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New Data to the Knowledge on the Corticolous Mite Fauna in Hungary (Acari: Prostigmata, Astigmata, Oribatida)

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Authors give a report on the results of the regular collections made between 1990 and 1998 on ornamental trees and shrubs, on streets, in parks, in green spaces of housing estates, in private gardens and in arboreta. A total of 19 corticolous mite species were found belonging to 14 families. *Michaelopus corticalis* (Michael, 1885), *Hericia hericia* Robin, 1868, *Eupalopsis maseriensis* (Canestrini et Fanzago, 1876), *Mediolata vandergeesti* (Gomaa et Bolland, 1982), *Cunaxoides kielczewskii* Michocka, 1982, and *Neophyllobius* spec. nov. are reported for the first time for the Hungarian fauna. *Hemisarcoptes budensis* Fain et Ripka, 1998, *M. corticalis* and *Cheletogenes ornatus* (Canestrini et Fanzago, 1876) were the most frequent species in the acarofauna associated with scale insects.

Key words: Corticolous Mites, Acari, Prostigmata, Astigmata, Oribatida

Among arboreal mites corticolous mites are less known contrary to foliage-dwelling mites. In the last three decades, Lebrun (1976), André (1986, 1987), Momen (1987, 1988), Momen and Lundqvist (1996), