altitude: 117 m a. s. l.

Locality 3 – Sečovská Polianka village, Vranov nad Topľou district (48°46,582′ N, 21°41,656′ E)
Site characteristics: A railway station without train operations, flatland area, presence of stones, gravel and moss, the site maintained and mowed regularly, sparse and lower vegetation.
Date of collecting: 2.11.2012
Altitude: 127 m a. s. l.

Locality 4 – Podčičva – Sedliská village, Vranov nad Topľou district (48°54,841′ N, 21°44,396′ E)
Site characteristics: A former quarry, sloping, rocky territory, presence of moss in significant quantities, large amount of fallen leaves, presence of lower vegetation (*Galium* sp., *Veronica* sp. etc.) and bushes (*Cornus* sp., *Rosa* sp.), the territory consists of a calcium substrate (triassic and dolomitic limestone).
Date of collecting: 3.11.2012
Altitude: 150 m a. s. l.

Locality 5 – part of the Vranov nad Topľou town – Vranovské Dlhé, Vranov nad Topľou district (48°52,181′ N, 21°42,298′ E)
Site characteristics: A railway station, shells collected directly on a rails, and near the rails, respectively, presence of lower vegetation, gravels and stones, a quite dirty place probably due to train operations.
Date of collecting: 3.11.2012
Altitude: 124 m a. s. l.

Locality 6 – Vranov nad Topľou town, Vranov nad Topľou district (48°53,519′ N, 21°40,303′ E)
Site characteristics: A railway station, stretch of railroad without train operations, stony and flatland territory with lower vegetation on the edge of the railway embankment, presence in particular common species of field and meadow grass, heavy pollution of anthropogenic origin, a large amount of garbage.
Date of collecting: 28.12.2012
Altitude: 128 m a. s. l.

Locality 7 – Vranov nad Topľou town, Vranov nad Topľou district (48°52,866′ N, 21°40,942′ E)
Site characteristics: An industrial park, abandoned and unused enterprise, the territory consists of several grassy, flatland spots with a total size of about 80 m^2, lower presence of vegetation, field grasses and spruces, area is mowed, lightly soiled, shells collected directly on fallen spruce needles.
Date of collecting: 28.12.2012
Altitude: 129 m a. s. l.

Locality 8 – Vranov nad Topľou town, Vranov nad Topľou district (48°52,528′ N, 21°41,777′ E)
Site characteristics: A garden area near a busy road, maintained and mowed flat area, somewhere stony, waterlogged soil, presence of moss, fruit trees and mushrooms, lower vegetation of vascular plants.
Date of collecting: 28.12.2012
Altitude: 122 m a. s. l.

Locality 9 – Brekov village, Humenné district (48°53,657′ N, 21°50,122′ E)
Site characteristics: A quarry in operation (mining of dolomitic limestone), sloping, rocky area near the main road and rail, presence of moss, vegetation consists of shrubs (especially *Rosa canina* L.) and meadow grass, eroded surface with traffic pollution, unmaintained area with waterlogged soil.
Date of collecting: 28.12.2012
Altitude: 145 m a. s. l.

Locality 10 – Skrabské village, Vranov nad Topľou district (49°00,745′ N, 21°35,355′ E)
Site characteristics: A flooded quarry without traffic (mining of calcareous marl in the past), protected rock deposit, rocky, stony, slight presence of moss, vegetation comprising mainly meadow grass, rarely herbs, among trees, dwarf pines and spruces dominate, further, *Robinia pseudoacacia* L., *Rosa canina*, *Salix* sp. are present.
Date of collecting: 30.12.2012
Altitude: 191 m a. s. l.

Locality 11 – Bystré village, Vranov nad Topľou district (49°01,180′ N, 21°32,784′ E)
Site characteristics: A forest, grassy and lighted slope, mixed forest, near the Topľa river, presence of pines, spruces and Old man's beard (*Clematis vitalba* L.), less meadow grass and moss.
Date of collecting: 30.12.2012
Altitude: 172 m a. s. l.

Locality 12 – Soľ village, Vranov nad Topľou district (48°55,880′ N, 21°36,093′ E)
Site characteristics: A grassy slope near a railroad (about 10 m), railway in operation, lower vegetation comprising meadow grasses and herbs (*Gallium mollugo* L., *Urtica dioica* L.), the area is maintained and mowed, if it is necessary, grass was burned occasionally, fragile snail shells probably due to fire.
Date of collecting: 30.12.2012
Altitude: 136 m a. s. l.

Locality 13 – Dvorianky village, Trebišov district (48°43,740′ N, 21°40,664′ E)
Site characteristics: A former railway station, occasional passage of freight trains, a flatland consists of gravel and stones, which is occasionally mowed, presence of moss and meadow grass.
Date of collecting: 2.1.2013
Altitude: 120 m a. s. l.

Locality 14 – Recreation area Domaša-Dobrá, Vranov nad Topľou district (49°01,194′ N, 21°41,079′ E)
Site characteristics: A cottage area in the forest, sloping area located less than 100 meters from a dam, which is maintained and mowed, vegetation includes meadow grasses, herbs (*Plantago lanceolata* L., *Lysimachia nummularia* L. and others), scrubs (mainly *Prunus spinosa* L.), trees (spruces and pines), presence of moss, frequent occurrence of shells directly on needles.
Date of collecting: 3.1.2013
Altitude: 166 m a. s. l.

Locality 15 – Strážske town, Michalovce district (48°51,944′ N, 21°49,514′ E)
Site characteristics: A railway station in operation, collecting of shells focused on surroundings of unused rails, without significant vegetation, grasses rarely, shells were situated directly on ballast, shells extensively damaged and cracked.
Date of collecting: 3.1.2013
Altitude: 132 m a. s. l.

Locality 16 – Malé Ozorovce village, Trebišov district (48°40,987′ N, 21°36,560′ E)
Site characteristics: Slight grassy slope near the flowing stream, the territory regularly mowed and fired, vegetation consists of fruit trees, herbs (species mainly from the family Apiaceae), others frequent herbs such as *Glechoma hederacea* L., *Taraxacum officinale* auct. non Weber, *Urtica* sp., also present moss, damaged shells.
Date of collecting: 26.12.2013
Altitude: 209 m a. s. l.

Locality 17 – Malé Ozorovce village, Trebišov district (48°40,903′ N, 21°36,578′ E)
Site characteristics: A slightly slope grassy area, near a stream and residential buildings, presence of fruit trees, herbs, meadow grass and a significant proportion of moss, the territory is maintained and mowed.
Date of collecting: 26.12.2013
Altitude: 204 m a. s. l.

Locality 18 – Skrabské village, Vranov nad Topľou district (49°00,787′ N, 21°35,245′ E)
Characteristics of a new location of locality 18: Steep area in a lower part of the quarry (near water), strongly illuminated and dry, poor vegetation, more grasses than herbs, typical *Juniperus communis* L.
Date of collecting: 28.12.2013
Altitude: 188 m a. s. l.
Date of collecting (Loc. 10): 30.12.2012
Altitude (Loc. 10): 191 m a. s. l.
Note:
Environmental conditions in the upper part of the quarry has not changed from first visit, site characteristics are described above; see Loc. no. 10. However, significant difference in the lower part of the quarry, compared with the previous collecting of shells, was a higher presence of the shells of *C. vindobonensis*, while the quantity of shells of *X. obvia* has been much smaller. In terms of the *H. pomatia*, in the lower part, it was in relatively large numbers, while in the upper part, any shell of that species was recorded. Opposite case was in *X. obvia*. Although the distance between these two parts of the quarry is only a few meters, the difference in environment character is noticeable. One of the reasons could be probably the sun exposition of the particular part of quarry, and thus also with this relevant the growth various dominants of vegetation.

Locality 19 – Vyšný Žipov village, Vranov nad Topľou district (48°58,983′ N, 21°34,829′ E)
Site characteristics: A grassy slope along the road and the river, slightly frequent road, presence of moss and lower vegetation, especially meadow grass, waterlogged soil, area probably seasonally mowed.
Date of collecting: 28.12.2013
Altitude: 143 m a. s. l.

Locality 20 – Vranov nad Topľou town, Vranov nad Topľou district (48°53,149′ N, 21°39,501′ E)
Site characteristics: Grassy spots separated by an asphalt road, considerable amount of moss along the sides of the road, shells were found in

the moss; lower vegetation consists of more grasses, occurrence of trees (*Betula pendula* Roth, *Populus* sp., *Acer* sp., *Salix* sp.), neglected and unmaintained area.
Date of collecting: 28.12.2013
Altitude: 138 m a. s. l.

Locality 21 – Vranov nad Topľou town, Vranov nad Topľou district (48°52,182′ N, 21°40,559′ E)
Site characteristics: A former agronomic enterprise, grassy area at the margin of the field, the most of shells around the fence; slightly neglected, but mowed area, vegetation consists of meadow grass, herbs, along the fence planted walnut (*Juglans* sp.), lower incidence of moss.
Date of collecting: 28.12.2013
Altitude: 129 m a. s. l.

Locality 22 – Vranov nad Topľou town, Vranov nad Topľou district (48°52,806′ N, 21°40,408′ E)
Site characteristics: An unoperated railway station Vranov nad Topľou-Predmestie, typically stony and gravel nature of locality, shells collected directly on the railroad, vegetation comprised mainly of grasses, presence of moss.
Date of collecting: 28.12.2013
Altitude: 131 m a. s. l.

Locality 23 – Sačurov village, Vranov nad Topľou district (48°49,319′ N, 21°42,199′ E)
Site characteristics: A sloping grassy area in the immediate vicinity of rails, presence of stones and gravel, area regularly mowed, otherwise, there are presence of shrubby vegetation (especially *Rosa canina*), a periodic swamp occurs below the slope, weak incidence of moss.
Date of collecting: 2.1.2014
Altitude: 119 m a. s. l.

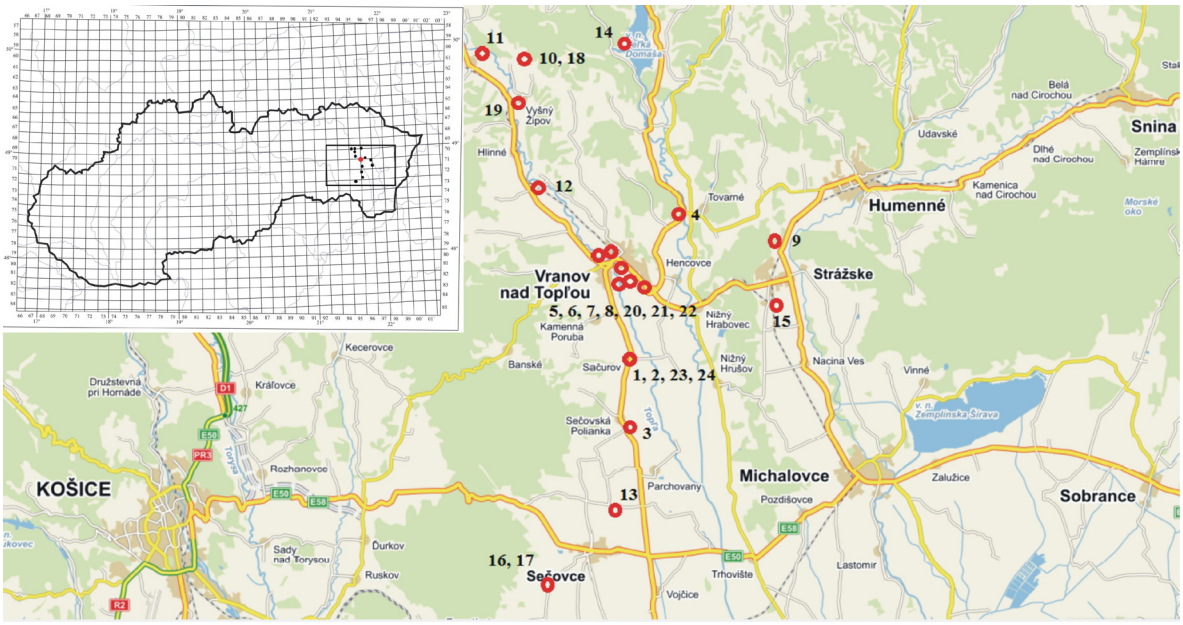
Locality 24 – Sačurov village, Vranov nad Topľou district (48°49,349′ N, 21°41,513′ E)
Site characteristics: A sloping, less grassy area covered with lots of fallen leaves, near the stream, slightly polluted and mowed area, in some places stony, vegetation consists of species such as *Chelidonium majus* L., *Rubus fruticosus* L., and trees such as *Aesculus hippocastanum* L., maples, spruces, presence of damaged and cracked shells.
Date of collecting: 2.1.2014
Altitude: 129 m a. s. l.

