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Mites (Acarina: Mesostigmata) in the nests of *Acrocephalus* spp. and in neighbouring reeds

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We obtained 7,366 individuals of mesostigmatid mites of 36 species in 69 nests of the great reed warbler (*Acrocephalus arundinaceus*) and the reed warbler (*Acrocephalus scirpaceus*). The nests and reed samples (*Phragmites australis*) were collected once a month at six sites in S Slovakia. *Ornithonyssus sylviarum*, a haematophagous ectoparasite of birds, was the predominant species (92.06%), while predacious species of the Phytoseiidae family, inhabiting plants, were the second most frequent group (3.65%). *Ornithonyssus sylviarum* occurred in nests during the growing season only, most frequently in August. Representatives of the Phytoseiidae family were present in nests all year round, occurring most frequently in September. The occurrence of mites in reed samples from the nest surroundings suggests that mites actively migrate to the nests from nearby vegetation across the water. In contrast, the haematophagous mite *O. sylviarum*, when overpopulated in nests at the end of the growing season, actively migrates to reed stands either to find new hosts or to hibernate in soil.

Key words: Mesostigmata, mites, bird nests, Slovakia, *Acrocephalus arundinaceus*, *Acrocephalus scirpaceus*.

Introduction

Although mesostigmatid mites in bird nests have been studied frequently, the knowledge of mite communities in the nests which are difficult to access is insufficient (MAŠÁN & KRIŠTOFÍK, 1995). The reed warbler's nests in reed stands above the water level belong to this group.

The first record of mesostigmatid mites on birds and in their nests in Slovakia originated from the 1950s (MRCIAK & ROSICKÝ, 1956). There are twenty-five studies focused on the mesostigmatid mite fauna in bird nests in Slovakia, but nests of *Acrocephalus* spp. were investigated only by FENĎA et al. (1998) and KRIŠTOFÍK et al. (2001). However, in the paper by KRIŠTOFÍK et al. (2001), the origin of the examined nests in the table of mite species is not clear (Slovakia, Austria or the Czech Republic).

The purpose of this paper is to describe the qualitative and quantitative composition of the fauna of mesostigmatid mites in the nests of reed warblers situated above the water surface. Parts of this study have already been published by FENĎA et al. (1998), FENĎA (1999) and FENĎA & SCHNIEREROVÁ (2000).

Material and methods

Site specification (with geographical coordinates):
– I. Borská nížina lowland: Jakubovské rybníky fish-ponds (48°24' N, 16°57' E) and Jakubov – Nová Šutrovňa dredging pool (48°24' N, 16°55' E).
– II. Podunajská rovina plain: dead arms of the Danube River in the within-dike area Číčovské mŕtve rameno dead arm (47°46' N, 17°44' E), Čičov – Lyon (47°45' N, 17°43' E), and Gabčíkovo – Malé Vranie (47°50' N, 17°32' E)
– III. Revúcka vrchovina highlands: Ružiná water basin (48°25' N, 19°34 'E).

We examined 30 nests of the great reed warbler [*Acrocephalus arundinaceus* (Linnaeus, 1758)] and 39 nests of the Eurasian reed warbler [*Acrocephalus scirpaceus* (Hermann, 1804)]. All nests were found and marked during the nesting period.

Nests were collected from six sites situated in three orographical complexes in Slovakia in 1995, 1997 and from May 1998 to December 1999, at monthly intervals (at least three nests a month, except during the nesting period).

Reed samples [*Phragmites australis* (Cav.) Trin. et Steud] were obtained from above the water level and at a distance of 2–3 m from the shore in Jakubovské rybníky fishponds and at Nová Šutrovňa sites from May to November 1999.

The nests were kept in plastic polyethylene bags. Mites were extracted from the nests to 70% ethyl alcohol using a Tullgren's apparatus with a 40 W light bulb as a heat source. The material was processed to yield microscopic preparations using chloral hydrate medium (Liquid de Swan). Ecological terms used are according to Margolis et al. (1982).

