

Harvestmen (Arachnida, Opiliones) of the Tatra Mountains (Slovakia)

Sekáči (Arachnida, Opiliones) Tater (Slovensko)

IVAN MIHÁL¹, STANISLAV KORENKO², PETER GAJDOŠ³

¹Institute of Forest Ecology, Slovak Academy of Sciences, Štúrova 2, 960 53 Zvolen, Slovakia, e-mail: mihal@sav.savzv.sk; ²Department of Botany and Zoology, Faculty of Science, Masaryk University, Kotlářská 2, Brno, CZ – 611 37, e-mail: korenko.stanislav@yahoo.com; ³Institute of Landscape Ecology, Slovak Academy of Sciences, Bratislava, Branch Office Nitra, Akademická 2, 949 01 Nitra, Slovakia, e-mail: nrukajd@savba.sk

Abstract: Authors present a summary of hitherto published as well as non-published data about occurrence of harvestmen in the Tatra Mts., proposing to fill information gaps about the species diversity of Opiliones in the Slovak part of the Tatra Mts. Total 18 harvestmen species were identified in the Tatra Mts. representing 54.5% of the species richness of the Slovak opiliofauna ($S = 33$). The species *Paranemastoma kochi*, *Ischyropsalis manicata*, *Platybunus pallidus*, *Gyas titanus* have been documented as a Carpathians elements and the harvestmen typical for undisturbed site conditions of climax mountain spruce stands. On the other hand, the species *Rilaena triangularis*, *Mitopus morio*, *Leiobunum* aff. *rupestre*, *Phalangium opilio* or *Opilio parietinus* are typical for ecotonal sun-heated habitats, forest meadows, clear cuts, borders of agricultural land and even for human settlements. In the future, more harvestmen species should be anticipated in the Tatra Mts., for example *Siro carpaticus*, *Astrobonus laevipes*, *Nelima semproni* or *Opilio dinaricus*. The authors present a possible utilisation the harvestmen as a bioindicators groups for biomonitoring of post-calamity changes in the forest and non-forest ecosystems in the Tatra Mts.

Key words: harvestmen, Opiliones, faunistics, Tatra Mts., Slovakia

INTRODUCTION

The area of the Tatra Mts., the highest mountain range in Slovakia, provides specific climatic and environmental conditions for occurrence of a number of invertebrate species, equally ones generally widespread as well as rare and endemic. The relatively high diversity of harvestmen (Opiliones) in submountain, mountain and alpine forest and non-forest habitats in the Tatra Mts. was observed already in the past (for example, Kratochvíl 1933, 1934, Šilhavý 1956, 1974). More recent information on the species richness in Opiliones in the Tatra Mts. can be found in works by Majzlan (1994), Mihál et Mašán (2006), Stašiov (2004), Stašiov et Bitušík (2001).

Opiliones have been studied also in several nearby regions: the Oravská kotlina basin and the Oravská vrchovina uplands (Astaloš 1998, 2003, Stašiov et Maršalek 2002), in the Chočské vrchy Mts. (Astaloš et Mihál 2009), the Nízke Tatry Mts. and Kozie chrbty Mts. (Astaloš et al. 2004, Kratochvíl 1934, Mihál et al. 2010, Stašiov 1999), the Podtatranská brázda furrow, the Podtatranská kotlina basin (Kratochvíl 1934), the Levočské vrchy Mts. (Maršalek 2001) and in the Spišská Magura Mts. (Stašiov 2003a).

In this work we present a summary of hitherto published as well as not published data about occurrence of harvestmen in the Tatra Mts., proposing to fill information gaps about the species diversity of Opiliones in the Slovak part of the Tatra Mts.

MATERIAL AND METHODS

The material documenting the species richness of Opiliones in the Tatra Mts. (Západné-West Tatra Mts., Vysoké-

High Tatra Mts. and Belianske Tatra Mts.) was collected and identified by several authors within their own research, e.g. Kratochvíl (1934), Majzlan (1994), Mihál et Mašán (2006), Stašiov (2004), Stašiov et Bitušík (2001), Šilhavý (1956, 1972, 1974). Our collections of harvestmen were irregular, carried out in years 2003–2009.