RESULTS

Altogether, 1085 shells from 24 sites were collected, of which 581 shells belonged to *C. vindobonensis*, 324 shells to *X. obvia* and 180 shells to *H. pomatia*. In the first collection period (2012/2013), there were 602 shells collected, in the second one (2013/2014), 483 shells.

Of the total number of shells, 116 spiders from ten families were obtained – Salticidae, Theridiidae, Gnaphosidae, Linyphiidae, Dictynidae, Clubionidae, Thomisidae, Liocranidae, Miturgidae and Araneidae, of which 13 species were determined. Total amounts of collected shells together with numbers of identified spiders are shown in Tab. 1. The shells occupation ratio was 10.69%. All species of spiders were juvenile, with exception of adults of *Robertus arundineti* (O. P.-Cambridge, 1871), *Zelotes apricorum* (L. Koch, 1876). The only specimen of genus *Talavera* was also juvenile and in this case is not possible to state its sex.

Of the aforementioned families, the Salticidae was the most abundant family. *Pellenes tripunctatus* was the most abundant species, which amounted to 50% of the total number of determined species. From the other frequent species, *S. penicillatus*, *Euryopis flavomaculata* (C. L. Koch, 1836) can be mentioned.



1: *Area of collecting shells. The red dot on the left map shows the Vranov nad Topľou town. Numbers on the right map represent particular localities*

Species composition is shown in the Tab. 2. From the ecologically significant species, *C. montanum* is considered as a vulnerable species, and *S. penicillatus* of a lower risk (Gajdoš, Svatoň, 2001).

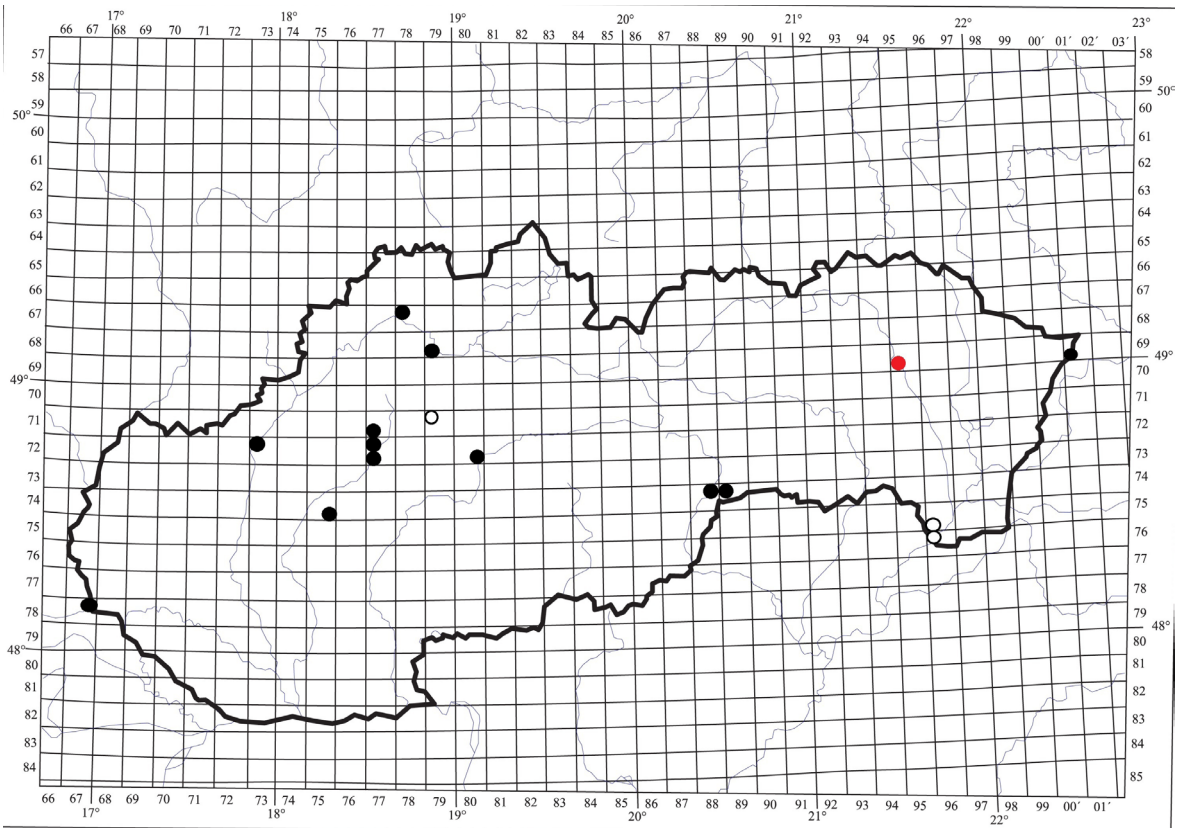
The most occupied shells (62.93 %) came from the quarry of the Skrabské village. Other species rich locality was the road embankment near the Vyšný Žipov village with relatively higher species diversity (*E. flavomaculata*, *Myrmarachne formicaria*, *C. montanum*, *Heliophanus* sp.), although the collected amount of shells was relatively small.