Results and discussion

Mites formed 83% of the individuals of the arthropod fauna in the *Acrocephalus* spp. nests (Mesostigmata 2/3 of mites) and they occurred in 97% of the nests. From the examined nest material, we obtained 7,093 individuals of 31 mesostigmatid mite species (Tab. 1). Each species had a typical trophictopic claim to determine the degree of its affinity to the nest and its host. The obtained species can be ranked into the following ecological groups:
– obligatory haematophages of birds: *Ornithonyssus sylviarum* (23 positive nests – 33.33% and 6530 individuals – 92.06%), *Dermanyssus gallinae*, *D. hirundinis*;
– facultative haematophages of birds: *Androlaelaps casalis*;
– predators living on plants: *Amblyseius cucumeris* (29 positive nests – 42.03% and 210 individuals – 2.69%), *A. andersoni*, *A. nemorivagus*, *A. neobernhardi*, *A. umbraticus*, *Anthoseius bakeri*, *Phytoseius juvenis*, *Proprioseiopsis levis*;
– coprophilous predators: *Gamasodes spiniger*, *Macrocheles merdarius*, *M. subbadius*;
– soil predators: *Lasioseius confusus* (12 positive nests – 17.39%), *Asca bicornis*, *Gamasellodes bicolor*, *Leioseius minusculus*, *Cheiroseius cassiteridium*, *Ch. mutilus*, *Blattisocius keegani*, *B. dentriticus*, *Arctoseius semiscissus*, *Neojordensia sinuata*, *Hypoaspis praesternalis*, *Pergamasus noster*;
– edaphic detricol: *Dinychus inermis*.

Ambros et al. (1992) described a group of free nests on water and in wet habitats (reed warblers and other birds) with high numbers of nonparasitic mite species. As for our material, there was no contact with soil either, because the nests were situated above the water level in the reed stands. Although nests of *Acrocephalus* spp are situated in wet habitats, the portion of nonparasitic mite species was negligible. The reed warblers *A. arundinaceus* and *A. scirpaceus* are migratory birds arriving in Slovakia in April and early May and leaving in August and September (Hudec, 1983).

The northern feather mite *Ornithonyssus sylviarum*, a cosmopolitan obligatory haematohagous mite, formed 92.06% of the mesostigmatid mites in the nests. It spends the major part of its life cycle, including reproduction, on the host's body (Yakimenko et al., 1990). Micherdziński (1980) recorded its occurrence in the nasal cavity of *Corvus frugilegus* Linnaeus, 1758. This mite species might represent a model for the step from nest parasitism to an epizootic way of life (a certain part of the mite population returns to the nest substrate during the reproduction period) (Borisova, 1977). Protonymphs and adults suck blood and sucking must have two periods. The whole life cycle, from females sucking blood to adults of the next generation, takes 5–7 days (Sikes & Chamberlain, 1954), although according to Zemskaya (1973) development in optimal conditions takes 48 hours only. In C. Europe, mite load is important in mate selection by *Remiz pendulinus* (Linnaeus, 1758), but has no ad-

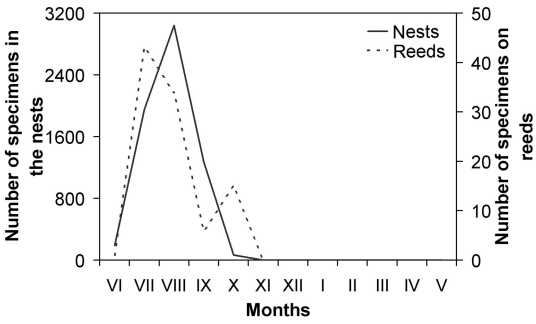

Fig. 1. Changes in abundance of *Ornithonyssus sylviarum* in nests and on reed during the year.

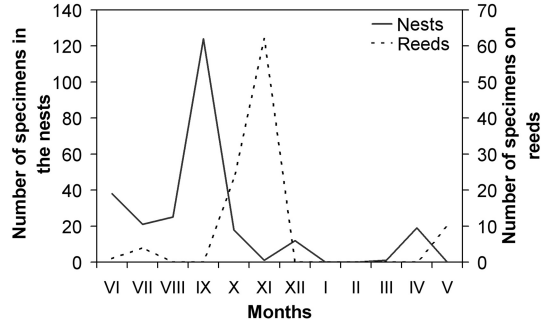

Fig. 2. Changes in abundance of members of the family Phytoseiidae in nests and on reed during the year.

verse effect on the reproductive success of the bird (Darolová et al., 1997). In contrast, Országhová & Puchala (2002) observed an adverse effect of mite load on the reproductive success of *Passer montanus* (Linnaeus, 1758). There are also known cases of parasitism by *Ornithonyssus sylviarum* on humans (Miyamoto & Sakaino, 1997).

In our study, females of *Ornithonyssus sylviarum* formed 96.19% of the population (occurrence from June to October and December, abundance highest in August), males 0.86% (June to August, with peak abundance in July), protonymphs 2.96% (June to September with peak abundance in July, after nesting). This mite species was also predominant in nests of *Carduelis chloris* (Linnaeus, 1758), *Lanius collurio* Linnaeus, 1758, and *Motacilla alba* Linnaeus, 1758 (Ambros et al., 1992). In the nests of *Hirundo rustica* Linnaeus, 1758, *O. sylviarum* had a dominance of 82.41% (Mašán & Országhová, 1995a), but females formed 48.89% of the population only and adults typically prevailed at the end of the nesting period (in August–September). As for nests of *Remiz pendulinus* in Slovakia, *Dermanyssus hirundinis* was more frequent than *O. sylviarum* during the entire nesting period (Krištofík & Mašán, 1996). Females dominated the *Ornithonyssus sylviarum* populations in nests of the penduline tit and, after young had left (first half of June), the numbers of nymphs and adults in nests were balanced. Females of this mite markedly dominated our material during the entire season. The peak in nymph abundance was supposed to occur after young had left, but we are not able to explain the continual increase in abundance of this mite in nests till August, i.e. during a long period after young had left. *Dermanyssus hirundinis*, another obligatory haematophagous mite, occurred in nests of *Acrocephalus* spp mainly while the birds were not nesting (January to March).

The occurrence of phytoseiid predators living on plants can be explained by direct contact of the nests with reed stands, where the nests are situated. Representatives of the Phytoseiidae family formed 3.65% of mite individuals in the nests of *Acrocephalus* spp. The situation was similar in the nests of *R. pendulinus* (Krištofík et al., 1993; Mašán & Krištofík, 1995). The abundance of predatory phytoseiid mites in the nests of *Acrocephalus* spp reached its peak in September (Fig. 2), when reed stand development culminated (potential food source also). When nests of *Acrocephalus* spp started to empty, the abundance of *O. sylviarum* decreased.

We recorded 273 individuals of 10 mesostigmatid mite species in reed samples (*Phragmites australis*; Tab. 1). Species present in the reeds only were *Anthoseius* sp., *Arctoseius cetratus*, *Asca aphidioides*, *Cyrtolaelaps mucronatus* and *Dendrolaelaps latior*. However, the occurrence of the obligatory haematophagous species *O. sylviarum* on reeds is interesting (Fig. 1) and is probably a consequence of the overpopulation in the nests during the nesting period and subsequent migration after the nesting period. Similar strategies to look for new hosts were used by another obligatory haematophagous species, *Dermanyssus gallinae*, in the nests of *Columba livia* Linnaeus, 1758 (Skierska, 1968) and by *D. hirundinis* in the nests of *Hirundo rus-*

Table 1. Survey of mesostigmatid mites found in the nests of reed warblers and in the samples of reed.

	Acrocephalus arundinaceus	*Acrocephalus scirpaceus*	*Phragmites australis*	Total	RD	MI	Do	Pr	Site	Month
Ascidae										
Arctoseius cetratus (Sellnick, 1940)			3						JR	V
Arctoseius semiscissus (Berlese, 1892)	3	6		9	0.13	3.00	0.13	4.35	JR, JN, ČL	VI, X, XII
Asca aphidioides (Linnaeus, 1758)			1						JR	V
Asca bicornis (Canestrini et Fanzago, 1887)	38			38	0.55	19.00	0.54	2.90	RU	IX
Blattisocius dentriticus (Berlese, 1918)	19	62		81	1.17	11.57	1.14	10.14	JR, JN, RU	IX - XII
Blattisocius keegani Fox, 1947	4			4	0.06	2.00	0.06	2.90	JN, ČR	I, VI
Cheiroseius cassiteridium (Evans et Hyatt, 1960)	2			2	0.03	2.00	0.03	1.45	ČL	VI
Cheiroseius mutilus (Berlese, 1916)	1			1	0.01	1.00	0.01	1.45	GM	VI
Gamasellodes bicolor (Berlese, 1918)	10			10	0.14	5.00	0.14	2.90	RU	IX
Leioseius minusculus Berlese, 1905	6	2	26	8	0.12	1.33	0.11	8.70	JR, JN, ČR, ČL	VI - VIII, X, XI
Lasioseius confusus Evans, 1958	54	5	19	59	0.86	4.92	0.83	17.39	JR, JN, ČL, GM	I, V, VI, VIII, IX, XII
Neojordensia sinuata Athias-Henriot, 1973	1		16	1	0.01	1.00	0.01	1.45	JN	VII - IX
Proctolaelaps sp.	1			1	0.01	1.00	0.01	1.45	JN	VII
Dermanyssidae										
Dermanyssus gallinae (De Geer, 1778)	10			10	0.14	2.50	0.14	5.80	JR, JN, ČR	I, VI, VII, IX
Dermanyssus hirundinis (Hermann, 1804)	8	26		34	0.49	3.78	0.48	13.04	JR, JN, ČL	I, II, III, VI, X
Digamasellidae										
Dendrolaelaps latior (Leitner, 1949)			1						JR	V
Laelapidae										
Androlaelaps casalis (Berlese, 1887)		2		2	0.03	2.00	0.03	1.45	JR	V
Hypoaspis praesternalis Willmann, 1949	26			26	0.38	13.00	0.37	2.90	GM	VI
Macrochelidae										
Macrocheles merdarius (Berlese, 1889)	1			1	0.01	1.00	0.01	1.45	JN	VII
Macrocheles subbadius (Berlese, 1904)		1		1	0.01	1.00	0.01	1.45	JN	XI
Macronyssidae										
Ornithonyssus sylviarum (Canestrini et Fanzago, 1877)	2,312	4,218	99	6,530	94.64		92.06	33.33	JR, JN, ČL, RU	VI - X, XII

