SOIL MITES (Acari, Mesostigmata) OF OAK FORESTS IN THE MALÉ KARPATY MTS (W SLOVAKIA)

PETER FENĎA, JANA CICEKOVÁ

Department of Zoology, Faculty of Natural Sciences, Comenius University, Mlynská dolina B-1, 842 15 Bratislava, The Slovak Republic, e-mail: fenda@fns.uniba.sk

Abstract

Fenďa P., Ciceková J.: Soil mites (Acari, Mesostigmata) of oak forests in the Malé Karpaty Mts (W Slovakia). Ekológia (Bratislava), Vol. 24, Supplement 2/2005, p. 102–112.

During the years 1999–2002 mesostigmatid mites, as important part of soil mesofauna communities, were studied in two oak-hornbeam forests in the Malé Karpaty Mts. 75 species from 4 cohors (Antennophorina, Gamasina, Sejina, and Uropodina) were recorded in these sites. The mite communities in the study site Lošonec-lom quarry regularly impacted by limestone dust from the nearby quarry show greater fluctuations in species richness and abundance of mites during the year. In the study site Lošonský háj grove Nature Reserve there are evident influence of more stable microclimatic conditions in the forest. The comparison of mite communities in consecutive years through hierarchical clustering suggests, that the temperature and air humidity can have stronger influence to mesostigmatid mite assemblages than the type of soil, pH and vegetation. From the faunistical point of view, *Pergamasus canestrinii* was recorded for the first time in Slovakia.

Key words: Acari, mites, soil, oak-hornbeam forests, Malé Karpaty Mts, Slovakia

Introduction

The majority of mesostigmatid mites are free-living predators inhabiting the layers of forest litter, where especially speedy predators find the optimal conditions. They hunt in the pore system of the upper layer of the soil (Karg, 1993). Another species play role in the decomposition processes in leaf litter, and a number of species are endoparasites or ectoparasites of mammals, birds, reptiles or insects.

The Malé Karpaty (Little Carpathians) Mts form the south–western projection of the Carpathian arch. The eastern and southern slopes of the Malé Karpaty Mts are influenced by the thermophilous Pannonian District. The area is covered by forests, woody steppes and rocky habitats. Forest stands have been under long–term anthropogenic pressure in the cultural land.

The mesostigmatid mites of the Malé Karpaty Mts are partially known from fur of small mammals and their nests (Ambros, 1984; Mašán et al., 1994), from birds' nests (Nosek, Lichard, 1962; Ambros et al., 1992), and also phoretic mites on insects (Mašán, 1999, 2001b; Mašán, Kalúz, 2001). But there is only one paper dealing with soil mites (Kalúz, 2005). Additionally in monographs of cohors Uropodina (Mašán, 2001a), family Macrochelidae (Mašán, 2003), family Zerconidae (Mašán, Fenďa, 2004) and family Ascidae (Kalúz, Fenďa, 2005) were summarized all known data from the Malé Karpaty Mts together with the new findings.

Study area

Study sites are situated in the zone of oak-hornbeam forests on southeastern slopes of the Malé Karpaty Mts.

Lošonský háj grove Nature Reserve (LH) [48°28' N, 17°24' E, Grid Reference Number of the Databank of the Fauna of Slovakia 7570b] – 80 to 100 year old oak-hornbeam forest (*Querco–Carpinetum caricetosum pilosae*) at the altitude of 260 m. Under the leaf litter the soil has a lumpy texture being humid in a dry year period too. Soil horizon pH = 4.29, humus content 12.67%.

Lošonec–lom quarry (LL) [48°29' N, 17°23' E, 7570a] – 80 to 100 year old oak-hornbeam forest (*Querco–Carpinetum melicetosum uniflorae*) at the altitude of 340 m. The site is regularly impacted by limestone dust emissions close to the quarry. Soil horizon pH = 6.74, humus content 6.55%.

The more detailed pedological and botanical characteristics of the study sites as well as the climatic conditions in the period of 1999–2002 have been included in the paper by Zlinská et al. (2005).

Methods and material

The study sites were investigated in the period 1999–2002. At each study plot, at about 1–month intervals from April to November, the material was collected by sifting from the leaf litter and upper part of soil from 1 m^2 (16 squares of 25×25 cm). The sifted material was separated using xereclectors of the Moczarski – Winkler's type (Balogh, 1958), and the animals were deposited in 75% ethyl alcohol. The mites were processed to yield microscopic preparations using chloralhydrate medium Liquid de Swan. The material has been deposited at the Department of Zoology, Faculty of Natural Sciences, Comenius University in Bratislava.