DISCUSSION

Our research on spiders overwintering in shells has produced several interesting information. With regard to the occurrence of species, *S. penicillatus* was recorded for the first time from studied region. Previously, the species was recorded only around the Streda nad Bodrogom town at the Hungarian border in Eastern Slovakia (Gajdoš *et al.*, 1999); moreover these data are more than 60 years old. More recent record is from the locality Bukovské vrchy at the Ukrainian border (Gajdoš *et al.*, 1999), for further distribution see Fig. 2. Species *S. penicillatus* is categorized with lower risk – LR (Gajdoš, Svatoň, 2001), while in this study were identified seven individuals.

The most surprising result is absence of the jumping spider *P. nigrociliatus*. This species was the first and the most often recorded species from the shells of *X. obvia* (Mikulska, 1961; Horn, 1980; Szinetár *et al.*, 1998). Another case of abundant occurrence of this species is research in the Czech Republic, mainly in southern Moravia (Hula *et al.*, 2009; Niedobová *et al.*, 2013; Michálková, 2012). In the work of Bauchhenss (1995), however, this species was not also mentioned. Although, in Slovakia is not a common species, but it is not classified into the categories of rare or endangered species (Gajdoš, Svatoň, 2001). It is surprising that we did find any specimen, because the incidence within of the Eastern Slovakia (Gajdoš, Svatoň, 2001), habitat conditions and affinity to shell (Hula *et al.*, 2009; Niedobová *et al.*, 2013) is similar to the *Sitticus penicillatus*. Thus, it is not a matter of unsuitable habitat, however, we are not to be able substantiate the cause of absence.

A distinct dominant was *P. tripunctatus*, which accounted for 50 % of all the determined species. Almost all individuals came from the limestone quarry near Skrabské village. Area of quarry has a calcareous ground, sparse vegetation, or almost none, low scrubs, gravelly or stony surface. These ideal conditions are probably the reason of such common occurrence of *P. tripunctatus*. The dominance of this species is mentioned by almost all authors, mainly Bauchhenns (1995), Bellmann (1999), Hula *et al.* (2009) and



2: *The occurrence of species Sitticus penicillatus in Slovakia (edited from Gajdoš et al., 1999). Black dots represent data older than 1950, white dots represent data later than 1950. The red dot shows a new record of S. penicillatus*

Niedobová *et al.* (2013). Most of them were hibernated in shell *C. vindobonensis*, so the affinity to this shell was confirmed. But this assertion is against with statement that *P. tripunctatus* also hibernates in shell of *Xerolenta* sp. (Bellmann, 1992) or *Zebrina detrita* and therefore choice depends upon availability of shells (Bauchhenns, 1995).

Regarding to ant-like species – *Myrmarachne formicaria* and *Micaria formicaria*, these species are mentioned mainly from habitats such as vineyards, orchards, road embankments or forest edges (mainly Hula *et al.*, 2009; Niedobová *et al.*, 2013). Salticid spider *Myrmarachne formicaria* colonises besides dry, steppe localities also more humid habitats (Bryja *et al.*, 2005). In our case, this species was discovered near the stream (Loc. 19) and marsh (Loc. 23). Gnaphosid spider *Micaria formicaria* colonises rocky steppes and quite often also forest edges, where lives close to ants (Kůrka *et al.*, 2014). On Locality Bystré, no. 11 (slope on edge of forest) we found two individuals.

