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# Overwintering of spiders in land-snail shells in South Moravia (Czech Republic)

VLADIMÍR HULA[1], JANA NIEDOBOVÁ[1], ONDŘEJ KOŠULIČ[2]

[1]*Agronomical faculty of Mendel University Brno, Department of Zoology, Fisheries, Hydrobiology and Apiculture, Zemědělská 1, CZ-613 00 Brno, Czech Republic; e-mail: hula@mendelu.cz (corresponding author)*

[2]*Morkůvky 229, CZ-69172, Klobouky u Brna, Czech Republic*

HULA V., NIEDOBOVÁ J. & KOŠULIČ O. 2009: Overwintering of spiders in land-snail shells in South Moravia (Czech Republic). *Acta Musei Moraviae, Scientiae biologicae* (Brno) **94:** 1–12. – That spiders overwinter in land-snail shells is known, but the phenomenon has only rarely been studied. A number of published works from middle Europe address it, but none from the Czech Republic. The aim of this research is to find which spider species overwinter in empty land-snail shells in the xeric habitats of South Moravia (Czech Republic). During the winter of 2008/2009 we collected 2448 empty land-snail shells from 31 localities in South Moravian. The shells were the remains of three species from three genera (*Cepea vindobonensis*, *Helix pomatia* and *Helicella* sp.). We found a total of 185 spiders – 150 adults and juvenile spiders that were determinable (20 species and 9 families) and 35 juvenile spiders (determined to family or genus level only). We also found six species that feature in the Red List of threatened species in the Czech Republic (four classified as vulnerable species and two as endangered). The most important record is of one juvenile gnaphosid *Phaeocedus braccatus*, hitherto known from only three historical localities. We confirmed that several species show a positive affinity to empty land-snail shells, particularly *Pellenes tripunctatus*, *Pellenes nigrociliatus*, *Sitticus pennicilatus* and *Myrmarachne formicaria*.

**Key words.** spiders, land-snail shells, overwintering, xeric habitats

## Introduction

A literature search reveals only a few papers dealing with invertebrates overwintering in empty snail shells in Europe. Even fewer papers address overwintering. The majority of the publications concern the water spider *Argyroneta aquatica* (e.g. HORN 1980). The spider fauna of empty snail shells in xeric habitats is not well known, especially in the Czech Republic. There exist a certain number of publications from the countries surrounding the Czech Republic. BELLMANN (1999) described the overwintering of relatively rare species, particularly from the families Salticidae and Theridiidae, in empty snail shells. For example, *Pellenes nigrociliatus* shows a preference for certain shells (*Helicella* sp. mainly), which they use for reproduction and overwintering (BELLMANN 2001). Only one published notice (BRYJA *et al.* 2005) exists for Czech Republic, relating to the relationship between *P. nigrociliatus* and shells on the limestone slopes of the Pálava Protected Landscape Area. Dolanský (pers. com.) has mentioned a relationship between *Myrmearachne formicaria* and empty water-snail shells. Probably the most exact study was published by SZINETÁR *et al.* (1998) from Hungary. They examined material consisting of 8 species of snail shells (water and land) at 24 sites – two on river banks and the rest in xeric habitats. They found two new species

for Hungary and established several very interesting faunistic records. Furthermore, they found that the spider *Pellenes nigrociliatus* lives inside shells until maturity, while other species of spiders only overwinter there. This relationship was published by RICHMAN (1992) as the only known relationship between shells and jumping spiders.

There are plenty of xeric habitats in South Moravia, under various statutory conservation regimes. These localities are surviving remnants of former xeric habitats and they serve as refugia for many species of xerothermic fauna and flora. These localities contain three particularly visible genera of land snails (*Helicella* sp., *Cepea* sp. and *Helix* sp.). This study attempts to summarise the spider material collected from the shells of these three species.

## Material

### Localities

The localities are provided with GPS coordinates and grid square numbers after PRUNER & MÍKA 1996 (see also Fig. 1).