The species dominance (in %) was characterized by the scale proposed by Tischler (1949) and the species constancy (in %) was expressed by categories in the sense of Schwerdtfeger (1975). The species abundance relationship after Ludwig and Reynolds (1988) was used to compare the structure of the mite communities [N0 – number of species, N1 – $e^{H'}$ (H' is Shannon's index), N2 – $1/\lambda$ (λ is Simpson's index), E1 – Pielou evenness index]. In cluster analysis was used Wishart's index (Podani, 1988).

Results

A total of 8,030 gamasid mites were extracted. Analysis of the material revealed 75 nominated species belonging to 4 cohors (Antennophorina, Gamasina, Sejina, Uropodina) (Table 1). Altogether 64 mite species occurred in LL site and 54 species in LH site. On the other hand, higher abundance was recognized in LH site (Table 1).

Table 1. Survey of mesostigmatid mites in study sites during years 1999–2002.

Study sites / MITES	Lošonský háj grove N	Lošonský háj grove PS	Lošonec-lom quarry N	Lošonec-lom quarry PS
cohors Antennophorina				
family Celaenopsidae				
Celaenopsis badius (C. L. Koch, 1841)	5	4	7	6
cohors Gamasina				
family Ascidae				
Aceoseius muricatus (C. L. Koch, 1839)	1	1	4	3
Arctoseius eremitus (Berlese, 1918)	-	-	1	1
Arctoseius venustulus (Berlese, 1916)	-	-	1	1
Leioseius bicolor (Berlese, 1918)	1	1	-	-
Leioseius minusculus (Berlese, 1905)	-	-	1	1
Zerconopsis remiger (Kramer, 1876)	20	9	17	12
family Eviphididae				
Eviphis ostrinus (C. L. Koch, 1836)	-	-	35	15
family Laelapidae				
Eulaelaps stabularis (C. L. Koch, 1836)	2	1	1	1
Haemogamasus nidi Michael, 1892	1	1	6	1
Hypoaspis aculeifer G. Canestrini, 1884	1	1	2	1
Hypoaspis brevipilis Hirschmann, 1969	4	2	6	5
Hypoaspis imitata Reitblat, 1963	-	-	1	1
Hypoaspis oblonga (Halbert, 1915)	-	-	4	2
Hypoaspis praesternalis Willmann, 1949	-	-	1	1
Hypoaspis vacua (Michael, 1891)	10	7	33	15
Hypoaspis spp.	3	3	8	3
family Macrochelidae				
Geholaspis longispinosus (Kramer, 1876)	255	32	159	29
Geholaspis mandibularis (Berlese, 1904)	2	2	1	1
Macrocheles glaber (J. Müller, 1859)	3	3	4	2
Macrocheles montanus Willmann, 1951	90	23	115	26
family Macronyssidae				
Ornithonyssus sylviarum (Canestrini et Fanzago, 1877)	1	1	-	-
family Pachylaelapidae				
Olopachys suecicus Sellnick, 1950	38	15	61	15
Pachylaelaps magnus (Halbert, 1915)	1	1	1	1
Pachylaelaps resinae Karg, 1971	23	6	8	6
Pachylaelaps spp.	10	8	52	14
Pachyseius humeralis Berlese, 1910	4	2	23	9
family Parasitidae				
Amblygamasus sp.	33	7	152	27
Eugamasus monticolus Berlese, 1905	-	-	2	2

Table 1. (Continued)

