Acta Soc. Zool. Bohem. **77**: 165–172, 2013
ISSN 1211-376X

Soil astigmatine (Acari: Astigmatina) mites from birds' nests in Slovakia

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Received 20 March 2013; *accepted 16 June 2013*
Published 5 August 2013

Abstract. Fourteen species of astigmatine mites belonging to four families were recorded in 25 birds' nests (Aves) collected in Slovakia from 1995 to 1999. Seven of the species are new records for Slovakia: *Histiostoma myrmicarum* Scheucher, 1957, *H. piceae* Scheucher, 1957, *Myianoetus tuerkorum* Scheucher, 1957, *Calvolia tarsonifracta* Turk et Turk, 1957, *C. fraxini* Turk et Turk, 1957, *C. tuberculata* Zachvatkin, 1941 and *Tyrolichus casei* (Oudemans, 1910). Some species of Histiostomatidae, Winterschmidtiidae and Acaridae are not typically found in this habitat. *Histiostoma ferorinarum* (Dufour, 1839), *H. sapromyzarum* (Dufour, 1839) and *Rhizoglyphus echynopus* (Fumouze et Robin, 1868) are usually recorded in soil or microhabitats related to soil, such as decaying organic material or plant roots. According to the literature *Myianoetus dionychus* is a strict troglophil. A list of synonyms, data on occurrence and short comments are provided for each species.

Key words. Distribution, faunistics, soil mites, nests, Acari, Astigmata, Astigmatina, Aves, Slovakia.

INTRODUCTION

Birds' nests are an example of an unstable, patchy microhabitat characterized by the presence of a distinctive invertebrate fauna. Most abundant among them are some groups of arthropods, but especially mites (Błoszyk et al 2005).

More than 70 years have passed since the first attempts to determine the relationship between birds and the invertebrate inhabitants of their nests, including mites (Nordberg 1936). However, astigmatine mites are often ignored in studies of nest acarofauna. Faunistic research on nest mites in Central Europe has focused mainly on the mesostigmatid inhabitants of this habitat (Błoszyk et. al. 2005, Fenďa et. al. 1998, Kaczmarek 1977, Mašán & Országhová 1995, Zeman & Jurík 1981). Nevertheless, Astigmatina are common part of birds' nidofauna.

In general, there are many groups of astigmatid mites associated in some way with birds. Mites of the superfamilies Analgoidea and Pterolichoidea are usually referred to as "feather mites" and are permanent ectosymbionts living on various parts of bird's feathers (feather mites sensu stricto), in skin or sub-cuticular tissues (skin mites) and some are even endoparasitic (living in the respiratory tract of birds, etc.), see O'Connor (2009). Another group consists of astigmatid species that live and feed in bird's nests. There are many taxa in this diverse and inconsistent group. As is apparent from this article, not only mites known to be nidicolous, but also species usually occurring in different environments are also found in this habitat. In general, only some species of the families Acaridae, Glycyphagidae, Histiostomatidae, Lardoglyphidae and Suidasiidae are known to be regularly nidicolous (Fain & Philips 1977, 1979; Hubard & Fashing 1996).

Species occurring most frequently in nests are nidicols or ubiquists, such as *Tyrophagus putrescentiae*. Parasites and commensals (for example, feather and skin mites that drop of the bodies of birds) occur less frequently (Jamriška et. al. 2011).

Presented at the 11th Central European Workshop on Soil Zoology, České Budějovice, Czech Republic, 11–14 April 2011.

In this study I recorded some species, which more typically occur in soil, or microhabitats related to soil (decaying organic material and wood etc.).

There are 78 species of astigmatid mites recorded in the literature for Slovakia (Zamec 2010).

