The soil fauna in the birds' nests in Slovakia

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In the years 1981-1995 we studied the invertebrates communities in the birds' nests from the territory of Slovakia. Into presented work we arranged material from 301 nests from point of view of the occurrence of edaphic or epigeic fauna. Qualitatively and quantitatively the richest material of mesostigmatic mites was acquired from the nests found on the ground, while in the nests under synanthropic conditions the soil mites absent at all. Species *Asternolaelaps fecundus* was found to be new for the fauna of Slovakia. Only 6 species of pseudoscorpions considered to soil inhabitants and their quantitatively representation was very low (only 27 specimens). The woodlices were represented in nests even less numerous. The woodlices were relatively abundant in the nests situated on the ground.

Keywords: Acarina, birds nests, Oniscidea, Pseudoscorpiones.

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Introduction

In the communities of nidifauna of various types of hosts often play an important role members or whole groups of soil or epigeic fauna. Some non-parasitic mites called nidicolous species (also extrasomatic species), can be part of soil stratocenosis. Mašán and Krištofík (1993) divided soil mesostigmatic mites in the nests into two groups – nidicolous species with the topic relation to some types of bird nests (they find there favourable microclimatic conditions for their reproduction and development) and the group of soil mites s. str., who have not any topic or trophic relation to their host. This division seems to be too rough and do not responsible for reality. This fact wake us to execute the part of obtained nest material from this point of view.

Material and methods

The material was obtained from 301 nests of birds from the territory of Slovakia. During the years 1981-1995 mites from 250 nests of 49 bird's species (63 localities) were studied. We used standard methods of collection - the interior of nests or whole nests were transported in plastic polyethylene bags. The material was extracted from the nests and conserved 70% ethylalcohol solution by the thermoeclectors with a 40W light bulb as a heat source during 48 hours. The mites were processed to yield microscopic preparations using the chloralhydrate medium Liquid de Swan. We used nomenclature of mites according Karg (1989, 1993). In the evaluation of the material we used the term abundance (mean number of mites per one nest) and

dominance (the percentage of species occurrence).

Results

From the nests of 17 species of hosts we obtained 237 individuals of Oniscidea, belonging to 17 species (Table 1). All detected species practically belonging to edaphic or epigeic species. Further we found out 1254 individuals of Pseudoscorpiones belonging to 19 species in nests of 54 species of hosts or their combinations. But there are different results - only six species practically belong to the edaphic or epigeic species (*Chthonius tetrachelatus, Chthonius* sp., *Neobisium crassifemoratum, Neobisium inaequale, Neobisium carcinoides* and *Neobisum* sp.). The others can be frequently found in soil too, but they are not the typical soil inhabitants. From material we obtained 33 113 individuals of Acarina. The mites was occured in 86% of nests, the mites from group Mesostigmata was found in 61% of them. We found out 99 species and 81 species of them belong to members of soil fauna.

Except mentioned invertebrate groups we found members of soil fauna in other groups too: 52 species of Araneae (from 108 species found in nests), 1 species of Dermaptera (*Labidura riparia*), more than 150 species of Coleoptera (from 358 species found in nests). The members of soil fauna are certainly in the reach material of Collembola too, and also among the members of another groups obtained from birds' nests (Diplopoda, Chilopoda, Symphylla, Diplura, Acarina-Oribatei).

Oniscidea

The most abundant species of this rarely group in the nests was *Hyloniscus riparius* (43,5%). Besides him was more abundant another three species - *Trachelipus rathkei* (13,5%), *Porcellium conspersum* (11%) and *Trachelipus wächtleri* (10,1%). The most of species was found in one to three nests, only species *T. rathkei* in 7 nests and *T. wächtleri* in 7 nests. Oniscidea was found in the nests of 17 hosts or their combinations (Table 1). They were dominant in the nests situated on the ground surface, relative frequent they were in the nests from hollows in the ground, but their abundance was not high. Their occurrence in the nests in cavities and in the free nests above the ground was accidental.

Pseudoscorpiones

Among soil inhabitants from this group was the most abundant species *Neobisium muscorum* and juveniles of the genus *Neobisum* sp. Another four species was accidental in the nests (Table 2). Totally we found only 27 individuals of soil species (2,2% of Pseudoscorpiones). The most of them were represented by immature stages. The soil species of Pseudoscorpiones do not prefer nest environment, like for example *Chelifer cancroides, Dactylochelifer latreillei, Cheiridium museorum* and *Dendrochernes cyrneus* respectively.

Noticeable is the fact, that they basically absent in the nests of *Riparia riparia* (nests from hollows in the ground).