Study sites / MITES	Lošonský háj grove N	Lošonský háj grove PS	Lošonec-lom quarry N	Lošonec-lom quarry PS
Holoparasitus calcaratus (C. L. Koch, 1839)	420	33	514	34
Holoparasitus sp.	1	1	3	3
Leptogamasus succineus Witaliński, 1973	-	-	13	4
Leptogamasus spp.	253	30	293	25
Parasitus fimetorum (Berlese, 1903)	1	1	-	-
Pergamasus barbarus Berlese, 1904	367	30	74	22
Pergamasus brevicornis (Berlese, 1903)	13	5	4	2
Pergamasus canestrinii (Berlese, 1884)	21	1	-	-
Pergamasus crassipes (Linnaeus, 1758) sensu Berlese, 1906	1	1	40	9
Pergamasus mediocris (Berlese, 1904)	74	21	34	12
Pergamasus ruhmi Willmann, 1938	2	1	26	8
Poecilochirus carabi G. et R. Canestrini, 1882	-	-	9	2
Porrhostaspis lunulata J. Müller, 1869	70	23	1	1
Vulgarogamasus kraepelini (Berlese, 1904)	432	31	650	31
Vulgarogamasus remberti (Oudemans, 1912)	8	1	2	1
family Rhodacaridae				
Cyrtolaelaps chiropterae Karg, 1971	-	-	1	1
Cyrtolaelaps mucronatus (G. et R. Canestrini, 1881)	-	-	3	2
Rhodacarus spp.	26	2	-	-
Sessiluncus hungaricus Karg, 1964	-	-	2	1
Stylochirus fimetarius (J. Müller, 1859) sensu Mašán et Kalúz, 2001	-	-	1	1
family Veigaiaidae				
Veigaia cerva (Kramer, 1876)	21	8	31	12
Veigaia exigua (Berlese, 1917)	16	1	-	-
Veigaia kochi (Trägårdh, 1901)	2	2	-	-
Veigaia nemorensis (C. L. Koch, 1839)	522	29	508	29
Veigaia transisalae (Oudemans, 1902)	-	-	5	1
family Zerconidae				
Prozercon carpathofimbriatus Mašán et Fenďa, 2004	86	5	5	3
Prozercon tragardhi (Halbert, 1923)	-	-	1	1
Zercon curiosus Trägårdh, 1910	5	5	12	4
Zercon hungaricus Sellnick, 1958	120	20	262	29
Zercon peltatus var. *peltatus* C. L. Koch, 1836	455	31	27	14
Zercon vacuus C. L. Koch, 1839	3	2	10	5
cohors Sejina				
family Sejidae				
Sejus togatus C. L. Koch, 1836	20	8	81	21
family Uropodellidae				
Asternolaelaps sp.	-	-	2	2
cohors Uropodina				
family Polyaspidae				
Polyaspinus schweizeri (Huţu, 1976)	8	7	3	2
Polyaspis patavinus Berlese, 1881	1	1	13	9
family Trachytidae				
Trachytes aegrota (C. L. Koch, 1841)	99	6	9	7
Trachytes baloghi Hirschmann et Zirngiebl-Nicol, 1969	3	3	7	4
family Trematuridae				
Trichouropoda elegans (Kramer, 1882)	-	-	3	3
Trichouropoda karawaiewi (Berlese, 1904)	1	1	-	-

T a b l e 1. (Continued)

Study sites / MITES	Lošonský háj grove N	Lošonský háj grove PS	Lošonec–lom quarry N	Lošonec–lom quarry PS
Trichouropoda obscurasimilis H i r s c h m a n n et Z i r n g i e b l–N i c o l, 1961	49	17	9	7
Trichouropoda orbicularis (C. L. K o c h, 1839)	3	1	-	-
Trichouropoda ovalis (C. L. K o c h, 1839)	336	26	277	29
Trichouropoda penicillata H i r s c h m a n n et Z i r n g i e b l–N i c o l, 1961	-	-	4	2
family Urodinychidae				
Dinychus bincheaecarinatus H i r s c h m a n n, W a g r o w s k a–A d a m c z y k et Z i r n g i e b l–N i c o l, 1984	9	2	3	3
Dinychus perforatus K r a m e r, 1886	2	1	21	7
Urodiaspis tecta (K r a m e r, 1876)	92	14	19	9
Uroobovella pulchella (B e r l e s e, 1904)	-	-	1	1
family Uropodidae				
Uropoda misella (B e r l e s e, 1916)	4	1	-	-
Uropoda orbicularis (O. F. M ü l l e r, 1776)	4	2	-	-
Uropoda splendida K r a m e r, 1882	267	28	16	8
Total individuals / samples	4325	36	3705	36
H'	2.92		2.84	
N0	54		64	
N1	1.07		1.04	
N2	1.37		10.87	
E1	0.72		0.67	

Notes: N – number of specimens, PS – number of positive samples, N0 – number of species, N1 – $e^{H'}$ (H' is Shannon's index), N2 – 1/λ (λ is Simpson's index), E1 – Pielou's evenness index

In addition, in the site Lošonec–lom quarry there were also taken soil samples of wet soil from the bank of the creek inside the forest. Only in these samples were detected species *Cheiroseius longipes* (W i l l m a n n, 1951), *Ch. salicorniae* (W i l l m a n n, 1949) and *Plesiosejus major* (H a l b e r t, 1923), all hygrophilous species from the family Ascidae, *Macrocheles carpathicus* M a š á n, 2003 and *M. tardus* (C. L. K o c h, 1841) sensu H y a t t et E m b e r s o n, 1988 from the family Macrochelidae. There was recorded also high number of larval and nymphal stages of big long–legged predators (especially *Pergamasus barbarus*), that were not recorded by sifting in the drier parts of forest.