Harvestmen in the Tatra Mts. were collected using several methods:

- 1) hand capture in forest litter and rotten wood, under stones, pieces of wood and bark, on leaves, rocks and tree stems,
- 2) pitfalls with a fixative 4% formaldehyde solution, placed in different numbers and orientations,
- 3) sieving forest litter and various soil substrates (the animals were isolated, among others, with photo-thermoelectors of the Tullgrén type),
- 4) sweeping nets and beating shrubs and tree branches with a stick.

The collected material of Opiliones were preserved in testing tubes with 75% ethanol. The material was identified in the laboratory using the stereo-magnifying lens, identification keys elaborated by Martens (1978) and Šilhavý (1956, 1971), and matching material deposited in the collection of the first author. The major part of Opiliones collected in years 2003–2009 has been deposited in the collection of Opiliones at the Museum of Central Slovakia in Banská Bystrica.

RESULTS AND DISCUSSION

Both historical and recent data on the species richness of Opiliones in the Tatra Mts. have been published by Kratochvíl (1933, 1934), Majzlan (1994), Mihál et Mašán (2006), Stašiov (2004), Stašiov et Bitušík (2001), Šilhavý (1956, 1972, 1974). Getting together the information from

literature as well as our data obtained from the field collection and laboratory identification allows us to obtain a reliable pattern of the species spectrum of Opiliones in the Slovak part of the Tatra Mts:

Palpatores Thorell, 1876

Nemastomatiidae Simon, 1879

1. *Nemastoma lugubre* (Müller, 1776)
2. *Paranemastoma kochi* (Nowicki, 1870)
3. *Mitostoma chrysomelas* (Hermann, 1804)

Trogulidae Sundevall, 1833

4. *Trogulus nepaeformis* (Scopoli, 1763)
5. *Trogulus tricarinatus* (Linnaeus, 1767)

Ischyropsalidae Simon, 1879

6. *Ischyropsalis manicata* L.Koch, 1865

Phalangidae Latreille, 1802

7. *Phalangium opilio* Linnaeus, 1761
8. *Opilio parietinus* (De Geer, 1778)
9. *Platybunus bucephalus* (C. L. Koch, 1835)
10. *Platybunus pallidus* Šilhavý, 1938
11. *Rilaena triangularis* (Herbst, 1799)
12. *Lophopilio palpinalis* (Herbst, 1799)
13. *Oligolophus tridens* (C. L. Koch, 1836)
14. *Lacinius ephippiatus* (C. L. Koch, 1835)
15. *Mitopus morio* (Fabricius, 1799)
16. *Gyas titanus* Simon, 1879
17. *Leiobunum rotundum* (Latreille, 1798)
18. *Leiobunum* aff. *rupestre* (Herbst, 1799)

The discussed taxonomic survey of the hitherto recognized species richness of Opiliones in the Tatra Mts. displays 18 harvestmen species identified mostly in mountain to alpine conditions, both in forest and non-forest biotopes. Considering the total of 33 Opiliones species recorded in Slovakia (Bezděčka 2009, Stašiov 2004), this number represents 54.5% of the species richness of the Slovak opiliofauna.

Table 1 describes the species richness of harvestmen based on the material collected and identified through 2003–2009 from a variety of localities across the Tatra Mts. The major part of the study localities was situated in the High Tatra Mts. and some of them in the West Tatra and Belianske Tatra Mts. The occurrence of most of the species is typical for mountain and alpine forest environment. The harvestmen species spectrum illustrated in Table 1 represents a significant contribution to the knowledge of Opiliones in the Tatra Mts.

Table 2 gives the list of harvestmen species which occurrence of the Tatra Mts. was recorded by Majzlan (1994) and published in a monography about the Tatra National Park. The occurrence of most of these species in the region is either general or well documented. The author reports about two another species which occurrence of the Tatra Mts. is disputable or dubious.

