

# Harvestmen (Opiliones) of Zvolen

## Sekáči (Opiliones) Zvolena

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**Abstract:** Harvestman (Opiliones) communities were studied in the urban area of Zvolen. Research was carried out at 13 localities out of which 4 represented buildings and 9 represented localities of urban vegetation. Harvestmen were collected by individual capture (7 localities) and by pitfall trapping (8 localities) through 1995–2009. In total, 123 individuals belonging to 20 species and 3 families were observed. The record of rare species *Zachaeus crista* (Brullé, 1832) is important. The north border of its areal is situated in Slovakia. The finding of 2 species (*Opilio canestrinii* (Thorell, 1876), *Nelima semproni* Szalay, 1951), which are considered to be invasive species, is also remarkable. Our results indicate that disturbed urban environment can sustain diverse communities of harvestmen.

**Key words:** harvestmen, Opiliones, Slovakia, Zvolen

## INTRODUCTION

Urbanized environment is largely out of interest of biologists, and more attention is generally given to the animal research in protected areas or in areas important for preservation of native communities or areas with occurrence of protected species and otherwise important areas. However, neglecting the human settlements in the zoological research can result in gaps of knowledge in distribution and ecology of several species. These can belong to endangered species or, on the other hand, to invasive species using the urban habitats as biocentres. The importance of urbanized environment is also highlighted by the fact that many of species were first recorded in this type of environment within the territory of our country.

Harvestmen belong to such group of species that like or are closely bound to the environment changed by human. Systematic research of opiliofauna in Slovakia has been carried out only in Karlova Ves village on the territory of Bratislava (Hajkova 1995). Stašiov (2004) in his work summarized the sporadic data on the harvestmen findings in other cities of Slovakia.

In Zvolen the extensive research of opiliofauna has not been realized yet. Findings of harvestmen from this area were published in two works (Stašiov 2004; Stašiov et al. 2009). On the territory of Zvolenská kotlina basin, where Zvolen is situated, harvestmen were researched by Ferianc (1949), Lác (1957), Stašiov (2002), Stašiov et Bitušík (1999), Stašiov et Kepič (2002), Stašiov et Snopková (2002), Stašiov et al. (2003). The work presents the result of the first larger faunistic research carried out in Zvolen. The main aim was to assemble a list of local opiliofauna and broaden knowledge on our species zoogeography.

## CHARACTERISTICS OF AREA

Zvolen is located in the south-western part of Zvolenská kotlina basin at the confluence of Hron and Slatina rivers. This city borders with the Javorie Mts. in the south.

The city currently has approximately 43 300 inhabitants. Altitude of the central part of the city is 293 m. Total area of the city covers 9 874 ha, out of which 1 294 ha represents the intravilan and 8 580 ha the extravilan.

Zvolen is situated in the area with a warm continental climate with average annual temperature of +8.8 °C (in January varying from - 2.5 °C to - 5 °C and with 18.5 °C in July). The average annual rainfall is 640 mm. The native communities in this area were Carpathian oak-hornbeam forests (*Carici pilosae–Carpinenion betuli*) with enclaves of durmast oak forests (*Quercetum petraeae–cerris* s. l.) (Michalko et al. 1986).

The research was carried out on 13 localities within the intravilan of Zvolen – inside the buildings or on the outer walls of the buildings (L1 – L4), as well as in the extravilan of this city – urban vegetation (L5–L13). Brief description of studied localities is as follows:

- L1 – On the building of the Institute of Forest Ecology of Slovak Academy of Sciences, Ľ. Štúra street 2, northern aspect, 293 m a. s. l.
- L2 – On the building of „X Legia“ pub, J. C. Hronského street 12, eastern aspect, 293 m a. s. l.
- L3 – Inside the building of the Institute of Forest Ecology of Slovak Academy of Sciences, Ľ. Štúra street 2, 295 m a. s. l.
- L4 – Inside the building of the Bariny campus of the Technical University of Zvolen, Študentská street 27, 293 m a. s. l.