In the forest soil the eudominant species were *Holoparasitus calcaratus* (LL 13.9), *Veigaia nemorensis* (LL 13.7, LH 12.1), *Vulgarogamasus kraepelini* (LL 17.5), and *Zercon peltatus* var. *peltatus* (LH 10.5); the dominant species were *Trichouropoda ovalis* (LL 7.5, LH 7.8), *Zercon hungaricus* (LL 7.1), *Geholaspis longispinosus* (LH 5.9), *Holoparasitus calcaratus* (LH 9.7), *Pergamasus barbarus* (LH 8.5), *Uropoda splendida* (LH 6.2), and *Vulgarogamasus kraepelini* (LH 9.9). The euconstant species were *Geholaspis longispinosus* (LL 80.5, LH 88.9), *Holoparasitus calcaratus* (LL 94.4, LH 91.7), *Trichouropoda ovalis* (LL 80.5), *Veigaia nemorensis* (LL 80.5, LH 80.6), *Vulgarogamasus kraepelini* (LL 86.1, LH 86.1), *Zercon hungaricus* (LL 80.5), *Pergamasus barbarus* (LH 83.3), *Uropoda splendida* (LH 77.8), and *Zercon peltatus* var. *peltatus* (LH 86.1); the constant species were *Sejus togatus* (LL 58.3), *Pergamasus barbarus* (LL 61.1), *Macrocheles montanus* (LL 72.2, LH 63.9), *Pergamasus mediocris* (LH 58.3), *Porrhostaspis lunulata* (LH 63.9), *Trichouropoda ovalis* (LH 72.2), and *Zercon hungaricus* (LH 55.6). All these species are widely distributed in Slovakia.

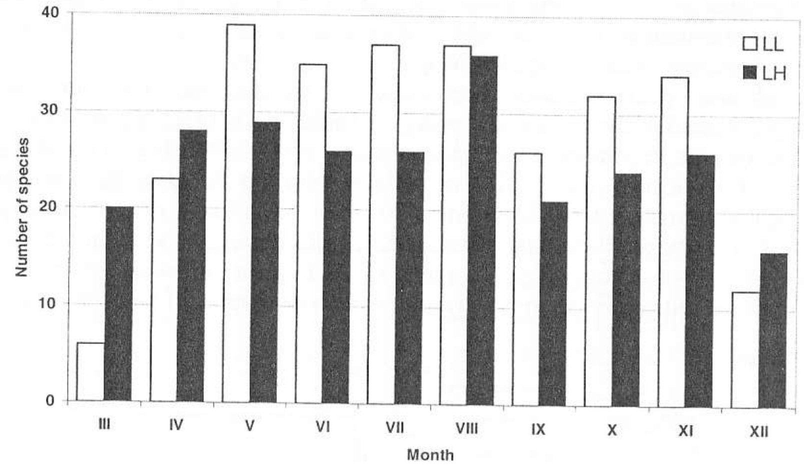

Fig. 1. Species richness of mites in both study sites during years 1999–2002. Abbreviations of study sites see in chapter "Study area". Note: Lošonský háj LH, Lošonec–lom LL.

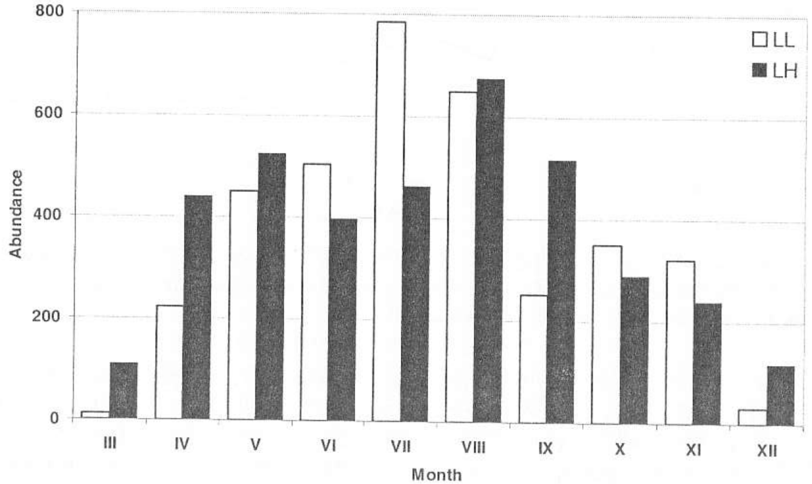

Fig. 2. Abundance of mites in both study sites during years 1999–2002. Abbreviations of study sites see in chapter "Study area". Note: Lošonský háj LH, Lošonec–lom LL.