The discussed taxonomic survey may be supplemented with additional species which occurrence of the Tatra Mts.

reported in the literature is dubious, and no material enabling re-identification has been preserved. These dubious harvestmen species are described in Table 3. The typical example is a finding of *Dicranopalpus gasteinensis*, commented by Šilhavý (1956) as: “a single immature individual in the High Tatra Mts. (lgt. Hrabě), severely destroyed and impossible to identify precisely”. Today only one juvenile exemplar of this species collected from the Vtáčnik Mts. is in Slovakia at disposal and this fact is consistent with findings by Stašiov (2004). Some other species (*Egaenus convexus*, *Lacinius horridus*, *Opilio saxatilis*) reported of the Tatra Mts. by several authors (Kratochvíl 1933, 1934, Šilhavý 1972, 1974), are according to Stašiov (2004) dubious, thus more findings are necessary for their re-identification or proving of their occurrence – because these species are thermophilous, typical for lower-situated habitats. In the case of the species *Nemastoma wernerii* (= *Paranemastoma quadripunctatum wernerii* Kulczynski, 1903) and *Megaplatybunus femoralis* (= *Megabunus lesserti* Schenkel, 1927) the author Šilhavý (1974) speculates about confusion in the localisation of the collection site, because these species do not belong to the Central European opiliofauna. On the other hand, Kratochvíl (1934) reports a finding of *Paranemastoma quadripunctatum* Perty, 1833 recorded by Hrabě in a not specified locality in the Tatra Mts. The description provided by the author is not sufficient to distinguish between the High and Low Tatras Mts. The same was concluded by Stašiov (2003b). The occurrence of *P. quadripunctatum* from the localities in Central Slovakia was confirmed by Bezděčka (2009).

In submountain and mountain forest and non-forest habitats in the Tatra Mts. occurrence of more harvestmen species can be presumed, such as *Siro carpaticus* Rafalski, 1956, with present occurrence nearby the Tatra Mts. in the Ondavská vrchovina uplands and in the Vihorlat Mts. (Stašiov et al. 2003; Mašán 2005), furthermore the species *Astrobonus laevipes* (Canestrini, 1872) and *Nelima semproni* Szalay, 1951, with the nearest locality of occurrence in the Ondavská vrchovina uplands (Stašiov et al. 2003), or *Opilio dinaricus* Šilhavý, 1936, documented from the Polish part of the Pieniny National Park by Staręga (1979). At the same time, we draw the attention to the species spectrum of harvestmen in the Tatra Mts. that may be supplemented by species which hitherto occurrence in the area has been considered as dubious or contradictory (primarily *Egaenus convexus*, *Opilio saxatilis* and *Lacinius horridus*), particularly as for the species confirmed with more *in situ* findings.

Considered as an invertebrate bio-indicator group, harvestmen can be divided in three basic bio-indicator groups according to their ecotrophic and ecotopic specialisation, described in Table 4. Underlined are the species typical for (dominant in) the given habitat, that means occurring in the highest abundance in all their developmental stages.

For mountain forests or submountain waterlogged spruce stands are typical *Gyas titanus*, *Paranemastoma kochi*, *Ischyropsalis manicata*, *Platybunus pallidus* and others.

These species indicate undisturbed site conditions of climax mountain spruce stands (Mihál 1998, Stašiov 2003a, 2004, Stašiov et Bitušik 2001, Šilhavý 1956).

On the other hand, the harvestmen group typical for the forest communities also involves species diffusing frequently towards the forest edges or clear cuts, for example *Nemastoma lugubre*, *Trogulus nepaeformis*, *Trogulus tricarinatus*, *Platybunus bucephalus*, *Oligolophus tridens*. According to the observation by Mihál (1997), Mihál et Gajdoš (2009) and Stašiov (2001) in submountain forest ecosystems, these harvestmen can occur even massively in different ecotonal assemblages and easily respond to abrupt changes to the forest environment (clear cuts, regeneration cuts). The harvestmen are fairly mobile Arachnida, and as such, they belong to the food opportunists with possible seasonal massive occurrence. Thus they represent a permanent component of soil zoo-edaphon in almost all ecotonal assemblages in which they can occur with typical forest species and the species associated with open habitats.