Mesostigmata

The most abundant species of soil mites (in whole material they was subdominant species) were *Parasitus consanguineus, Hypoaspis aculeifer* and *Parasitus fimetorum*. The values of dominance more than 1 had another three species only (*Macrocheles rotundiscutis, Lasioseius confusus* and *Hypoaspis lubrica*).

The nests situated on the ground surface displayed qualitatively and quantitatively the richest fauna of mesostigmatic mites (52 species). The abundance of soil mites (average 72,96 per nest) was supreme from all examined nests. In the table we do not mention the hosts where we found the parasitic mites only. The soil mites formed a great part – from 84,6 to 100% of all mites in the nests (Table 3).

In the nests from nestling boxes and cavities the portion of soil mites from the total

number of mites fluctuated from 2,63 to 74,14% (Table 4). We found 34 species with average value of abundance 4,67. In the table we do not mention hosts, where we found parasitic species only. The find of *Asternolaelaps fecundus* from natural cavity in natural reserve Šúr near Svätý Jur is the first find for Slovak territory. The data about the occurrence of *A.fecundus* are unknown from the surrounding states, existing known findings coming from Italy and Sweden (Evans, 1954).

In the free nests above the ground was the portion of soil species from the total number of mites considerable unbalanced, it fluctuates from 2,99 to 100% (Table 5), while in the number of nests the mites absent at all. In this type of nests we found 18 species of soil mites with average value of abundance 7,62. We make not a mention of hosts without mites and hosts, where absent the soil mites.

In synantropic nests (situated on man-built objects) of hosts *Hirundo rustica* (4 nests), *Delichon urbica* (15 nests), *Phoenicurus* sp. (2 nests) and *Phoenicurus ochruros* (1 nest) soil species of mites absent at all.

Discussion

In the winter we noticed the elimination of temporary and accidental inhabitants of the nests, their fauna is anually restored with nest material in the time of nest building, phoretic ones on the feathers of the birds, together with food or like a result of phoresy on insects. The result of this process is occurrence of typical soil mites in nests. Their species composition depend on specific localities, where the nests are situated and where the birds looking for food (Yakimenko et al., 1990). The nests situated on the ground surface had qualitatively and quantitatively the richest fauna, what is probably a result of narrow contact with fauna of surroundings. In the free nests above the ground unbalanced values of abundance arose probably thanks the fact, that the open nests are more influenced by surrounding environment. Noticeable is the fact, that members of soil fauna absent in the synanthropic nests.

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Table 1. Abundance of Oniscidea in the bird's nests in Slovakia.
Aca - *Acrocephalus arundinaceus*, **Anp** - *Anas platyrhynchos*, **Ant** - *Anthus trivialis*, **Cef** - *Certhia familiaris*, **Cic** - *Cinclus cinclus*, **Fia+Mua** - *Ficedula albicollis* + *Muscardinus avellanarius*, **La** - typ *Lanius*, **Mo** - typ *Motacilla*, **Mua** - *Muscardinus avellanarius*, **Pam** - *Parus montanus*, **Psm** - *Passer montanus*, **Phc** - *Phylloscopus collybitta*, **Prm** - *Prunella modularis*, **Rir** - *Riparia riparia*, **Trt** - *Troglodytes troglodytes*, **Tup** - *Turdus philomelos*, **Tu** -*Turdus* sp.

	Aca	**Anp**	**Ant**	**Cef**	**Cic**	**Fia+ Mua**	**La**	**Mo**	**Mua**	**Pam**	**Psm**	**Phc**	**Prm**	**Rir**	**Trt**	**Tup**	**Tu**	Total
Number of nests	1	1	1	1	1	1	1	1	1	1	3	2	2	10	1	2	3	35
Armadillidium versicolor quinqueseriatum											0.33			0.2				0.09
Armadillidium vulgare		13												0.2				0.43
Armadillidium zenckeri											0.33							0.03
Cylisticus convexus																	0.33	0.03
Hyloniscus riparius												50.5				1		2.94
Lepidoniscus minutus			1	1													2	0.23
Metoponorthus pruinosus														0.6				0.17
Porcellio scaber													1.5					0.09
Porcellium collicolum							4				0.33							0.14
Porcellium conspersum									21			2.5						0.74
Protracheoniscus politus			1					1										0.06
Trachelipus rathkei	1	9									0.67	8		0.1	3			0.91
Trachelipus ratzeburgi																1.5		0.09
Trachelipus wächtleri	2					1				13			3	0.1			0.33	0.69
Trachelipus sp.	2																	0.06
Trichoniscus pusillus					3													0.09
Total	5	22	2	1	3	1	4	1	21	13	1.7	62	4.5	1.2	3	2.5	2.7	

Table 2. Abundance of Pseudoscorpiones in the bird's nests in Slovakia.
Lum - *Luscinia megarhynchos*, **Teu** - *Tetrao urogalus*, **Emc** - *Emberiza citrinella*. Other abbreviations see Table 1.