The abundant species have two patterns of seasonal dynamics. The first pattern has first maximum in spring (April–May) and the second one in summer months (July–August) in LH site and only one maximum in summer (August) in LL site (e.g. species *Geholaspis longispinosus*, *Holoparasitus calcaratus*, *Pergamasus barbarus*, and *Veigaia nemorensis*). The second pattern has only one spring maximum (April–May) in LH site, and one summer maximum (July–August) in LL site (e.g. species *Macrocheles montanus*, *Vulgarogamasus kraepelini*) (Fig. 3).

Although the species richness was higher in the LL site, the more balanced community occurred in the LH site (E1 = 0.717, Table 1). That fact is confirmed also by differences of species richness during the years 1999–2002 (Fig. 1) and also by differences of abundance (Fig. 2). The mite communities in the study site Lošonec–lom quarry regularly impacted by limestone dust from the nearby quarry show greater fluctuations in species richness and abundance of mites during the year. In the study site Lošonský háj grove Nature Reserve there is an evident influence of more stable microclimatic conditions in the forest (with maximum abundance of mites in August).

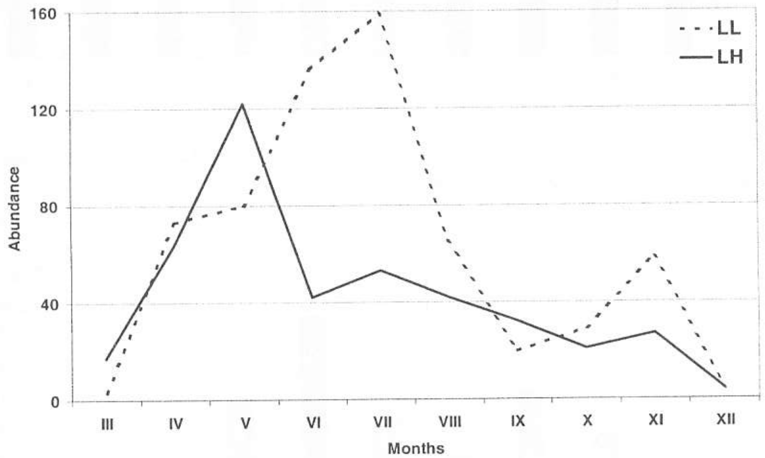

Fig. 3. Abundance of species *Vulgarogamasus kraepelini* in both study sites during years 1999–2002. Abbreviations of study sites see in chapter "Study area". Note: Lošonský háj LH, Lošonec–lom LL.

The species *Eviphis ostrinus* occurred only in Lošonec–lom quarry (dominance 0.9, constancy 41.7). Also species *Asternolaelaps* sp., *Eugamasus monticolus*, *Leptogamasus succineus*, *Trichouropoda elegans*, *T. penicillata*, and *Veigaia transisalae* were recorded only in LL site. Some other species occurred in both sites, but they evidently preferred the conditions in Lošonec–lom quarry: *Dinychus perforatus*, *Hypoaspis vacua*, *Pachyseius humeralis*, *Polyaspis patavinus*, and *Sejus togatus*. It is possible, that the above-mentioned species prefer the neutral value (pH = 6.74) of the upper soil horizon in the study site Lošonec–lom quarry, in comparison with pH = 4.29 in Lošonský háj grove Nature Reserve (Zlinská et al., 2005).

On the other hand, some species preferred the LH site: *Polyaspinus schweizeri*, *Porrhostaspis lunulata* (LH dominance 1.6, constancy 63.9 vs. LL dominance 0.03, constancy 2.8), *Trichouropoda obscurasimilis* (LH dominance 1.1, constancy 47.2 vs. LL dominance 0.2, constancy 16.4), *Veigaia exigua*, and *V. kochi*.

The comparison of mite communities in consecutive years through hierarchical clustering (Fig. 4) shows an interesting fact, that the most important factor to form species composition and abundance of soil Mesostigmata seems to be the climatic conditions. The most similarities are between different study sites in the same year (Fig. 4), not between the same study sites. It appears from this that the temperature and air humidity have greater influence on mesostigmatid mite assemblages than the type of soil and vegetation (Zlinská et al., 2005).