MATERIAL AND METHODS

Astigmatine mites were collected from the nests of the following families and species of birds (Vertebrata: Aves):
Accipitridae: *Aquilla heliaca* (Savigni, 1809), *Aquilla pomarina* Brehm, 1831, *Milvus milvus* (Lacepede, 1799).
Acrocephalidae: *Acrocephalus arundinaceus* (Linnaeus, 1758), *Acrocephalus scirpaceus* (Hermann, 1804).
Anatidae: *Anas plathyrhynchos* (Linnaeus, 1758).
Ardeidae: *Ixobrichus minutus* (Linnaeus, 1766).
Cinclidae: *Cinclus cinclus* (Linnaeus, 1758).
Falconidae: *Falco vespertinus* (Linnaeus, 1766).
Laniidae: *Lanius collurio* (Linnaeus, 1758).
Locustellidae: *Locustella luscinoides* (Savi, 1824).
Muscicapidae: *Phoenicurus ochruros* (Linnaeus, 1758).
Paridae: *Parus major* (Linnaeus, 1758).
Podicipedidae: *Podiceps cristatus* (Linnaeus, 1758).
Rallidae: *Porzana parva* (Scopoli, 1769), *Fulica atra* Linnaeus, 1758.

Astigmatine mites were collected from 1995–1999 by several people. Location of the collection sites are indicated on the map in Fig. 1. In the case of large nests, only the lining material from the nest cup was collected. Small nests were collected whole. The mites were extracted using a Tullgren funnel and then stored in 70% ethylalcohol. A Zeiss Amplival microscope was used to identify the mites (magnification 100–400×).

The mites were identified using the keys of Černý & Samšiňák (1971), Hughes & Jackson (1958), O'Connor (2009), Rosický (1979), Scheucher (1957) and Turk & Turk (1957). Nomenclature and taxonomy follows O'Connor (2009) for mites and Kovalik et. al. (2010) for birds. Material is deposited in the author's collection at the Comenius University, Bratislava, Slovakia.

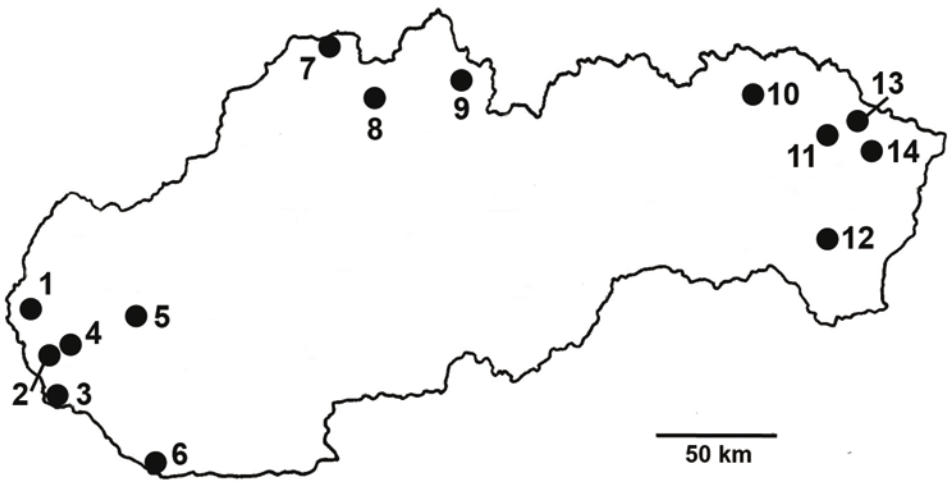


Fig. 1. Map of Slovakia showing localities where nests of birds were collected between 1995 and 1999. 1 – Jakubov, 2 – Bratislava-Biely Kríž, 3 – Bratislava-Rusovce, 4 – Svätý Jur, 5 – Trnava, 6 – Čičov, 7 – Svrčinovec, 8 – Terchová-Štefanová, 9 – Zábiedovo, 10 – Hankovce, 11 – Myslina, 12 – Trebišov, 13 – Papín, 14 – Belá nad Cirochou.

RESULTS

Fourteen species of four families of astigmatine mites were identified in 25 nests of birds belonging to 16 species and 12 families. Of them, seven species are new records for Slovakia: *Histiostoma myrmicarum*, *Histiostoma piceae*, *Myianoetus tuerkorum*, *Calvolia tarsonifracta*, *Calvolia fraxini*, *C. tuberculata* and *Tyrolichus casei*. Deutonymphs and other stages of mites were extracted from samples by means of a Tullgren funnel.