1. Balcarka (NR), GPS 49°22′35.216″N, 16°45′27.08″E; Grid square 6666: Shells collected in a bushy part of a north-exposed slope of the Balcarka outcrop, currently lacking active conservation management. The geological substrate of the locality is limestone.
2. Budkovice (SAC Krumlovsko-Rokytenské slepence), GPS 49°4′10.504″N, 16°20′43.611″E; Grid square 6964: south-east-exposed slope in Budkovice village up the river Rokytná, geological substrate conglomerate. Material was collected on a slope under the walls of the historical stronghold. The locality currently lacks active conservation management.
3. Horka (NM), GPS 49°10′50.861″N, 16°43′41.915″E; Grid square 6866: former conglomerate quarry, hill covered on top by loess. Locality is mown and bushes have been removed.
4. Hrádek (NR), GPS 48°57′18.884″N, 16°51′4.148″E; Grid square 7067: forest-steppe locality on loess, without active conservation management.
5. Jesličky (NM), GPS 48°56′34.109″N, 16°50′20.626″E; Grid square 7067: loess slope, former sheep pasture and extensive plum orchard. Steppe part with stands of Scotch pine *Pinus sylvestris* and black locust *Robinia pseudoacacia*. The grass is mown.
6. Kamenný vrch-jih (NR Kamenný vrch u Kurdějova), GPS 48°57′55.786″N, 16°45′21.589″E; Grid square 7066: south-exposed slope of xeric grassland on loess with solitary bushes. Conservation management consists of allowing sheep to graze and regular mowing.
7. Kamenný vrch-sever (SAC Kamenný vrch u Kurdějova), GPS 48°57′49.207″N, 16°45′19.784″E; Grid square 7066: north-exposed slope of xeric grassland on loess with solitary bushes. Conservation management consists of allowing sheep to graze and regular mowing.

8. Kienberg (NM), GPS 48°48′10.82″N, 16°41′9.622″E; Grid square 7166: abandoned calcareous clay quarry, top of hill covered in loess. Hill-top plateau with xeric vegetation and free-growing thorns (*Crataegus* sp.), dog-roses (*Rosa canina*) and blackthorns (*Prunus spinosa*). Plateau is grazed and mowed, remainder without active conservation management.
9. Kurdějov-nad bažantnicí, GPS 48°58′3.598″N, 16°45′40.261″E; Grid square 7066: southwest- exposed slope of Holý vrch hill. Loess geological substrate, once grazed; lacking formal conservation status.
10. Louky pod Kumstátem (NR), GPS 48°59′35.762″N, 16°55′20.812″E; Grid square 7067: south-west- and west-exposed slope on loess near the Krumvíř village. Grazed.
11. Macošská stráň 1 (SAC Moravský kras), GPS 49°22′14.329″N, 16°44′13.089″E; Grid square 6666: south-exposed slope on limestone, unmanaged.
12. Macošská stráň 2 (SAC Moravský kras), GPS 49°22′13.81″N, 16°44′21.749″E; Grid square 6666: south-exposed slope on limestone, grazed.
13. Mariánský mlýn-jih, GPS 48°48′32.388″N, 16°39′20.263″E; Grid square 7165: former limestone quarry on Sv. Kopeček u Mikulova massif. Material was collected in dry part of quarry. No vegetation. Lacking conservation management and formal conservation status.
14. Mariánský mlýn-sever, GPS 48°48′40.056″N, 16°39′27.576″E; Grid square 7165 former limestone quarry in the Sv. Kopeček u Mikulova massif. No conservation management. Very sparse vegetation in the flooded part of the quarry.
15. Medlánecký kopec (NM), GPS 49°14′12.206″N, 16°33′29.147″E; Grid square 6765: acidic outcrop, material collected on a south-exposed slope which is without management.
16. Milovická stráň (NR), GPS 48°50′55.562″N, 16°41′32.475″E; Grid square 7166: south-west-exposed loess slope. Black locust growth and solitary trees removed in the past; now without conservation management.
17. Moravský Krumlov I. (NNR Krumlovsko-Rokytenské slepence), GPS 49°3′57.305″N, 16°19′28.192″E; Grid square 6963: south-exposed conglomerate slope under the chapel of Saint Florian. Without conservation management.
18. Moravský Krumlov II. (NNR Krumlovsko-Rokytenské slepence), GPS 49°3′0.949″N, 16°19′16.052″E; Grid square 6963: west- and south-west-exposed conglomerate slope. Without conservation management.
19. Pálava-Děvičky (NNR Děvín), GPS 48°52′30.931″N, 16°39′41.831″E; Grid square 7165: south-east-exposed limestone slope under the ruins of Děvičky Castle. Without management.
20. Pálava-skalní step steppe (NNR Děvín), GPS 48°52′24.055″N, 16°39′33.552″E; Grid square 7165: south-east exposed limestone slope, without management.
21. Pálava-vyhlídka (NPR Děvín), GPS 48°52′19.276″N, 16°39′21.267″E; Grid square 7165: south-east-exposed limestone slope, without management.