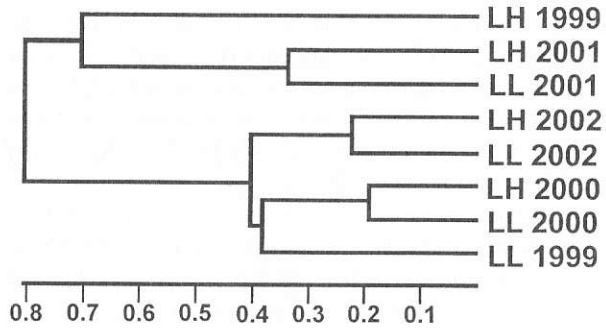

Fig. 4. Dendrogram of mite communities in study sites (Wishart's index). Abbreviations of study sites in chapter "Study area".

Discussion

In Central Europe there are not comparable data from oak or oak-hornbeam forests. The data about human impact on soil mites are known mainly from Poland (Seniczak et al., 1996, 1997, 2002). The concentration of phosphorus and fluorine generally reduced the density of mites and species number of Oribatida and Gamasida (Seniczak et al., 1996), similarly a high concentration of heavy metals greatly reduced the density and species richness of mites. A high concentration of nitrogen pollution reduced slightly the density of mites in all soil horizons (Seniczak et al., 2002). We do not observe shining differences between the study site Lošonec–lom quarry, regularly impacted by limestone dust imissions close to the quarry, and the Nature Reserve Lošonský háj grove. Also the fauna of centipedes (Chilopoda) on both study sites was similar with value 70% (Országh, Országhová, 2005). On the contrary, in Poland a pollution by a cement and lime factory corresponded with lower density and species number of Oribatida and Gamasida (Seniczak et al., 1997). For example in the study sites LL and LH the earwig

Chelidura acanthopygia (Dermaptera) responded to the limestone dust caused the neutral value (pH = 6.74) of the upper soil horizon (Országh, 2005).

Clearly the age of forest, presence of dead wood and deep layer of leaf litter in the forest, pedological characteristics like pH or content of humus are important factors for mite assemblages. A long–term investigation of the soil fauna in the littoral zone of the Jakubovské rybníky fishponds on a blown sand area in the southwestern Slovakia, where the leaf litter, humus layer or dead wood completely absent, shows comparable fauna (H' = 2.974, N0 = 106, N1 = 19.57, N2 = 9.901, E1 = 0.634) like in oak forests in the Malé Karpaty Mts (Fenďa, Schniererová, 2005). The fauna of mesostigmatid mites of oak forests in Slovakia is not markedly rich, humidity is probably one of the most important factors for the species richness and abundance of mesostigmatid mites. The study site Lošonský háj grove Nature Reserve has more balanced mite community, there are more stable microclimatic conditions. The deep layer of leaf litter is able to keep the humidity for a long time. The highest diversity of centipedes (Chilopoda) in the Malé Karpaty Mts was observed just in Lošonský háj grove Nature Reserve (Országh, Országhová, 2005). The study site Lošonec–lom quarry is drier, for example the lower abundance of hygrophilous weevils (Coleoptera, Curculionidae) in the Malé Karpaty Mts was detected just in the study site LL (Holecová et al., 2005).

From the faunistical point of view, *Pergamasus canestrinii* was recorded for the first time in Slovakia. The species *Sessiluncus hungaricus*, *Trachytes baloghi*, *Trichouropoda elegans*, *T. penicillata*, *Zercon hungaricus*, and probably also *Pergamasus ruhmi* are typical thermophilic species in Slovakia. Moreover, the species *Zercon vacuus* is a typical element of forest litter of western Slovakia (Mašán, Fenďa, 2004).

Translated by P. Fenďa

Acknowledgement

Our thanks belong to M. Holecová and I. Országh for collecting material in field. The research was supported by VEGA (Scientific Grant Agency of the Ministry of Education and the Slovak Academy of Sciences), grant No. 1/0119/03.

References

Ambros, M., 1984: The fauna of mites (Acari: Mesostigmata) on the small mammals of the Záhorská nížina lowland and the Malé Karpaty Mts (in Slovak). Acta Rerum Naturalium Musei Nationalis Slovaci, *30*, p. 87–102.

Ambros, M., Krištofík, J., Šustek, Z., 1992: The mites (Acari, Mesostigmata) in the birds nests' in Slovakia. Biologia, Bratislava, *47*, p. 369–381.

Balogh, J., 1958: Lebensgemeinschaften der Landtiere. Akadémiai Kiadó, Akademie–Verlag, Budapest, Berlin, 560 pp.