Histiostomatidae Berlese, 1897

Histiostoma ferorinarum (Dufour, 1839)

Material examined. Terchová-Štefanová, 29 November 1996: 2 adult females, from nest of *Cinclus cinclus* on a cliff.

Comments. All life stages are known. Deutonymphs of this species occur on many groups of arthropods (Isopoda, Chilopoda, Diplopoda, various families of Coleoptera). Adults occur in decaying and rotting plant material (Scheucher 1957). Species have a wide (probably cosmopolitan) distribution and have been recorded in most European countries, North America, South Africa, Australia and New Zealand (Hughes & Jackson 1958, Scheucher 1957).

Histiostoma myrmicarum Scheucher, 1957

Material examined. Jakubov – ponds, 27 May 1997: 3 adult males, from ground nest of *Anas plathyrhynchos* (Linnaeus, 1758) in reeds; – Svätý Jur-Šúr, 10 June 1998: 2 adult males, from nest of *Fulica atra* (Linnaeus, 1758) floating on water in reeds.

Comments. All life stages are known, previously only from Germany. Deutonyphs are phoretic on ants; adults live in soil or nests of vertebrates (Scheucher 1957). This is the first record for Slovakia.

Histiostoma piceae Scheucher, 1957

Material examined. Myslina – woodland, 25 July 1998: 1 deutonymph, from nest of *Aquila pomarina*.

Comments. This species is strongly associated with the bark beetle *Ips typhographus* (Linnaeus, 1758) (Insecta: Coleoptera: Scolytidae). Deutonymphs are phoretic on the bodies of these beetles and the adults are present in the tunnels of these beetles under the bark of trees (Scheucher 1957). Previous confirmed occurrence of this species is only for Germany (Scheucher 1957) and Croatia (Pernek et. al. 2012). This is the first record for Slovakia.

Histiostoma sapromyzarum (Dufour, 1839)

Material examined. Čičov – ox-bow lake on the Danube, 17 June 1995: 9 adult females, from nest of *Porzana parva* floating on water; – Svätý Jur-Šúr, 6 August 1998: 9 adult females, 1 deutonymph, from nest of *Fulica atra* floating on water.

Comments. Adult females and deutonymphs are known. Adults of this forest species are commonly found on various decaying fungi. Deutonymphs are phoretic on several families of Coleoptera and some species of myriapods, mainly *Lithobius forficatus* (Linneaus, 1758) (Miriapoda: Chilopoda: Lithobiidae). This mite also occurs on rotting oak and alder wood and is probably cosmopolitan as it occurs in Europe, South America, Asia and Australia (Hughes & Jackson 1958, Scheucher 1957).

Myianoetus dionychus (Oudemans, 1910)

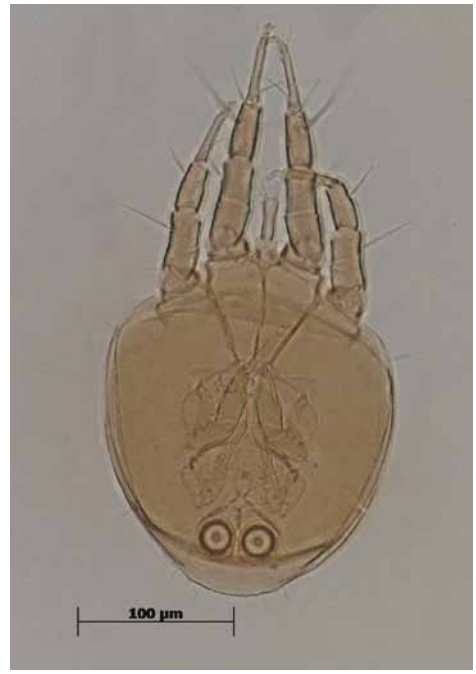
Material examined. Papín-Dubník, 10 May 1998: 1 adult female, 8 deutonymphs, from a nest of *Aquila pomarina* in a tree (Fig. 3).