22. Rokytná I. (NNR Krumlovsko-Rokytenské slepence), GPS 49°3′47.803″N, 16°19′42.035″E; Grid square 6963: conglomerate rocks, shells collected on south-exposed rock steppe partly covered in old, dry vegetation and bushes. Without conservation management.
23. Rokytná II. (skály) (NNR Krumlovsko-Rokytenské slepence), GPS 49°3′57.305″N, 16°19′28.192″E; Grid square 6963: conglomerate rocks, shells collected on surface rock with poor vegetation and without bushes. Without conservation management.
24. Santon (NM), GPS 49°11′16.492″N, 16°45′49.491″E; Grid square 6866: with north-east-exposed slope, conglomerate base and loess cover. Shells collected in the lower part of slope where black locust growth has been removed in the past.
25. Stránská skála (NPP), GPS 49°11′24.287″N, 16°40′28.205″E; Grid square 6865: former limestone quarries, shells collected in quarries and on the top of outcrop. Without management, walkers′ erosion only.
26. Velatice (NR), GPS 49°11′33.156″N, 16°45′20.634″E; Grid square 6866: conglomerate slopes with loess cover up the Rokytnice river. Black locust growth was removed from the locality but remains in the surroundings. Solitary Scotch pines present.
27. Velké Družďavy (NM), GPS 49°6′46.241″N, 16°39′10.808″E; Grid square 6966: on loess isolated among crop fields, without conservation management
28. Vilémovická stráň 1 (SAC Moravský kras), GPS 49°22′7.176″N, 16°44′32.176″E; Grid square 6666: north-west-exposed slope on limestone, grazed.
29. Vilémovická stráň 2 (SAC Moravský kras), GPS 49°22′9.479″N, 16°44′38.407″E; Grid square 6666: west-exposed slope on limestone, grazed.
30. Vinice, GPS 48°58′21.56″N, 16°52′17.901″E; 7067: south-exposed xeric slopes on loess. Material collected on slopes between vineyard terraces near the village of Morkůvky. These terraces are intensively managed by cutting bushes and trees.
31. Vinohrady (NM), GPS 49°11′30.293″N, 16°44′47.327″E; Grid square 6866: on loess among crop fields. Part of the locality is mown, remainder without conservation management.

## Methodology

All the study localities were visited in the course of winter 2008/2009 and a total of 2448 empty land-snail shells collected . Approximately an hour was spent at each locality and all the empty shells that could be found were collected. Temperatures at the time of collection were below 10°C in the winter months (14.12.2008, 20.12.2008, 28.12.2008, 21.1.2009, 26.1.2009, 2.3.2009, 10.3.2009, 12.3.2009, 15.3.2009 and 16.3.2009). All available land snail shells from each locality were placed in plastic bags (*Helix pomatia*, *Cepaea vindobonensis* and *Helicella* sp., all species together) and then transferred to plastic boxes with fixed covers in the laboratory. Laboratory conditions were maintained