	Anp	**Rir**	**Mo**	**Trt**	**Cic**	**Cic+ Mo**	**Lum**	**Teu**	**Ant**	**Emc**	Total
Number of nests	1	1	1	1	1	1	1	1	1	1	11
Chthonius tetrachelatus	2										0.18
Chthonius sp.							2				0.18
Neobisium carcinoides			7	1	1	4					1.18
Neobisium crassifemoratum								1			0.09
Neobisium inaequale			1								0.09
Neobisium sp.		1					3		1	2	0.64
Total	2	1	8	1	1	4	5	1	1	2	

Table 3. Abundance of Mesostigmata in the nests on ground surface in Slovakia.
Ana - *Anser anser*, **Vav** - *Vanellus vanellus*, **Pop** - *Porzana parva*, **Pht** - *Phylloscopus trochilus*. Other abbreviations see Table 2.

	Anp	**Ana**	**Vav**	**Pop**	**Pht**	**Emc**	Total
Number of nests	17	2	1	1	1	2	26
Iphidosoma fimetarium	0.18						0.12
Alliphis siculus	0.59	11	72			2	4.15
Holostaspella subornata	0.24						0.15
Macrocheles americana			19				0.73
Macrocheles glaber		2	13				0.65
Macrocheles montanus		4					0.31
Macrocheles punctoscutatus	0.24						0.15
Macrocheles rotundiscutis	13.06						8.54
Olopachys suecicus	0.06						0.04
Pachylaelaps pectinifer		1					0.08
Pseudoparasitus placentulus	0.18						0.12
Pseudoparasitus sellnicki	0.12						0.08
Hypoaspis aculeifer	23.18	0.5					15.19
Hypoaspis astronomica	0.06						0.04
Hypoaspis miles	0.24						0.15
Hypoaspis praesternalis	2.82						1.85
Hypoaspis vacua	1.12						0.73
Proctolaelaps pygmaeus	0.24						0.15
Ameroseius corbiculus	0.12	2					0.23
Ameroseius lidiae				1			0.04
Epicriopsis horridus	0.12						0.08
Lasioseius confusus		1.5		179			7
Cheiroseius cassiteridium				14			0.54
Arctoseius semiscissus				8			0.31
Leioseius minusculus				2			0.08
Digamasellus punctum			5				0.19
Dendrolaelaspis angulosus	0.06						0.04

Table 3. Continuation.

	Anp	**Ana**	**Vav**	**Pop**	**Pht**	**Emc**	Total
Number of nests	17	2	1	1	1	2	26
Punctodendrolaelaps fallax			1				0.04
Punctodendrolaelaps strenzkei	0.35						0.23
Cyrtolaelaps mucronatus	0.06						0.04
Pergamasus brevicornis	0.06						0.04
Pergamasus crassipes	3.29	4				0.5	2.5
Lysigamasus vagabundus	7.59	2.5					5.15
Gamasodes spiniger	0.53						0.35
Vulgarogamasus oudemansi	0.12						0.08
Parasitus beta		9.5					0.73
Parasitus coleoptratorum		2	17				0.81
Parasitus consanguineus					1	0.5	0.08
Parasitus fimetorum	13.94	16	71				13.08
Parasitus hyalinus			4				0.15
Parasitus loricatus		1					0.08
Cornigamasus lunaris	1.47						0.96
Veigaia kochi	0.18						0.12
Veigaia nemorensis	2.82	12.5					2.81
Trachytes aegrota		0.5					0.04
Uroseius sp.	0.18						0.12
Uroseius cylindricus						1.5	0.12
Trichouropoda orbicularis	0.12						0.08
Trichouropoda ovalis	0.12						0.08
Nenteria sp.	1.12						0.73
Nenteria breviunguiculata	1.06					0.5	0.73
Dinychus inermis	0.59					0.5	0.42
Uroobovella nova			15				0.58
Uropoda orbicularis	1.47	2					1.12
Total	77.7	72	217	204	1	5.5	
Portion of soil species (%)	86.39	97.96	99.09	100	100	84.62	

Table 4. Abundance of Mesostigmata in the nests from nestling boxes and cavities.
Pa - *Parus* sp., **Pmj** - *Parus major*, **Pca** - *Parus caeruleus*, **Pad** - *Passer domesticus*, **Sie** - *Sitta europaea*, **Stv** - *Sturnus vulgaris*. Other abbreviations see Table 1.