Comments. According to previous studies, this species is a typical troglophil. Deutonymphs are phoretic on "cave flies" and adults are recorded on bat guano and substrates in caves (Scheucher 1957). This species is previously recorded from Germany (Scheucher, 1957), Great Britain (Hughes & Jackson 1958), France (Fain 1978) and Hungary (Mahunka 1972). In Slovakia it was recorded by Mašán & Krištofík (1992).

Myianoetus tuerkorum Scheucher, 1957

Material examined. Bratislava-Biely Kríž, 21 May 1998: 2 females, from nest of *Aquila heliaca* on a forester's lodge; – Bratislava-Rusovce, 23 August 1998: 18 deutonymphs, from nest of *Falco vespertinus* in a tree in windbreak; – Terchová-Štefanová, 29 November 1996: 2 deutonymphs, from the nest of *Cinclus cinclus* on rocks.

Comments. Scheucher (1957) found live individuals of all stages of this species in nests of *Sturnus vulgaris* (Linnaeus, 1758) in Germany (Aves: Sturnidae). This the first record for Slovakia.



Figs. 2, 3. Soil astigmatine mites. 2 – female of *Tyrophagus longior* (Gervais, 1844) (Belá nad Cirochou, February 1999). 3 – deutonymph of *Myianoetus dionychus* (Oudemans, 1910) (Rapín-Dubník, May 1998). Photos by R. Zamec

Winterschmidtiidae Oudemans, 1923

Calvolia fraxini Turk et Turk, 1957

Material examined. Jakubov-Nová Šutrovňa, 2 February 1999: 1 deutonymph, from nest of *Acrocephalus scirpaceus* in reeds.

Comments. Only deutonymphs are known. This species is probably restricted to ash trees, because nymphs are often found on ash timber. Phoretic on adults of *Leperisinus orni* (Fuchs, 1906) (Insecta: Coleoptera: Scolytidae) burrowing into wood of ash trees in Germany. Deutonymphs live under the elytra of the beetles (Turk & Turk 1957). This is the first record for Slovakia.

Calvolia tarsonifracta Turk et Turk, 1957

Material examined. Jakubov-Nová Šutrovňa, 3 December 1998: 1 deutonymph, in nest of *Acrocephalus arundinaceus* (Linnaeus, 1758) in reeds.

Comments. All life stages are known. Deutonymphs are phoretic on beetles of the family Ptiliidae. Adults have occurred on decaying tops of *Solanum tuberosum* (potato) in Germany (Turk & Turk 1957). This is the first record for Slovakia.

Calvolia tuberculata Zachvatkin, 1941

Material examined. Belá nad Cirochou-Na Kazateľni, 28 November 1999: 5 adult females, in nest of *Aquila pomarina* in tree; – Čičov – ox-bow lake on the Danube, 30 May 1998: 1 adult female, from nest of *Locustella luscinoides* floating on water; – Hankovce-Baňa, 11 April 1998: 8 adult females, 4 adult males, from nest of *Milvus milvus*; – Jakubov – ponds, 1998–1999: 5 adult females, from the nest of *Acrocephalus arundinaceus* in reeds; – Trnava – ponds, 10 August 1998: 1 adult female, from ground nest of *Fulica atra*.

Comments. Only adult forms are known. Zachvatkin (1941) found this species in cobs of *Zea mays* (corn) in the former Soviet Union. This is the first record for Slovakia.

Glycyphagidae Berlese, 1887

Glycyphagus domesticus De Geer, 1778

Material examined. Terchová-Štefanová, 29 November 1996: 1 adult female, from nest of *Cinclus cinclus* on rocks; – Terchová-Štefanová, 30 July 1996: 4 adult females, from nest of *Phoenicurus ochruros* on building.