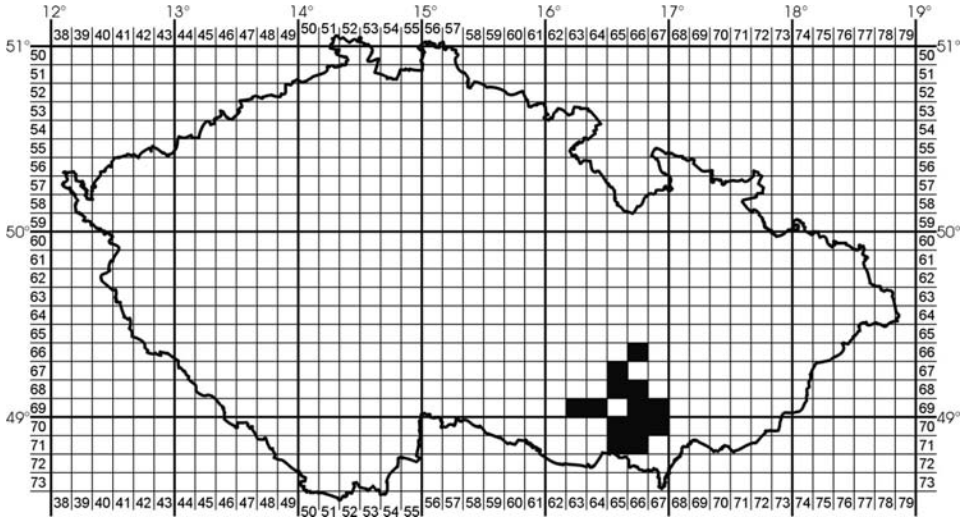


**Fig. 1.** Map of faunistic grid squares visited.

at a temperature of 22°C with relatively low air humidity. All animals that left the shells were collected twice a day, recorded, stored in alcohol and determined after criteria laid down by MILLER (1971), HEIMER & NENTWIG (1991), NENTWIG *et al.* (2003), ROBERTS (1995), and ŻABKA (1997). Nomenclature and arrangement of families, genera and species follow that employed in *Catalogue of Spiders of the Czech Republic* (BUCHAR & RŮŽIČKA 2002) and the most recent version of *The World Spider Catalogue* (PLATNICK 2009). The names of collectors and determiners are abbreviated to two-letter combinations: VH (Vladimír Hula), OK (Ondřej Košulič) and JN (Jana Niedobová).

**Abbreviations**

PLA . . . . . Protected Landscape Area
SAC . . . . . Special Conservation Area
NNP . . . . . National Nature Monument
NNR . . . . . National Nature Reserve
NR . . . . . Nature Reserve
NM . . . . . Nature Monument

EN . . . . . endangered
VU . . . . . vulnerable

## Results

A total of 2448 snail shells was collected, with three genera represented, breaking down into 845 *Cepaea vindobonesis* shells, 421 *Helix pomatia* shells and 1182 shells of *Helicella* sp. From these, 185 spiders of 20 species (33 adult and 152 juveniles), as well as 35 undetermined, emerged.

The results are arranged systematically according to families and alphabetically-ordered taxons (first order) and localities (second order) in the checklist. For each record we provide the following information: official name of general locality; particular placement within the locality (unless too minor); date; name of collector (leg.); and number of males, females and juveniles (juv.). Conservation status follows Růžička (2005) and is placed at the end of each particular species description. The voucher material is available in the collection of the determiner (Vladimír Hula, Brno).

For each species we briefly characterize the habitat preferences and abundance within the Czech Republic or in surrounding countries (Miller 1971, Bryja *et al.* 2005, Heimer & Nentwig 1991, Roberts 1995, Buchar & Růžička 2002 and Żabka 1997).

## Annotated list of species

### Family THERIDIIDAE

***Euryopis flavomaculata* (C. L. Koch, 1836)**

**Material.** NR Louky pod Kumstátem, 28. 12. 2008, leg. OK, 1 juv.; Kurdějov-nad bažantnicí, 14. 12. 2008, leg.VH, 1 juv.