On the other hand, ecotonal assemblages may enter the species typical for sun-heated habitats, forest meadows, clear cuts, and borders of agricultural land as well as species typical even for human settlements: *Rilaena triangularis*, *Mitopus morio*, *Leiobunum aff. rupestre*, *Phalangium opilio* or *Opilio parietinus*. These and some other species indicate open, well illuminated and mostly warmer biotopes of all types, which has been confirmed also by Kromp et Steinberger (1992), Mihál (1997), Stašiov et al. (2010) and Uhorskaiová (2009).

The knowledge of the bioindicator value of harvestmen as well as their species richness in the given habitat is, in case of abrupt structural changes, an efficient tool for fast recognition of sorting or concentration of the animals in certain groups. These groups next colonise only the parts of the habitat that meet their food and habitat demands. Today, this fact seems to be of interest for bio-monitoring of post-calamity changes in the forest and non-forest ecosystems in the Tatra Mts.

ACKNOWLEDGEMENTS

This research was supported by the Agency for Supporting Research and Development, based on the contract No. APVV-0456-07. SK was supported by the grant No. MSM0021622416 provided by the Ministry of Education, Youth and Sports of the Czech Republic. Paper is based on the research supported by the financial mechanism of EEA, project No. 2008-03-09 „Development scenarios of representative landscape ecosystems in the Slovak Republic considering global changes“. The authors thank to Mgr. P. Fend'a, PhD., RNDr. P. Mašán, PhD., Ing. Z. Šustek, CSc. as well as to the colleagues at the Institute of Forest Ecology SAS Zvolen for the field assistance.

SOUHRN

Autoři v předložené práci sumarizují dosavadní známé publikované a nepublikované údaje o výskytu sekáčů v Tatrách a tímto způsobem chtějí přispět k ucelení poznatků o druhové diverzitě opiliofauny slovenské části Tater.

Druhová diverzita sekáčů z různých lokalit v rámci Západních, Vysokých a Belanských Tater byla vícerymi autory sbíraná a determinovaná během jejich vlastního výzkumu, který probíhal již od třicátých let minulého století. Naše vlastní odchyty sekáčů probíhaly nepravidelně během let 2003 až 2009.

Starší, ale i nové, údaje o druhové diverzitě sekáčů v Tatrách je možné nalézt v publikacích autorů Kratochvíl (1933, 1934), Majzlan (1994), Mihál et Mašán (2006), Stašiov (2004), Stašiov et Bitušik (2001), Šilhavý (1956, 1972, 1974). Z uvedených literárních zdrojů a z našeho v terénu získaného a determinovaného materiálu je možné sestavit druhové spektrum sekáčů, které je spolehlivě determinované nebo publikované ze slovenského území Tater.

V převážně horských až vysokohorských podmínkách lesních i nelesních biotopů Tater bylo doposud zjištěno 18 druhů sekáčů, což z celkového počtu 33 dosud známých druhů na Slovensku (Bezděčka 2009, Stašiov 2004) tvoří 54,5 % druhové diverzity slovenské opiliofauny. Do seznamu zjištěných druhů sekáčů z Tater bychom mohli zařadit i některé další druhy, jejichž reálný výskyt v Tatrách považujeme podle daných literárních zdrojů za pochybný a sporný, resp. se u těchto druhů nezachoval materiál na re-determinaci. Jsou to sekáči: *Paranemastoma quadripunctatum wernerii*, *Opilio saxatilis*, *Egaenus convexus*, *Lacinius horridus*, *Dicranopalpus gasteinensis*, *Megabunus lesserti*. Na druhé straně můžeme v Tatrách očekávat výskyt i dalších druhů, např. sekáče *Siro carpathicus*, *Astrobus laevipes*, *Nelima semproni* nebo *Opilio dinaricus*. Zároveň je třeba dodat, že druhové spektrum sekáčů Tater mohou obohatit i druhy, jejichž výskyt na tomto území je doposud považován za dubiózní nebo sporný (např. druhy *Egaenus convexus*, *Opilio saxatilis* a *Lacinius horridus*), a to zejména po ověření jejich výskytu dalšími nálezy *in situ*.