- L5 – Jewish cemetery, T. G. Masaryka street, without aspect, 294 m a. s. l.
- L6 – The Park “J. D. Matejovie park”, M. Rázusa street (the Zlatý Potok suburb), southern aspect, 298 m a. s. l.
- L7 – The cemetery “Cintorín padlých rumunských vojakov”, Slnčná street, southern aspect, 305 m a. s. l.
- L8 – The arboretum “Arborétum Borová hora”, Borovianska cesta street, under vegetation of *Populus nigra* L., without aspect, 290 m a. s. l.
- L9 – The arboretum “Arborétum Borová hora”, Borovianska cesta street, under vegetation of *Abies alba* L., northern aspect, 330 m a. s. l.
- L10 – The arboretum “Arborétum Borová hora”, Borovianska cesta street, under vegetation of *Pinus sylvestris* L., northern aspect, 345 m a. s. l.
- L11 – The arboretum “Arborétum Borová hora”, Borovianska cesta street, under vegetation of *Carpinus betulus* L., northern aspect, 310 m a. s. l.
- L12 – The municipal park “Lanice”, Štúrova street, meadow, without aspect, 293 m a. s. l.
- L13 – The municipal park “Lanice”, Štúrova street, floodplain forest, without aspect, 293 m a. s. l.

## METHODS

Two methods were used to capture harvestmen: the individual collection (on localities from L1 to L7) and the pitfall trapping (on localities L7 to L13). Both methods were used only on locality L7. Using the first method, harvestmen were collected manually from walls of the buildings or from the soil surface and from the herb layer using tweezers. Individual collections were carried out only once (except for the L1 locality where two samplings were carried out). As for the L1–L4 localities accidental findings of harvestmen from or in the buildings were carried out. As for the urban vegetation (localities L5, L6, L7) samples were taken for approximately 2 hours from each of the locality.

Using the method of traps at the pitfall trapping the glass cups were used with the opening diameter of 5.5 cm and the volume of 0.3 l. Fixation fluid in the trap (filled approximately to the one third of the volume) was 10% formaldehyde solution. Two traps were placed on locality L7 with distance circa 30 m. The traps were installed from summer to autumn 2009 and captured animals were removed from the traps only once. On localities L8–L11 3 traps in one line were placed with 5 m spacing (12 traps in total). 10 traps (5 traps on each of localities) were placed on localities L12 and L13 randomly. Traps were installed on these four localities during 3 autumn months and the captured epigeon was removed only once, at the end of the sampling period.

The obtained biological material has been sorted out in the laboratory and the harvestmen were determined to the level of species. Subsequently the gender and the age group were determined. The sampling material was fixed in the 80 % ethyl alcohol and deposited at the corresponding author.

## RESULTS

In total, 123 individuals of harvestmen belonging to the 20 species and 3 families were observed during the research. The highest number of species (12) from the studied territory belonged to the family Phalangiidae. The highest number of species was observed on localities L9 (8 species), L8 (6) and L13 (5).

The list of harvestman species with faunistic information (data on number, sex, age group, date of collections and references if available) is as follows:

### **family: Phalangiidae**

- Phalangium opilio* Linnaeus, 1758  
L8 (20. 6.–23. 9. 2008): 1♀ adult, 1♀ subadult, 1♀ juvenil  
L10 (20. 6.–23. 9. 2008): 1♂ subadult, 1♀ adult
- Opilio canestrinii* (Thorell, 1876)  
L5 (23. 9. 2008): 1♀ adult
- Opilio parietinus* (De Geer, 1778)  
L2 (5. 10. 2009): 1♀ adult  
L3 (10. 9. 2001): 1♂ adult (Stašiov 2004)
- Opilio saxatilis* C. L. Koch, 1839  
L6 (7. 10. 2008): 2♀ adults
- Platybunus bucephalus* (C. L. Koch, 1835)  
L9 (23. 9.–17. 12. 2008): 2? juveniles
- Rilaena triangularis* (Herbst, 1799)  
L13 (29. 9.–10. 11. 2008): 2? juvenils
- Lophopilio palpinalis* (Herbst, 1799)  
L9 (23. 9.–7. 12. 2008): 2♂ adults
- Zachaeus crista* (Brullé, 1832)  
L7 (10. 6.–21. 11. 2009): 2♂ adults, 2♀ adults, 3♀ subadults, 1♀ juveniles
- Oligolophus tridens* (C. L. Koch, 1836)  
L9 (23. 9.–17. 12. 2008): 1♂ adult  
L12 (29. 9.–10. 11. 2008): 5♀ adults  
L13 (29. 9. 10. 11. 2008): 5♂ adults, 3♀ adults
- Lacinius ephippiatus* (C. L. Koch, 1835)  
L8 (23. 9.–17. 12. 2008): 1♂ adult, 9♀ adults  
L9 (23. 9.–17. 12. 2008): 11♀ adults  
L12 (29. 9.–10. 11. 2008): 1♀ adult  
L13 (29. 9.–10. 11. 2008): 1♀ adult
- Lacinius horridus* (Panzer, 1794)  
L10 (21. 9.–28. 12. 2009): 1♀ adult
- Mitopus morio* (Fabricius, 1799)  
L10 (20. 6.–23. 9. 2008): 1♀ adult
- Astrobonus laevipes* (Canestrini, 1872)  
L8 (23. 9.–17. 12. 2008): 11♂ adults, 12♀ adults  
L9 (23. 9.–17. 12. 2008): 2♂ adults, 7♀ adults  
L13 (29. 9.–10. 11. 2008): 5♂ adults, 3♀ adults
- Leiobunum rotundum* (Latreille, 1798)  
L1 (4. 9. 1995): 1♂ adult (Stašiov, 2004)  
L1 (28. 10. 1999): 1♂ adult (Stašiov, 2004)  
L4 (15. 7. 1998): 1♂ adult (Stašiov, 2004)
- Leiobunum tisciae* Avram, 1968  
L11 (20. 6.–23. 9. 2008): 1♀ adult

16. *Nelima semproni* Szalay, 1951  
 L1 (22. 8. 2007): 1♀ adult  
 L7 (8. 10. 2008): 2♂ adults  
 L8 (23. 9.–7. 12. 2008): 1♂ adult, 1♀ adult  
 L9 (23. 9.–17.12. 2008): 1♀ adult

**family: Trogulidae**

17. *Trogulus nepaeformis* agg. (Scopoli, 1763)  
 L9 (23. 9.–17. 12. 2008): 1♀ adult  
 18. *Trogulus tricarinatus* (Linnaeus, 1767)  
 L8 (23. 9. – 17. 12. 2008): 2? juveniles

**family: Nemastomatidae**

19. *Nemastoma lugubre* (Müller, 1776)  
 L8 (23. 9.–17. 12. 2008): 8♂ adults, 2♀ adults  
 L9 (23. 9.–17. 12. 2008): 1♂ adult, 1♀ adult  
 L12 (29. 9.–10. 11. 2008): 2♂ adults  
 L13 (29. 9.–10. 11. 2008): 6♂ adults, 2♀ adults  
 20. *Mitostoma chrysomelas* (Hermann, 1804)  
 L12 (29. 9. –10. 11. 2008): 1♂ adult

Total numbers of harvestman species recorded on the studied localities during the research are presented in Fig. 1.

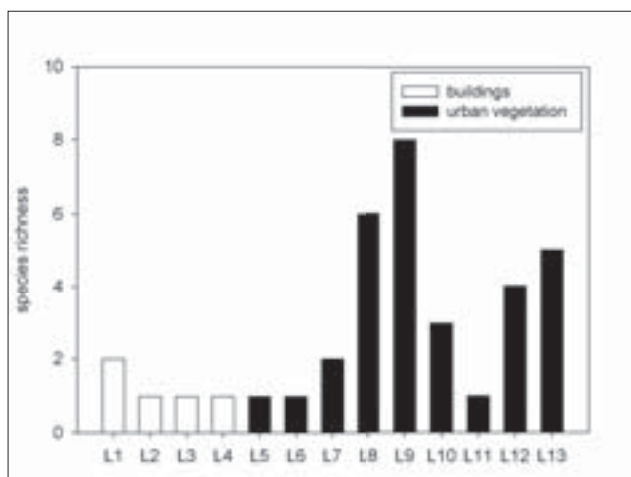


Fig. 1. Total numbers of harvestman species recorded on the studied localities during the research.