Fenďa, P., Schniererová, E., 2005: Mites (Acarina, Gamasida) in littoral zone of Jakubov fishponds (Slovakia). In Tajovský, K., Schlaghamerský, J., Pižl, V. (eds): Contributions to Soil Zoology in Central Europe I. ISB AS CR, České Budějovice, p. 9–14.

Holecová, M., Némethová, D., Kúdela, M., 2005: Structure and function of weevil assemblages (Coleoptera, Curculionoidea) in epigeon of oak-hornbeam forests in SW Slovakia. Ekológia (Bratislava), *24*, Suppl. 2, p. 179–204.

Hyatt, K.H., Emberson, R.M., 1988: A review of the Macrochelidae (Acari: Mesostigmata) of the British Isles. Bull. Br. Mus. (Nat. Hist.) Zool., *54*, p. 63–125.

Kalúz, S., 2005: Soil mites (Acarina) (in Slovak). In Majzlan, O. (ed.): Fauna Devínskej Kobyly. APOP edícia, Bratislava, p. 44–55.

Kalúz, S., Fenďa, P., 2005: Mites (Acari, Mesostigmata) of the family Ascidae of Slovakia. Institute of Zoology, Slovak Academy of Sciences, NOI Press, Bratislava, 168 pp.

Karg, W., 1993: Acari (Acarina), Milben. Parasitiformes (Anactinochaeta) Cohors Gamasina, Leach, Raubmilben. (Die Tierwelt Deutschlands 59). Gustav Fischer Verlag, Jena–Stuttgart–New York, 523 pp.

Ludwig, J.A., Reynolds, J., 1988: Diversity indices. In Statistical Ecology. Whilley–Interscience Public, New York, p. 85–103.

Mašán, P., Kalúz, S., Babjaková, A., 1994: Mites (Acarina) from the winter nests of the common mole (*Talpa europaea* L.) in south Slovakia. Biologia, Bratislava, *49*, p. 667–673.

Mašán, P., 1999: Mites (Acarina) associated with burying and carrion beetles (Coleoptera, Silphidae) and description of *Poecilochirus mrciaki* sp.n. (Mesostigmata, Gamasina). Biologia, Bratislava, *54*, p. 515–524.

Mašán, P., Kalúz, S., 2001: The adult stages of *Stylochirus fimetarius* (Acari, Mesostigmata) and new systematic status of the genus *Iphidosoma*. Biologia, Bratislava, *56*, p. 483–488.

Mašán, P., 2001a: Mites of the cohors Uropodina (Acarina, Mesostigmata) in Slovakia (in Slovak). Annotationes Zoologicae et Botanicae (Bratislava), *223*, p. 1–320.

Mašán, P., 2001b: First records of mesostigmatid mite species (Acarina) in Slovakia. Biologia (Bratislava), *56*, p. 216–218.

Mašán, P., 2003: Macrochelid mites of Slovakia (Acari, Mesostigmata, Macrochelidae). Institute of Zoology, Slovak Academy of Sciences, NOI Press, Bratislava, 149 pp.

Mašán, P., Fenďa, P., 2004: Zerconid mites of Slovakia (Acari, Mesostigmata, Zerconidae). Institute of Zoology, Slovak Academy of Sciences, NOI Press, Bratislava, 238 pp.

Nosek, J., Lichard, M., 1962: Beitrag zur Kenntnis der Vogelnestfauna. Entomologické Problémy (Bratislava), *2*, p. 29–51.

Országh, I., 2005: Phenology of *Chelidura acanthopygia* (Dermaptera: Forficulidae) larval instars in oak-hornbeam forests of the Malé Karpaty Mts and Trnavská pahorkatina hills (SW Slovakia). Ekológia (Bratislava), *24*, Suppl. 2, p. 152–160.

Országh, I., Országhová, Z., 2005: Structure of centipede communities (Antennata: Chilopoda) in oak-hornbeam forests of the Malé Karpaty Mts and Trnavská pahorkatina hills (SW Slovakia). Ekológia (Bratislava), *24*, Suppl. 2, p. 124–142.

Podani, J. 1988. Syn–tax III user's manual. Abstracta Botanica, Suppl. 1, p. 1–183.

Seniczak, S., Dabrowski, J., Klimek, A., Kaczmarek, S., 1996: The mites (Acari) associated with young Scots pine forests polluted by a chemical factory Lubon near Poznan. Bulletin de l'Académie Polonaise des Sciences (Série des Sciences Biologiques), *44*, p. 101–104.