Z hlediska využití sekáčů Tater jako bioindikační skupiny bezobratlých můžeme jejich druhové spektrum rozdělit do třech základních bioindikačních skupin – na druhy dominantní pro prostředí horských lesů, pralesů a pramenišť (např. *Gyas titanus*, *Paranemastoma kochi*, *Platybunus pallidus*); na skupinu sekáčů typickou pro podmínky společenstev ekotonu (*Trogulus nepaeformis*, *Platybunus bucephalus*, *Oligolophus tridens*) a na skupinu typickou pro otevřené biotopy horských luk, pastvin a pasek (*Rilaena triangularis*, *Leiobunum aff. rupestre*, *Phalangium opilio*).

REFERENCES

ASTALOŠ B. (1998): Fauna koscov (Opiliones) prírodnej pamiatky Hradné bralo v Oravskom Podzámku. – Zborník Oravského múzea, 15: 159–162.

- ASTALOŠ B. (2003): Kosce (Arachnida, Opiliones) rašelinísk Hornej Oravy. – Entomofauna Carpathica, 15: 56–59.
- ASTALOŠ B. et MIHÁL I. (2009): Príspevok k poznaniu koscov (Arachnida, Opiliones) Veľkého Choča v Chočských vrchoch. – Naturae Tutela, 13: 59–64.
- ASTALOŠ B., STAŠIOV S., MAŠÁN P., MARŠALEK P., KUBOVČÍK V. (2004): K poznaniu koscov (Arachnida, Opiliones) Kozích chrbtov. – Naturae Tutela, 8: 153–157.
- BEZDĚČKA P. (2009): Koscec *Paranemastoma quadripunctatum* potvrdený pre Slovensko. – Folia Faunistica Slovaca, 14: 59–62.
- KRATOCHVÍL J. (1933): Přehled zeměpisného rozšíření našich sekáčů. – Věda přírodní, 16/1: 5–12.
- KRATOCHVÍL J. (1934): Sekáči (Opilioneida) Československé republiky. – Práce Moravské přírodovědní společnosti, 9: 1–35.
- KROMP B., STEINBERGER K. H. (1992): Grassy field margins and Arthropod diversity: a case study on ground beetles and spiders in eastern Austria (Coleoptera, Carabidae, Arachnida: Aranei, Opiliones). – Agriculture, Ecosystems and Environmental, 40: 71–93.
- MAJZLAN O. (1994): Bezstavovce. – In: VOLOŠČUK I. et al. [eds.], Tatranský národný park – Biosférická rezervácia. – Gradus, Liptovský Mikuláš, p. 162–178.
- MARŠALEK P. (2001): Kosce (Opiliones) Levočských vrchov. – Natura Carpatica, 42: 187–190.
- MARTENS J. (1978): Weberknechte, Opiliones – Spinnentiere, Arachnida. – In: SENGLAUB K., HANNEMANN H. J., SHUMANN H. [eds.], Die Tierwelt Deutschlands, 64. Teil, VEB G. Fischer Verlag, Jena, 464 pp.
- MAŠÁN P. (2005): Prvý nález kosca *Siro carpaticus* (Opiliones, Cyphophthalmi, Sironidae) vo Vihorlate. – Telekia, Spravodaj CHKO Vihorlat, 3: 28.
- MIHÁL I. (1997): Harvestmen (Opilioneida) in a brush stand and fir-beech forest of the Kremnické vrchy mountains. – Biologia, 52: 191–194.
- MIHÁL I. (1998): Kosce (Opiliones) lesných porastov a lúk na Poľane. – Ochrana prírody, 16: 119–124.
- MIHÁL I., GAJDOŠ P. (2009): Kosce (Opiliones) výskumnej plochy Báb pri Nitre po obnovnej lesnej ťažbe. – Rosalia, 21: (in print).