Table 1. (continued)

	Acrocephalus arundinaceus	*Acrocephalus scirpaceus*	*Phragmites australis*	Total	RD	MI	Do	Pr	Site	Month
Parasitidae										
Gamasodes spiniger (Trägårdh, 1910)	1			1	0.01	1.00	0.01	1.45	JN	IX
Pergamasus noster (Berlese, 1903)		1		1	0.01	1.00	0.01	1.45	JR	III
Phytoseiidae										
Amblyseius andersoni (Chant, 1957)		6		6	0.09	1.50	0.08	5.80	JR, JN	VII, X - XII
Amblyseius cucumeris (Oudemans, 1930)	153	57	16	210	3.04	7.24	2.96	42.03	JR, JN, ČL, RU	IV, V - X, XII
Amblyseius nemorivagus Athias-Henriot, 1961		8		8	0.12	8.00	0.11	1.45	JR	X
Amblyseius neobernhardi Athias-Henriot, 1966	1	21		22	0.32	7.33	0.31	4.35	ČL, RU	IX
Amblyseius umbraticus (Chant, 1956)	5			5	0.07	5.00	0.07	1.45	JN	VI
Amblyseius sp.		2		2	0.03	2.00	0.03	1.45	JR	X
Anthoseius bakeri (Garman, 1948)	2	1		3	0.04	1.50	0.04	2.90	JR, RU	IX, XII
Anthoseius sp.			91						JR, JN	V, VII, VIII, X, XI
Phytoseius juvenis (Wainstein et Arutyunyan, 1970)		1		1	0.01	1.00	0.01	1.45	JR	X
Proprioseiopsis levis (Wainstein, 1960)		1		1	0.01	1.00	0.01	1.45	JR	III
Proprioseiopsis sp.	1			1	0.01	1.00	0.01	1.45	JN	VII
Rhodacaridae										
Cyrtolaelaps mucronatus (G.et R. Canestrini, 1881)			1						JN	VII
Urodinychidae										
Dinychus inermis (C.L. Koch, 1841)	14			14	0.20	7.00	0.20	2.90	GM	VI
Total number of individuals	2,673	4,420	273	7,093						
Number of nests / positive nests	30/27	39/31		69/58						
RD	89.1	113.3		102.8						
MI	99	142.6		122.3						

Key: RD – relative density or abundance, average number of individuals in all nests, MI – mean intensity, average number of individuals in positive nests, Do – dominance, Pr – prevalence, percentage of positive nests; JR – Jakubovské rybníky; JN – Jakubov – Nová Šutrovňa; ČR – Čičovské mŕtve rameno; ČL – Čičov – Lyon; GM – Gabčíkovo – Malé Vranie; RU – Ružiná.

tica (Mašán & Országhová, 1995b). In October, mites actively migrate to sites of hibernation, probably to the soil. The abundance of predatory phytoseiid mites living on reeds reached its peak in the autumn months (Fig. 2). Their low numbers in bird nests from May to July can be explained by their food specialisation on eggs and larvae of phytophagous insects as well as on mites living on reeds. Due to the development of new reed in this period, the amount of food available for mites is relatively poor. Decrease of reed growth at the beginning of November and during winter coincides with the end of the vegetative period and migration of mites to hibernation sites. However, part of the mite population hibernates in nests. Probably, mites are not able to differentiate between the nest habitat and surrounding littoral reed stands and the nests are only a pause in their migration activities.

Although *Acrocephalus scirpaceus* builds smaller nests in denser reed stands with thinner blades and depends less on the presence of water, while *A. arundinaceus* builds bigger nests in reed stands with stable source of water (Hudec, 1983), there are no significant differences between the nest fauna of these two birds. Similarly, no differences between the nest fauna were recorded among the study sites. This might be proof that nest localisation and nest material structure are more important factors for the composition of nest fauna than the species of nesting bird.

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