Comments. All life stages are known. This species occurs on dried plants and in nests of birds and mammals (Turk & Turk 1957). In houses, these mites are present mainly on cushioning of furniture and feed on mould; this species is cosmopolitan (Rosický 1979).

Acaridae Latreille, 1802

Rhizoglyphus echinopus (Fumouze et Robin, 1868)

Material examined. Trebišov-Ondava, 17 June 1998: 2 adult females, 4 tritonyphs, from nest of *Aquila heliaca* in tree.

Comments. All life stages are known. Deutonymphs are phoretic on various groups of insects; adult mites are common pests of roots of tulips, hyacinths and other garden plants (more in discussion); it is a typical, cosmopolitan soil species (Manson 1972, Rosický 1979).

Tyrophagus longior (Gervais, 1844)

Material examined. Belá nad Cirochou-Na kazateľni, 28 February 1999: 4 adult females, from nest of *Aquila pomarina* (Fig. 2); – Čičov – ox-bow lake on the Danube, 23 June 1997: 1 adult female, from nest of *Acrocephalus aruninaceus* in reeds; – Čičov – ox-bow lake on the Danube, 23 July 1997: 3 adult females, from nest of *Ixobrychus minutus* floating on water; –Jakubov – ponds, 1 September 1998: 1 adult male, 1 adult female, from nest of *Acrocephalus arundinaceus* in reeds; – Jakubov – ponds, 15 April 1998: 14 adult females, 2 adult males, from nest of *Locustella luscinoides* in reeds; – Jakubov – ponds, 4 August 1998: 1 adult female, from nest of *Podiceps cristatus* floating on water; Terchová-Štefanová, 30 July 1996: 14 adult females, 9 adult males, from nest of *Phoenicurus ochruros* on building.

Comments. It is very similar to the next species. Like *Tyrophagus putrescentiae* (Rosický 1979) this species is also ubiquitous.

Tyrophagus putrescentiae (Schrank, 1781)

Material examined. Čičov – ox-bow lake on the Danube, 30 may 1998: 5 adult females, from nest of *Locustella luscinioides* floating on water; – Čičov – ox-bow lake on the Danube, 23 July 1997: 3 adult females, 1 adult male, from nest of *Ixobrichus minutus* floating on water; – Čičov – ox-bow lake on the Danube, 17 June 1995: 5 adult females, from nest of *Porsana parva* floating on water; – Jakubov – ponds, 23 June 1998: 1 adult female, from nest of *Fulica atra* floating on water; – Jakubov – ponds, 15 april 1999: 6 adult females, 1 adult male, nest of *Locustella luscinioides* in reeds; Svrčinovec, 29 December 1995: 3 adult females, from nest of *Carduelis* sp. in tree; – Svrčinovec, 7 April 1997: 1 adult male, from nest of *Parus major*; – Zábiedovo-Vojtašková, 22 July 1999: 20 adult females, 9 adult males, from nest of *Lanius collurio*.

Comments. Although all the other stages have been recorded deutonymphs have not been observed for any of the species in this genus *T. putrescentiae* is ubiquitous, occurring both in nature and houses (Rosický 1979). This species is often found in soil (Kalúz 1997, Kalúz & Žuffová 1989) and birds' nests (Turk & Turk 1957).

Tyrolichus casei (Oudemans, 1910)

Material examined. Terchová-Štefanová, 29 November 1996: 5 adult females, 1 adult male, from nest of *Cinclus cinclus* on building. This is the first record for Slovakia.

Comments. This species is similar to *Tyrophagus putrescentiae* and *T. longior*. It is a cosmopolitan pest of stored food (Rosický 1979). Zachvatkin (1941) found it in nature under the bark of trees.

DISCUSSION

Based on my research on nidicolous astigmatine mites I conclude there is little useful information on them. The families (Histiostomatidae, Glycyphagidae and Acaridae) included in this study have received little attention. Specimens are quite difficult to identify and these and other families of Astigmatina are in need of revision. For example, over half of the genera have been described since the last revision of the Histiostomatidae (O'Connor 1982).