- MIHÁL I., MAŠÁN P. (2006): Príspevok k poznaniu koscov (Opiliones) stredného a východného Slovenska. – Natura Carpatica, 47: 89–96.
- MIHÁL I., JARAB M., KORENKO S. (2010): Kosce (Arachnida, Opiliones) východnej časti Kozích chrbtov. – Naturae Tutela, 14: (in print).
- STARĘGA W. (1979): Kosarze (Opiliones) Pienin. – Fragmenta faunistica, 24: 175–183.
- STAŠIOV S. (1999): Rozšírenie *Ischyropsalis manicata* (Opilioneida) na Slovensku. – Entomofauna Carpathica, 11: 9–12.
- STAŠIOV S. (2001): Vybrané skupiny epigeickej makrofauny (Opilioneida, Diplopoda a Chilopoda) ako indikátory stavu vrchnej pôdnej vrstvy v podhorskej bučine. – Vedecké štúdie, 8/2001/A, Technická univerzita Zvolen, 88 pp.
- STAŠIOV S. (2003a): Rozšírenie a ekológia *Paranemastoma kochi* (Opiliones) na Slovensku. – Správy Slovenskej zoologickej spoločnosti, 20/21: 131–138.
- STAŠIOV S. (2003b): Výskyt *Paranemastoma quadripunctatum* (Opiliones) na Slovensku. – In: Entomologická konferencia 2003, Zborník abstraktov, 18.–19. 6. 2003, Mošovce, p. 18.
- STAŠIOV S. (2004): Kosce (Opiliones) Slovenska. – Vedecké štúdie, 3/2004/A, Technická univerzita Zvolen, 119 pp.
- STAŠIOV S., BITUŠÍK P. (2001): Rozšírenie troch skupín epigeickej makrofauny pozdĺž výškového gradientu v doline Nefcerka (Vysoké Tatry): kosce (Opilioneida), mnohonôžky (Diplopoda), stonôžky (Chilopoda). – Acta Facultatis Ecologiae, 8: 115–121.
- STAŠIOV S., MARŠALEK P. (2002): Kosce (Opilioneida) hornooravských rašelinísk. – Natura Carpatica, 43: 283–286.
- STAŠIOV S., HAZUCHOVÁ L., MIHÁL I. (2010): Kosce (Opiliones) mesta Zvolen. – Acta rer. natural., 8: (in print).
- STAŠIOV S., MARŠALEK P., MIHÁL I., MAŠÁN P., ASTALOŠ B., JARAB M. (2003): Kosce (Opiliones) Ondavskej vrchoviny. – Natura Carpatica, 44: 261–266.
- ŠILHAVÝ V. (1956): Sekáči – Opilioneida. – Fauna ČSR, NČSAV, Praha, 7, 274 pp.
- ŠILHAVÝ V. (1971): Sekáči – Opilioneida. – In: DANIEL M., ČERNÝ V. [eds.], Klíč zvířeny ČSSR IV., Academia, Praha, p. 33–49.
- ŠILHAVÝ V. (1972): Druhý příspěvek k poznání československých sekáčů (Opilioneida). – Zprávy Československé společnosti entomologické při ČSAV, 8: 93–96.
- ŠILHAVÝ V. (1974): Opilioneida. – In: Zborník prác o TANAP-u. Osveta, 16: 81–85.
- UHORSKAIKOVÁ L. (2009): Vplyv formy obhospodarovania poľnohospodárskej krajiny na štruktúru a dynamiku koscov (Opiliones). Doktorská dizertačná práca, FEE TU Zvolen, 80 pp.

Tab. 1. Harvestmen (Opiliones) found on the selected localities of the Tatra Mts. during 2003–2009.

Tab. 1. Sekáči (Opiliones) nalezeni na vybraných lokalitách v Tatrách v letech 2003 až 2009.