Obr. 1. Celkový počet druhů zaznamenaných na studovaných lokalitách v průběhu výzkumu.

## DISCUSSION

In Zvolen unexpectedly diversified opiliofauna was recorded. Twenty harvestman species present at such area represent remarkable species diversity even for habitats far less disturbed by human. Hajkova (1995), for example, recorded 9 harvestman species in Karlova Ves village (Bratislava) out of which 7 species were common with findings in Zvolen (*Phalangium opilio*, *Opilio parietinus*, *Opilio saxatilis*, *Lacinius horridus*, *Trogulus tricarinatus*, *Leio-bunum rotundum* and *Nelima semproni*). The same author

observed the presence of *Opilio dinaricus* Šilhavý, 1938 in Karlova Ves. This species have not been recorded for Zvolen, yet. Further research on the Zvolen territory would probably reveal the presence of some other harvestman species recorded in its vicinity.

Besides above mentioned species recorded in Zvolen and Karlova Ves (Bratislava), species such as *Egaenus convexus* (C. L. Koch, 1835), *Lacinius dentiger* (C. L. Koch, 1848), *Ischyropsalis manicata* L. Koch, 1865 and *Paranemastoma kochi* (Nowicki, 1870) were observed in the intravilan and the extravilan of several Slovak cities and villages so far. Thus, 25 harvestman species all together were recorded in urbanized environs of Slovakia representing more than three quarters of the known Slovak opiliofauna species. Such tolerance to the conditions characteristic for the urban habitats can be found only as for a few animal groups.

The record of rare species *Zachaeus crista* is important. The north border of its areal is situated in Slovakia. The findings of *Opilio canestrinii* and *Nelima semproni* are significant too. Both belong to a very rare harvestmen species in Slovakia and also to the invasive species. However, neglecting the urban habitats in the research of harvestmen can result in the lack of data on its occurrence in Slovakia. So far, *Opilio canestrinii* was observed only in the intravilan of our country, namely at 6 sites within 6 quadrants of the Databank of Fauna of Slovakia (DFS) (No. 7169, 7170, 7370 (Klimeš 1999), 7373, 7467, 7868 (Mašán et Mihál 2007)), belonging to 4 geomorphological units (the Chvojnická pahorkatina uplands hills (Klimeš 1999), the Borská nížina lowland, the Podunajská rovina lowland, the Trnavská pahorkatina uplands (Mašán et Mihál 2007). Zvolen is the seventh and the easternmost known locality of occurrence for this species in Slovakia. This species comes from Italy and adjacent islands (Gruber 1984) as well as from North Africa (Gruber 1988). Only recently it has spread to the central Europe. It was observed in Austria in the 60s of the last century, furthermore it was discovered in the Czech Republic in 1995, in Moravia in 1997 and in Slovakia (in Senica) in 1999 (Klimeš 1999). Today, this species is also known from the territory of Germany, Austria, Denmark, Netherlands, Belgium, from the southern parts of Sweden, Norway and Finland, as well as from Slovenia, Poland, Hungary, the Czech Republic and Slovakia (Mašán et Mihál 2007). The invasion of this harvestman eastwards and northwards can be expected, as it gradually becomes a common species in the human settlements in Slovakia. In spite of that this species is at present level of knowledge rated as a very rare species for Slovakia; it well can be an invasive species. *Nelima semproni* except for Zvolen was found at 9 localities (2 of them representing deciduous forest, 2 riparian vegetation, 2 meadow and 3 intravilan) situated in 6 quadrates of DFS (7868, 7373, 6895, 6999, 6900, 7000) within 4 geomorphological units (the Bukovské vrchy Mts., the Malé Karpaty Mts., the Ondavská vrchovina upland, the Považský Inovec Mts.). It represents species spread through the central Europe migrating northwards. Its southern areal extends to

the central part of the Apennine peninsula (east of Rome). Except for Italy it was also found in northern Slovenia and Croatia, Austria, western Hungary, eastern Germany, eastern Poland, the Czech Republic and Slovakia (Stašiov 2004). Despite the habitats diversity of this harvestman described in Slovakia so far, this species tends to populate the urban environment where it probably finds the most suitable and safe sites for life. To spread, this species usually uses roads and streamside stands as bio-corridors.