A special feature is the absence of species *Euryopis quinqueguttata*, which is mentioned very often in the context of wintering in shells (Bauchhenss, 1995; Szinetár *et al.*, 1998; Bellmann 1999; Hula *et al.*, 2009; Niedobová *et al.*, 2013). In the work of Szinetár *et al.* (1998) was even the second most common specimen. Regarding the occurrence, this species is recorded directly in the monitored area, near the Vranov nad Topľou town (Gajdoš *et al.*, 1999). The reason of absence is maybe for its small abundance on Slovak territory. Species is categorized as vulnerable (Gajdoš, Svatoň, 2001).

Instead of this species, in our case was recorded *Euryopis flavomaculata* which is not mentioned so often under this topic. This is a relatively abundant species, extended throughout Slovakia (Gajdoš *et al.*, 1999). A total of 6 individuals were recorded in empty shells, located in the grasslands, in one case, in fallen spruce needles. It were the most anthropogenically disturbed areas.

A significant finding is *Cheiracanthium montanum*, which is categorized as vulnerable in Slovakia (Gajdos, Svatoň, 2001). *Cheiracanthium* sp. was found also in a study Szinetár et al (1998) in large numbers, on parched steppes or on sand dunes. However, its presence was intended only as accidental (Szinetár *et al.*, 1998). Habitats, which are completely conditioned by human activity, seem to be more ideal. In the Czech Republic, *C. montanum* and *C. pennyi* were discovered on vineyard terraces in high quantity in spite of the fact that in the Czech Republic are categorized as a critically endangered. Moreover, certain affinity to shell *X. obvia* was recorded (Hula *et al.*, 2009; Niedobová *et al.*, 2013). In our case, *C. montanum* was also found on strongly anthropogenically disturbed locality (Loc. 19 – road embankment) but in shell *C. vindobonensis*.

Various species of spiders have different requirements for the environment. Significant findings of spiders, which hibernate in shells, may not be obtained only from sites with calcareous ground or under above-mentioned conditions. Many interesting species were obtained from areas that did not look as suitable habitats. In any case, the majority of these localities are certain types of postindustrial habitats, especially quarries, roads and railway embankments and similar types of habitats.

CONCLUSION

The research was focused on overwintering of spiders in snail shells in the wider area of the Vranov nad Topľou town. Collecting shells took place in the winter period at the turn of 2012/2013 and 2013/2014. Attention was paid on shells of *X. obvia*, *C. vindobonensis* and *H. pomatia*. A total of 1085 shells were collected from 24 sites. Number of obtained spiders, which occupied the shells, amounted to 116 individuals. Ten families were identified, which included 18 different genera. Due to affinity of jumping spiders to shells of *X. obvia* and *C. vindobonensis*, the salticids occurred most frequently. The most abundant jumping spider was *P. tripunctatus* occurring mainly in *C. vindobonensis* shells. The most interesting finding was the absence of *P. nigrociliatus*, despite of its affinity to *X. obvia* shells. It was confirmed, that postindustrial habitats can provide an important refuge for ecologically significant and endangered species, e.g. *S. penicillatus* and vulnerable *C. montanum*. The greatest species diversity was recorded in the quarries and near the road and railway embankments where the specific requirements of species were considerably different. While in areas with calcareous ground, near the quarries and railway tracks mainly species of jumping spiders were recorded, shells on road embankments were hiding other ecologically important species such as a gnaphosid *Micaria formicaria* or a jumping spider *Myrmarachne formicaria*. Spiders overwintering in shells are mostly scarce and little studied species. Number of similar studies dealing with these issues is negligible, whereby the results often bring interesting knowledge. It is therefore appropriate to continue in similar researches. By collecting of shells and subsequent analysis, it is possible to improve the quality of faunistic exploration and to learn more information about the lives of these significant species of spiders.