Knowledge of the occurrence and habitat preferences of these mites is incomplete. The results presented in this paper confirm this statement. According to the literature several species found in bird's nests do not typically occur in this type of habitat. The species *Histiostoma ferorinarum*, *H. sapromyzarum* and *Rhizoglyphus echynopus* occur mainly in soil and soil-related microhabitats, such as decaying plant material or parts of living plants, fungi or dung (see description of each species). Adults (or tritonymphs) of these species were found in birds' nests (*Histiostoma ferorinarum* and *Rhizoglyphus echinopus* each in one nest, *Histiostoma sapromyzarum* in two nests). Species of the genus *Rhizoglyphus* Claparede, 1869 are serious pests, capable of damaging many

agricultural and ornamental plants (specifically their bulbs). *Rhizoglyphus echynopus* feeds on corms of *Gladiolus* and bulbs of *Iris* spp., *Tulipa* spp., *Hyacinthus* spp., *Narcissus* spp., *Gloxinia* spp. and *Allium sativum* (Manson 1972). It is now obvious, that this species is able to survive on other kinds of food since it occurs in birds' nests. Species of *Histiostoma* Krammer, 1876 usually inhabit wet substrates, where their highly modified mouthparts are used to filter organic material and microorganisms from water films (O'Connor 2009); which agrees with its above-mentioned occurrence. They are able to survive in nests that are wet enough to provide sufficient feeding conditions. That is most likely the case for *Histiostoma sapromyzarium*, which was recorded in two nests floating on water (see Material examined). Unfortunately, I have no information on the condition of the "nest of *Cinclus cinclus* on a cliff" from which *H. ferorinarum* was collected. Fain & Philips (1979) also record two species of *Histiostoma*, from a nest of *Megascops asio* (L.), but only the nonfeeding hypopial stage of this mite.

I have recorded twenty four specimens of *Calvolia tuberculata* in the nests of five species of birds whereas Zachvatkin (1941) records it occurring only in cobs of *Zea mays* (corn).

Eight deutonymphs and one adult female of *Myianoetus dionychus* were found in a nest of *A. pomarina*. This mite is known as a troglophil and restricted to caves (Scheucher 1957). Adults of the genus *Myianoetus* Oudemans, 1929 inhabit and feed on dung, with deutonymphs often specialised for phoresy on particular dung-associated Diptera (Bongers et. al. 1985). It seems that this species occurs in many more habitats than previously presumed.

Deutonymphs of *Histiostoma piceae*, *Calvolia tarsonifracta* and *C. fraxini* are known to be phoretic on different groups of Coleoptera. I have found only one deutonymph of each of these species, so random occurrence cannot be ruled out. Specimens could be, for example, transported to nests by a random contact between an insect carrier and a bird's nest.

There are other species that have been recorded in nests by other authors (Scheucher 1957, Turk & Turk 1957), which are typical nidicolous or ubiquitous species with a wide occurrence (see description for each species).

The species *Histiostoma myrmicarum*, *H. piceae*, *Myianoetus tuerkorum*, *Calvolia tarsonifracta*, *C. fraxini, C. tuberculata*, and *Tyrolichus casei* were recorded for the first time in Slovakia.

The information presented indicates little is known about the ecology, nutrition and habitat preferences of astigmatine mites. Many species might have more diverse feeding habits and a wider occurrence than currently thought. Further research is required.

Acknowledgements

I would like to express my gratitude to the following colleagues for collecting bird's nests – Miroslav Krumpál, Dušan Cyprich and Erika Schniererová (Department of Zoology, Comenius University, Bratislava), and Jozef Chavko (Raptor Protection of Slovakia, Bratislava), and Slávka Siryová (Department of Ecology, Comenius University, Bratislava). This study was funded by the Agency of Ministry of Education, Science, Research and Sport of the Slovak Republic for the Structural Funds of EU (VEGA 2/0012/11). The language of the manuscript was kindly checked by Prof. Anthony F. G. Dixon (Norwich, UK).

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