The high species diversity recorded at the studied area results from ecological requirements of observed species that correspond with various conditions of heterogeneous urbanized environment. Here not only synatrop species were recorded (*Opilio canestrinii*, *Opilio parietinus*, *Opilio saxatilis*), but also species of humid deciduous and mixed forests (*Lophopilio palpinalis*, *Platybunus bucephalus*, *Lacinius ephippiatus*, *Leiobunum tisciae*, *Trogulus nepaeformis*, *Trogulus tricarinatus*), as well as species preferring thermophilic deciduous and mixed forests and their ecotones (*Rilaena triangularis*, *Zachaeus crista*, *Astrobinus laevipes*, *Leiobunum rotundum*, *Nelima semproni*), harvestmen living on meadows (*Phalangium opilio*, *Lacinius horridus*) and euryvalent species (*Oligolophus tridens*, *Mitopus morio*, *Mitostoma chrysomelas*, *Nemastoma lugubre*). The occurrence of forest species was primarily concentrated on the last two localities situated in the arboretum. Conditions similar to ones in forests are characteristic for these localities. Moreover, Hajkova (1995) explains the relatively diverse opiliofauna of Karlová Ves village as a result of the great heterogeneity of urbanized habitats. According to the same author, the widening of ecological plasticity of harvestmen in this new type of habitat results in species diversity of opiliofauna in cities.

Gradual synantropization of some animal group species observed over last decades can also be expected as for harvestmen (Klausnitzer 1989). For Slovakia, for example, this possibility relates to *Leiobunum rotundum* and *Nelima semproni*. In spite of that these two species were in Slovakia recorded in various natural habitats in the past, their new records are mainly from intravilans. This type of habitat gradually prevails as for the localities of their occurrence. Therefore, the subsequent synantropization of both species, as well as some other harvestmen, can be expected. Hajková (1995), for example, considers *Phalangium opilio* to be a synatrop species, too. Such statement can be considered though early and it will be necessary to verify it by relevant research. Nevertheless, in regard to conditions prevalent in human settlements it can be presumed that mainly xerothermophilous species will tend to the synantropization, especially *Phalangium opilio*, *Zachaeus crista*, *Egaenus convexus* and *Lacinius horridus*, eventually some euryvalent species.

The research results suggest that urbanized environment can provide suitable living conditions for relatively diverse harvestman communities, including some interesting (rare or invasive) species. Therefore, aiming the harvestman

research at this type of significantly changed biotope can broaden our knowledge of both the distribution and ecology of the harvestmen, as well as of the processes associated with a progressive synantropization of some harvestman species and the migration of invasive harvestmen species. Invasive harvestmen species often find better conditions in environs changed by human than in natural habitats and they gradually can force out autochthonous species.

## SOUHRN

V práci jsou prezentovány výsledky faunistického výzkumu taxocenóz sekáčů (Opiliones) města Zvolen. Výzkum byl realizován na 13 lokalitách, z nichž 4 reprezentovaly budovy a 9 urbánní vegetaci. Sekáči byli odchytáváni individuálním sběrem (na 7 lokalitách) a pomocí zemních pastí (na 8 lokalitách), během let 1995–2009. Celkově bylo odchyceno 123 jedinců 20 druhů, patřících do 3 čeledí. K významnějším patří nález pontomediterránního sekáče *Zachaeus crista*, který je na Slovensku méně běžným druhem. Územím Slovenska prochází severní hranice jeho areálu. Zvláštní pozornost zasluhují také nálezy sekáčů *Opilio canestrinii* a *Nelima semproni*, které jsou na území Slovenska považovány za invazní druhy. Výsledky výzkumu poukazují na to, že i antropicky narušené urbanizované prostředí může poskytnout vhodné životní podmínky pro druhově velmi pestré taxocenózy sekáčů. Zvolen je přitom z hlediska opiliofauny druhově nejbohatší lokalitou na Slovensku.

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