Locality ⁽¹⁾	Harvestmen species ⁽²⁾	Source of data (lgt.) ⁽³⁾
WEST TATRA MTS. ⁽⁴⁾		
Baníkov	<i>Mitopus morio</i> , <i>Platybunus bucephalus</i>	2003, P. Fend'a
Jalovecká dolina	<i>Lophopilio palpinalis</i> , <i>Mitopus morio</i> , <i>Platybunus bucephalus</i> , <i>Platybunus pallidus</i>	2006, P. Gajdoš
Roháčske plesá	<i>Rilaena triangularis</i>	2003, P. Fend'a, 2005, P. Mašán
Tichá dolina	<i>Gyas titanus</i> , <i>Lacinius ephippiatus</i> , <i>Leiobunum</i> aff. <i>rupestre</i> , <i>Mitopus morio</i> , <i>Paranemastoma kochi</i> , <i>Platybunus bucephalus</i> , <i>Platybunus pallidus</i>	2006, 2007, 2009, P. Zach et al.
HIGH TATRA MTS. ⁽⁵⁾		
Kolové pleso	<i>Mitopus morio</i> , <i>Platybunus bucephalus</i>	2005, P. Fend'a
Kolová dolina	<i>Mitopus morio</i> , <i>Platybunus bucephalus</i>	2005, P. Fend'a
Predné Kopské sedlo	<i>Platybunus bucephalus</i>	2005, P. Mašán
Javorová dolina	<i>Ischyropsalis manicata</i> , <i>Mitopus morio</i> , <i>Mitostoma chrysomelas</i> , <i>Nemastoma lugubre</i> , <i>Paranemastoma kochi</i> , <i>Platybunus bucephalus</i>	2005, P. Mašán, Z. Šustek
Zadné Meďodoly	<i>Ischyropsalis manicata</i> , <i>Lacinius ephippiatus</i> , <i>Mitopus morio</i> , <i>Mitostoma chrysomelas</i> , <i>Nemastoma lugubre</i> , <i>Oligolophus tridens</i> , <i>Paranemastoma kochi</i> , <i>Platybunus bucephalus</i> , <i>Platybunus pallidus</i>	2004, 2005, P. Mašán, Z. Šustek
Danielov dom	<i>Lacinius ephippiatus</i> , <i>Mitostoma chrysomelas</i> , <i>Nemastoma lugubre</i> , <i>Platybunus bucephalus</i> , <i>Platybunus pallidus</i>	2006, S. Korenko
Jamy	<i>Mitopus morio</i> , <i>Nemastoma lugubre</i> , <i>Platybunus pallidus</i>	2006, S. Korenko
Smrekovec	<i>Mitopus morio</i> , <i>Nemastoma lugubre</i> , <i>Oligolophus tridens</i> , <i>Platybunus pallidus</i>	2006, S. Korenko
Štrbské pleso	<i>Mitopus morio</i>	2005, S. Korenko
BELIANSKE TATRA MTS. ⁽⁶⁾		
Košiare	<i>Platybunus bucephalus</i>	2003, P. Fend'a
Monkova dolina	<i>Mitopus morio</i>	2005, S. Korenko
Skalné vráta	<i>Leiobunum</i> aff. <i>rupestre</i>	2003, P. Fend'a
Široké sedlo	<i>Ischyropsalis manicata</i> , <i>Mitopus morio</i> , <i>Platybunus bucephalus</i>	2005, P. Mašán

(1) lokalita (2) druhy sekáčů (3) zdroj dat (4) Západní Tatry (5) Vysoké Tatry (6) Belanské Tatry

Tab. 2. Species spectrum of harvestmen (Opiliones) of the Tatra Mts. by Majzlan (1994).

Tab. 2. Druhové spektrum sekáčů (Opiliones) Tater podle Majzlana (1994).

Species ⁽¹⁾	Notes ⁽²⁾
<i>Dicranopalpus gasteinensis</i>	Stašiov (2004), Šilhavý (1956)
<i>Gyas titanus</i>	
<i>Ischyropsalis manicata</i>	
<i>Mitopus morio</i>	
<i>Nemastoma (Paranemastoma) quadripunctatum</i>	Kratochvíl (1934), Stašiov(2003b)
<i>Oligolophus tridens</i>	
<i>Opilio parietinus</i>	
<i>Paranemastoma kochi</i>	
<i>Phalangium opilio</i>	
<i>Platybunus bucephalus</i>	
<i>Trogulus nepaeformis</i>	
<i>Trogulus tricarinatus</i>	

(1) druhy (2) poznámka (viz. text a Tab. 3)

Tab. 3. Dubious findings of harvestmen (Opiliones) of the Tatra Mts.