Seniczak, S., Dabrowski, J., Klimek, A., Kaczmarek, S., 1997: Effect of pollution produced by a cement and lime factory Kujawy on mites (Acari) associated with young scots pine forests in Bielawy, Poland. Bulletin de l'Académie Polonaise des Sciences (Série des Sciences Biologiques), *45*, p. 1–6.

Seniczak, S., Kaczmarek, S., Klimek, A., Seniczak, A., 2002: The effect of some air pollutants on the vertical distribution of mites (Acari) in soils of young Scots pine forests in Poland. European Journal of Soil Biology, *38*, p. 311–314.

Schwerdtfeger, F., 1975: Ökologie der Tiere. Band III – Synökologie. Verlag Paul Parey, Hamburg – Berlin, 451 pp.

Tischler, W., 1949: Grundzüge der Terrestrischen Tierökologie. Friedrich Vieweg, Braunschweig, 219 pp.

Zlinská, J., Šomšák, L., Holecová, M., 2005: Ecological characteristics of studied forest communities of an oak-hornbeam tier in SW Slovakia. Ekológia (Bratislava), *24*, Suppl. 2, p. 3–19.

Received 30. 7. 2005

Fenďa P., Ciceková J.: **Pôdne roztoče** (Acari, Mesostigmata) **dubových lesov Malých Karpát (Západné Slovensko).**

V rokoch 1999–2002 sme uskutočnili výskum mesostigmátnych roztočov v dvoch dubovo-hrabových lesoch Malých Karpát. Zistili sme 75 druhov patriacich do štyroch kohort (Antennophorina, Gamasina, Sejina, Uropodina). Spoločenstvá roztočov na lokalite Lošonec-lom ovplyvnenej vápenným prachom z neďalekého lomu vykazovali väčšie výkyvy v počte druhov a v početnosti počas roka. V prírodnej rezervácii Lošonský háj je zreteľný vplyv stabilnejších mikroklimatických podmienok v lese. Porovnaním spoločenstiev pôdnych roztočov v jednotlivých rokoch na študovaných lokalitách sa ukázalo, že teplota a vzdušná vlhkosť majú na druhovú skladbu a početnosť mesostigmátnych roztočov väčší vplyv ako typ pôdy, pH a vegetácie. Z faunistického hľadiska sme zaznamenali prvý nález druhu *Pergamasus canestrinii* pre územie Slovenska.

COMMUNITIES OF TERRESTRIAL ISOPODS (Crustacea: Isopoda: Oniscidea) IN EPIGEON OF OAK-HORNBEAM FORESTS OF SW SLOVAKIA

IVAN H. TUF, JANA TUFOVÁ

Department of Ecology and Environmental Science, Faculty of Science, Palacký University, Svobody 26, 772 00 Olomouc, The Czech Republic, e-mail: tuf@prfnw.upol.cz

Abstract

Tuf I.H., Tufová J.: Communities of terrestrial isopods (Crustacea: Isopoda: Oniscidea) in epigeon of oak-hornbeam forests of SW Slovakia. Ekológia (Bratislava), Vol. 24, Supplement 2/2005, p. 113–123.

Terrestrial isopods were studied in 10 oak-hornbeam forests in the Malé Karpaty Mts and in their vicinity. In total, seven species were recorded. Individual communities consisted from one to six species, *Protracheoniscus politus* and *Porcellium collicola* dominated in most of the studied sites. Beside the age of forest growth, the soil type and pH seems to be important environmental factors affecting the species richness of isopod communities.

Key words: Oniscidea, terrestrial isopods, Malé Karpaty Mts, Slovakia

Introduction

Terrestrial isopods (Crustacea: Isopoda: Oniscidea) represent one of the main groups of soil macrofauna importantly participated in soil-forming processes. They mechanically destroy dead leaves and others plant rests, they stir anorganic particles with fragments of dead organic matter and enhance thus surfaces of organic matter accessible for soil microorganisms (Hassall et al., 1987; Zimmer et al., 2005). Isopods are decomposers of animal carrions, too (Grassberger, Frank, 2004). On the other hands, together with millipedes play important role in food web as an source of calcium for insectivorous birds and other animals (Graveland, Vangijzen, 1994).

In SW Slovakia, the terrestrial isopods were studied by Gulička (1960) in the Svätojurský Šúr within the investigation of ecological consequences of changes of water regime and soil macrofauna. Population ecology and biology of terrestrial isopods were studied in the same site in the seventies by Krumpál (1973, 1976). A detail inventory of terrestrial isopod fauna was done in the Malé Karpaty Protected Landscape Area by Flasarová (Flasarová, 1980, 1986; Flasar, Flasarová, 1989).