	Fia	**Pa**	**Pmj**	**Pca**	**Pam**	**Pad**	**Psm**	**Sie**	**Stv**	Total
Number of nests	5	24	26	4	2	1	19	5	2	94
Eviphis ostrinus								0.2		0.01
Crassicheles holsaticus			0.15							0.04
Macrocheles glaber					0.5					0.01
Macrocheles recki								0.2		0.01
Macrocheles rotundiscutis		0.04								0.01
Hypoaspis lubrica	0.4	0.38	0.19				0.05	5.6		0.48
Hypoaspis sardoa					1.5					0.03
Proctolaelaps cyllodi			0.62							0.17
Proctolaelaps pygmaeus	0.8		0.69			1	0.05			0.26
Ameroseius sp.								0.4		0.02
Ameroseius apodius			0.08					0.4		0.04
Ameroseius plumea	0.4									0.02
Lasioseius ometes		0.46	1.62	0.25	0.5			0.4		0.61
Lasioseius penicilliger			0.04				0.32			0.07
Leioseius bicolor							0.05			0.01
Zercon sp.		0.04	0.12					0.2		0.05
Punctodendrolaelaps arvicolus					1					0.02
Cyrtolaelaps chiropterae									0.5	0.01
Gamasellus montanus			0.04							0.01
Euryparasitus emarginatus			0.04							0.01
Holoparasitus calcaratus		0.17								0.04
Pergamasus sp.								0.4		0.02
Pergamasus brevicornis		0.04								0.01
Vulgarogamasus remberti		0.04	4.15							1.16
Vulgarogamasus oudemansi					0.5					0.01
Parasitus consanguineus			0.08							0.02
Parasitus hyalinus						7	0.05			0.09
Parasitus lunulatus		0.13								0.03
Uroseius infirmus		0.79					0.05			0.21
Trichouropoda longiovalis			1.58							0.44
Trichouropoda orbicularis	0.2						1.11			0.23
Trichouropoda ovalis					12					0.26
Trichouropoda tuberosa					5.5	1				0.13
Nenteria breviunguiculata	1.4									0.07
Dinychus perforatus			0.04							0.01
Urodiaspis tecta								0.2		0.01
Uropoda sp.							0.05			0.01
Asternolaelaps fecundus							0.05			0.01
Total	3.2	2.09	9.44	0.25	21.5	9	1.78	8	0.5	
Portion of soil species (%)	3.79	3.95	32.67	20.00	74.14	16.98	5.06	52.6	2.63	

Table 5. Abundance of Mesostigmata in free nests above the ground.
Chc - *Chloris chloris*, **Fr** - *Fringilla* sp., **Gag** - *Garrulus glandiarius*, **Lac** - *Lanius collurio*, **Pip** - *Pica pica*, **Prc** - *Prunella collaris*, **Pmo** - *Prunella modularis*, **Sy** - *Sylvia* sp., **Tum** - *Turdus merula*, **Tpi** - *Turdus pilaris*. Other abbreviations see Table 1.

	Aca	**Chc**	**Fr**	**Gag**	**La**	**Lac**	**Pip**	**Prc**	**Pmo**	**Sy**	**Tu**	**Tum**	**Tpi**	**Tup**	Total
Number of nests	3	6	1	1	3	2	2	1	3	9	9	9	1	8	89
Iphidosoma fimetarium												0.1			0.01
Alliphis siculus											0.4			1	0.13
Hypoaspis praesternalis	8.67														0.29
Hypoaspis lubrica												0.1			0.01
Lasioseius confusus	13.3														0.45
Lasioseius ometes							7.5								0.17
Lasioseius penicilliger				1								0.11		0.75	0.09
Asca bicornis												0.56			0.06
Cheiroseius necorniger	0.33														0.01
Cheiroseius borealis														5.38	0.48
Leioseius bicolor		0.17	2							0.33		0.22			0.09
Punctodendrolaelaps fallax					6.67				13			3			0.97
Gamasellus montanus								2							0.02
Leptogamasus tectegynellus								6							0.07
Parasitus consanguineus		4.17				32.5					7.67	8	110	6.63	4.43
Parasitus fimetorum		0.17										1.33			0.15
Trichouropoda sp.										0.11					0.01
Trichouropoda orbicularis					0.33									0.13	0.02
Dinychus inermis	4.67														0.16
Uropoda sp.												0.11			0.01
Total	27	4.5	2	1	7	32.5	7.5	8	13	0.44	8.11	13.5	110	13.8	
Portion of soil species (%)	100	93.1	8.7	100	100	100	39.5	100	97.5	2.99	49.3	74.9	93.2	99.1	