Acknowledgement

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I: *The amounts of collected shells and all spiders per locality*

Locality	Number of shells			Number of spider species	Number of spiders
	X. obvia	***C. vindobonensis***	***H. pomatia***		
1. Sačurov, railway embankment		25		0	0
2. Sačurov, slope			6	0	0
3. Sečovská Polianka, railway station	57			2	3
4. Podčičva, quarry		25	22	0	0
5. Vranovské Dlhé, railway station		35		0	0
6. Vranov, railway station	16	10		1	2
7. Vranov, industrial park		23		3	3
8. Vranov, garden area		51		2	2
9. Brekov, quarry	43	12		0	0
10. Skrabské, quarry	72	51		5	22
11. Bystré, slope on edge of forest		35		3	4
12. Soľ, grassy slope		40		3	5
13. Dvorianky, railway station	51			1	2
14. Domaša, cottage area			18	2	3
15. Strážske, railway station			10	1	1
16. Malé Ozorovce, slight grassy slope			10	0	0
17. Malé Ozorovce, grassy area			22	1	1
18. Skrabské, quarry (2nd loc.)	85	165	8	4	51
19. Vyšný Žipov, road embankment		47	7	4	10
20. Vranov, grassy, mossy area			10	2	2
21. Vranov, grassy area		16	14	1	1
22. Vranov-Predmestie, railway station		27	24	1	1
23. Sačurov, grassy slope near the rails		10	13	1	1
24. Sačurov, slope near the stream		9	16	2	2
Total	324	581	180		116

II: *Species composition for each locality*

Locality	*Pellenes tripunctatus*	*Ballus chalybeius*	*Zelotes apricorum*	*Eurygopis flavomaculata*	*Myrmarachne formicaria*	*Robertus arundineti*	*Cheiracanthium montanum*	*Talavera petrensis*	*Talavera aequipes*	*Talavera*	*Micaria formicaria*	*Cicurina cicur*	*Enoplognatha latimana/ovata*	*Sitticus penicillatus*	*Heliophanus* sp.	*Zelotes* sp.	*Haplodrassus* sp.	*Clubiona* sp.	*Larinioides* sp.	*Talavera* sp.	*Phrurolithus* sp.	*Xysticus* sp.	*Drassodes* sp.	Linyphiidae sp.	Dictynidae sp.	Theridiidae sp.
1. Sačurov, railway embankment																										
2. Sačurov, slope																										
3. Sečovská Polianka, railway station									2						1											
4. Podčičva, quarry																										
5. Vranovské Dlhé, railway station																										
6. Vranov, railway station								2																		
7. Vranov, industrial park		1		1																				1		
8. Vranov, garden area				1		1																				
9. Brekov, quarry																										
10. Skrabské, quarry	15		1													1				1					4	
11. Bystré, slope on edge of forest											2					1			1							
12. Soľ, grassy slope											2	1			2											
13. Dvorianky, railway station	2																									
14. Domaša, cottage area		1	2																							
15. Strážske, railway station																		1								

Locality	*Pellenes tripunctatus*	*Ballus chalybeius*	*Zelotes apricorum*	*Euryopis flavomaculata*	*Myrmarachne formicaria*	*Robertus arundineti*	*Cheiracanthium montanum*	*Talavera petrensis*	*Talavera aequipes*	*Micaria formicaria*	*Cicurina cicur*	*Enoplognatha latimana/ovata*	*Sitticus penicillatus*	*Heliophanus* sp.	*Zelotes* sp.	*Haplodrassus* sp.	*Clubiona* sp.	*Larinioides* sp.	*Talavera* sp.	*Phrurolithus* sp.	*Xysticus* sp.	*Drassodes* sp.	Linyphiidae sp.	Dictynidae sp.	Theridiidae sp.
16. Malé Ozorovce, slight grassy slope																									
17. Malé Ozorovce, grassy area																									1
18. Skrabské, quarry (2nd loc.)	41												7								1	2			
19. Vyšný Žipov, road embankment				4	3		1							2											
20. Vranov, grassy, mossy area																1	1								
21. Vranov, grassy area																				1					
22. Vranov-Predmestie, railway station														1											
23. Sačurov, grassy slope near the rails					1																				
24. Sačurov, slope near the stream												1								1					
Total	58	2	3	6	4	1	1	2	2	4	1	1	7	6	2	1	2	1	1	2	1	2	1	4	1

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