**Remarks.** Common species with two ecological optima – steppe habitats and peat-bogs.

***Euryophis quinqueguttata* Thorell, 1875**

**Material.** NR Milovická stráň, 15. 3. 2009, leg. JN, 1♂; Vinice, 20. 12. 2008, leg. OK, 3 juv.

**Remarks.**Very rare, inhabits very warm and dry habitats, under stones and vegetation. Published findings from empty land-snail shells are known from Germany (Bauchhenss 1995, Bellmann 1999). EN

***Robertus arundineti* (O. P.-Cambridge, 1871)**

**Material.** PR Balcarka, 10. 3. 2009, leg. VH et JN, 1♂.

**Remarks.** Common species of open habitats. Its prefers mainly wet habitats.

### Family DYSDERIDAE

***Harpactea rubicunda* (C. L. Koch, 1838)**

**Material.** NNR Krumlovsko-Rokytenské slepence, Moravský Krumlov I., 16. 3. 2009, leg. JN, 1♀.

**Remarks.** Very common species, often found under stones, in rock fissures and in warm, dry grassland sites, even in houses.

### Family LINYPHIIDAE

***Diplocephalus cristatus* (Blackwall, 1833)**

**Material.** NNM Stránská skála, 14. 12. 2008, leg. VH et JN, 1♀.

**Remarks.** MILLER (1971) considers this species to be common in parks, in moss and leaf litter. BRYJA *et al.* (1995) suggested this species as rare in southern Moravian conditions. It prefers mainly wet and often flooded habitats.

### Family TITANOECIDAE

***Titanoeca schineri* L. Koch, 1872**

**Material.** NNR Krumlovsko-Rokytenské slepence, Moravský Krumlov I., 16. 3. 2009, leg. JN, 1juv.

**Remarks.** Common species of various dry, mainly calcareous, habitats.

### Family CLUBIONIDAE

***Clubiona* sp.**

**Material.** NR Louky pod Kumstátem, 20. 12. 2008, leg. OK 1 juv.; NM Velké Družďavy, 12. 3. 2009, leg. VH et JN, 1juv.

**Remarks.** Two individuals found, each in one locality

### Family MITURGIDAE

***Cheiracanthium pennyi* O.P.-Cambridge, 1873**

**Material.** NR Louky pod Kumstátem, 20. 12. 2008, leg. OK, 1 juv.; Vinice, 20. 12. 2008, leg. OK, 1 juv.

**Remarks.** Very rare species. The single adult specimen has been known from the Czech Republic so far (the same locality "Vinice"). The juveniles mentioned here confirm this record. Det. Jan Dolanský (Východočeské muzeum v Pardubicích, Pardubice).

### *Cheiracanthium* sp.

**Material.** NR Louky pod Kumstátem, 20. 12. 2008, leg. OK, 1 juv.; Vinice, 20. 12. 2008, leg. OK, 1 juv.

**Remarks.** We were unable to determine the individuals further; however, they are distinct from the most common *C. erraticum*.

## Family GNAPHOSIDAE

### Gnaphosidae sp.

**Material.** NNR Děvín, Pálava-Děvičky, 15. 3. 2009, leg. JN, 1 juv.; NM Jesličky, 15. 3. 2009, leg. JN, 1 juv.; NR Kamenný vrch u Kurdějova, Kamenný vrch-jih, 14. 12. 2008, leg. VH, 2 juv.; SAC Krumlovsko-Rokytenské slepence, Budkovice, 16. 3. 2009, leg. JN, 1 juv.; NNR Krumlovsko-Rokytenské slepence, Moravský Krumlov II., 16. 3. 2009, leg. JN, 1 juv., NNR Krumlovsko-Rokytenské slepence, Rokytná I., 16. 3. 2009, leg. JN, 3 juv.; NR Louky pod Kumstátem, 28. 12. 2008, leg. OK, 1 juv.; NR Milovická stráň, 15. 3. 2009, leg. JN, 2 juv.; Pálava-skalní step steppe, 15. 3. 2009, leg. JN, 1 juv.

### *Drassodes lapidossus* (Walckenaer, 1802)

**Material.** NNR Krumlovsko-Rokytenské slepence, Moravský Krumlov II., 16. 3. 2009, leg. JN 1♀.

**Remarks.** Common species of various dry habitats.

### *Micaria formicaria* (Sundevall, 1831)

**Material.** NR Balcarka, 10. 3. 2009, leg. VH et JN, 1♀; NNR Děvín, Pálava-vyhlídka, 15. 3. 2009, leg. JN, 1♂.

**Remarks.** Rare species, first record for Pálava PLA (*sensu* Bryja *et al.* 2005).

### *Micaria fulgens* (Walckenaer, 1802)

**Material.** NR Jesličky, 15. 3. 2009, leg JN 1♂.

**Remarks.** Relatively common species of various warm habitats. Records from land-snail shells exist from Germany (Bellmann 1999).