Tab. 3. Pochybné a sporné nálezy sekáčů (Opiliones) v Tatrách.

Species ⁽¹⁾	Notes ⁽²⁾
<i>Opilio saxatilis</i> C. L. Koch, 1839	Stašiov (2004), Šilhavý (1974)
<i>Egaenus convexus</i> (C. L. Koch, 1835)	Stašiov (2004), Šilhavý (1974)
<i>Lacinius horridus</i> (Panzer, 1794)	Stašiov (2004), Šilhavý (1974)
<i>Dicranopalpus gasteinensis</i> Doleschall, 1852	Stašiov (2004), Šilhavý (1956)
<i>Nemastoma werneri</i> Kulczyński, 1903	Šilhavý (1974)
<i>Megaplatybunus femoralis</i> Roewer, 1956	Šilhavý (1974)

(1) druhy (2) poznámka (viz. text)

Tab. 4. Harvestmen (Opiliones) of the Tatra Mts. according to preference for particular habitat types.

Tab. 4. Sekáči (Opiliones) Tater podle jejich preference různých habitatů.

FOREST STANDS ⁽¹⁾	ECOTONE STANDS ⁽²⁾	OPEN HABITATS ⁽³⁾
virgin forests, Norway spruce monocultures, forest spring stand ⁽⁴⁾	forest edges, hedgerows, open - cutting forests after calamity cause ⁽⁵⁾	mountain meadows, glade spots, open - cutting forests after calamity cause, fire - box spots, human settlement ⁽⁶⁾
<u><i>Gyas titanus</i></u>	<u><i>Nemastoma lugubre</i></u>	<u><i>Rilaena triangularis</i></u>
<u><i>Paranemastoma kochi</i></u>	<u><i>Trogulus nepaeformis</i></u>	<u><i>Mitopus morio</i></u>
<u><i>Ischyropsalis manicata</i></u>	<u><i>Trogulus tricarinatus</i></u>	<u><i>Leiobunum rotundum</i></u>
<u><i>Nemastoma lugubre</i></u>	<u><i>Platybunus bucephalus</i></u>	<u><i>Leiobunum aff. rupestre</i></u>
<u><i>Trogulus nepaeformis</i></u>	<u><i>Rilaena triangularis</i></u>	<u><i>Phalagium opilio</i></u>
<u><i>Trogulus tricarinatus</i></u>	<u><i>Oligolophus tridens</i></u>	<u><i>Opilio parietinus</i></u> *
<u><i>Platybunus bucephalus</i></u>	<u><i>Mitopus morio</i></u>	<i>Platybunus bucephalus</i>
<u><i>Platybunus pallidus</i></u>	<u><i>Leiobunum rotundum</i></u>	<i>Oligolophus tridens</i>
<u><i>Oligolophus tridens</i></u>	<u><i>Leiobunum aff. rupestre</i></u>	<i>Lacinius ephippiatus</i>
<u><i>Lacinius ephippiatus</i></u>	<i>Mitostoma chrysomelas</i>	
<u><i>Mitostoma chysomelas</i></u>	<i>Lophopilio palpinalis</i>	
<u><i>Lophopilio palpinalis</i></u>	<i>Lacinius ephippiatus</i>	
<i>Leiobunum rotundum</i>	<i>Phalangium opilio</i>	
<i>Mitopus morio</i>	<i>Opilio parietinus</i> *	
<i>Rilaena triangularis</i>		

⁽¹⁾ les ⁽²⁾ ekoton ⁽³⁾ otevřený habitat ⁽⁴⁾ prales, smrková monokultura, lesní pramenisté ⁽⁵⁾ okraje lesů, remízky, částečně otevřené porosty po kalamitě ⁽⁶⁾ horské louky, paseky, částečně otevřené porosty po kalamitě, spáleníště, sídliště

Gyas titanus – the dominant species for the given habitat type – dominantný druh pro daný habitat, * – synanthropic species, frequent also in forest ecotones and open habitats – synantropný druh, častý též v ekotónech a otevřených habitatech