### *Micaria* sp.

**Material.** NM Jesličky, 15. 3. 2009, leg. JN, 2 juv.; SAC Kamenný vrch u Kurdějova, Kamenný vrch-sever, 14. 12. 2008, leg. VH, 1 juv.; Kurdějov-nad bažantnicí, 14. 12. 2008, leg. VH, 2 juv.; SAC Moravský kras, Macošská stráň 1, 10. 3. 2009, leg. VH et JN, 2 juv.

### *Phaeocedus* cf. *braccatus* (L. Koch, 1866)

**Material.** NNR Krumlovsko-Rokytenské slepence, Rokytná I., 16. 3. 2009, leg. JN 1 juv.

**Remarks.** Very rare species characteristic of open and very dry habitats. In the Czech Republic it has been found in only three other localities: Nový Dům in the Rakovník district (MILLER 1941), NNR Hádecká Planinka, and Domašov-Říčky in the vicinity of Brno (KŮRKA 1994). Known from land-snail shells in Hungary (SZINETÁR *et al.* 1998) and Germany (BELLMAN 1999). EN.

### *Zelotes apricorum* (L. Koch, 1876)

**Material.** Mariánský mlýn-jih, 15. 3. 2009, leg. JN, 1♀.

**Remarks.** Very common species typical of open habitats.

## Family THOMISIDAE

### Thomisidae sp.

**Material.** NR Louky pod Kumstátem, 20. 12. 2008, leg. OK, 1 juv.; Vinice, 20. 12. 2008, leg. OK, 1 juv.

### *Xysticus striatipes* L. Koch, 1870

**Material.** Kurdějov-nad bažantnicí, 14. 12. 2008, leg. VH, 1♀; Vinice, 20. 12. 2008, leg. OK, 1♀.

**Remarks.** Scarce, on vegetation of grass steppes.

## Family SALTICIDAE

### Salticidae sp.

**Material.** NR Kamenný vrch u Kurdějova, Kamenný vrch-jih, 14. 12. 2008, leg. VH, 1 juv.; NR Louky pod Kumstátem, 20. 12. 2008, leg. OK, 1 juv.; NNM Stránská skála, 14. 12. 2009, leg. VH et JN, 5 juv.; Vinice, 20. 12. 2008, leg. OK, 1 juv.

### *Heliophanus auratus* C. L. Koch, 1835

**Material.** NR Louky pod Kumstátem, 28. 12. 2008, leg. OK 1♀.

**Remarks.** Common. BRYJA *et al.* (2005) suggested that it may be a complex of two species.

### *Heliophanus* sp.

**Material.** NNM Stránská skála, 14. 12. 2009, leg. VH et JN, 5 juv.

### *Myrmarachne formicaria* (De Geer, 1778)

**Material.** Kurdějov-nad bažantnicí, 14. 12. 2009, leg. VH, 1♂, 4♀; NR Louky pod Kumstátem, 20. 12. 2008, leg. OK, 5♂, 6♀, 1 juv.; Vinice, 20. 12. 2008, leg., OK, 1♀.

**Remarks.** Relatively common species with two ecological optima – wet and dry. BRYJA *et al.* (2005) considered that it could be a complex of two species, but found no morphological differences. BELLMANN (1999) mentioned its behavioural affinity with land-snail shells. VU.

### *Pellenes nigrociliatus* (Simon, 1875)

**Material.** SAC Krumlovsko-Rokytenské slepence, Budkovice, 16. 3. 2009, leg. JN 6 juv.; NNR Děvín, Pálava-Děvičky, 15. 3. 2009, leg. JN 1 juv.; NNR Děvín, Pálava-skalní step steppe, 15. 3. 2009, leg. JN 2 juv.; NNR Krumlovsko-Rokytenské slepence, Moravský Krumlov I., 16. 3. 2009, leg. JN 4 juv.; NR Milovická stráň, 15. 3. 2009, leg. JN 1 juv.; NNM Stránská skála, 14. 12. 2009, leg. VH et JN 5 juv.

**Remarks.** Locally common species with very well-known behavioural relationship with land-snail shells for overwintering and reproduction. VU.

### *Pellenes tripunctatus* (Walckenaer, 1802)

**Material.** NNR Děvín, Pálava-Děvičky, 15. 3. 2009, leg. JN, 8 juv.; NNR Děvín, Pálava-vyhlídka, 15. 3. 2009, leg. JN, 7 juv.; NR Kamenný vrch u Kurdějova, Kamenný vrch-jih, 14. 12. 2008, leg. VH, 17 juv.; NM Kienberg, 15. 3. 2009, leg. JN, 4 juv.; SAC Moravský kras, Macošská stráň 1, 10. 3. 2009, leg. VH et JN, 26 juv.; SAC Moravský kras, Macošská stráň 2, 10. 3. 2009, leg. VH et JN, 8 juv.; NR Milovická stráň, 15. 3. 2009, leg. JN, 5 juv.; Vinice, 20. 12. 2008, leg. OK, 5 juv.

**Remarks.** Relatively common species of open dry habitats with well-known behavioural relationship with land-snail shells, especially for overwintering and reproduction.

### *Phlegra fasciata* (Hahn, 1826)

**Material.** NR Louky pod Kumstátem, 28. 12. 2008, leg. OK, 1♂.

**Remarks.** Common species of forest steppe and other open habitats.

### *Sitticus penicillatus* (Simon, 1875)

**Material.** NNM Stránská skála, 14. 12. 2008, leg. VH et JN, 1 juv.; Vinice, 20. 12. 2008, leg. OK, 4♂, 3 juv.

**Remarks.** Rare species of very dry habitats (e.g. quarries, steppe biotopes with sparse vegetation). Records from snails published in all papers on this topic (e.g. BAUCHHENSS 1995, BELLMANN 1999, SZINETÁR *et al.* 1998). VU.

***Talavera aequipes* (O. P.-Cambridge, 1871)**

**Material.** NNM Stránská skála, 14. 12. 2008, lgt VH et JN, 1♀, 1 juv.

**Remarks.** Common species of various open habitats – steppe, quarries, peat-bogs, heathlands. BELLMAN (1999) published it from land snail shells.

## Discussion

Four papers on the overwintering of spiders in xeric habitats in Central Europe have been published: BAUCHHENSS (1995), BELLMANN (1999), HORN (1980) and SZINETÁR *et al.* (1998). All the authors mentioned behavioural relationships in *Pellenes tripunctatus* and *P. nigrociliatus*, both of which have been found in land-snail shells, in the vegetation season as well as in wintertime. SZINETÁR *et al.* (1998) and BELLMANN (1999) discussed their reproductive behaviour. *Myrmarachne formicaria* is another spider species found in snail-shells in summertime (BELLMAN 1999, 2001). We collected only in wintertime but found all the above-mentioned species. *Myrmarachne formicaria* occurred commonly at various localities (18 specimens) and we thereby confirmed observations by BELLMANN (1999) that it lives inside land-snail shells. In contrast, although this species is common in Hungary, SZINETÁR *et al.* (1998) found it far from common in shells (one specimen only). It is possible that several behavioural strategies exist, as this spider may consist of a complex of several species (BRYJA *et al.* 2005). This is supported by a published note from PROSZYNSKI (2003) that drew attention to the problems of taxonomy for the genus *Myrmarachne* arising out of their ant mimicry and adaptation to various ants species-models.

We also found several rare species entered in the Red List of the Czech Republic. From the Vinice and Milovicka stráň localities we have four findings of the endangered *Euryopis quinqueguttata.* The most important record is one juvenile gnaphosid spider *Phaeocedus* cf. *braccatus* found in the Rokytná I. locality and is also classified as an endangered species. This finding is the only recent one from the Czech Republic.

Some species, especially *Pellenes tripunctatus*, *Pellenes nigrociliatus*, *Sitticus pennicillatus* and *Myrmarachne formicaria* were more abundant in several other localities.

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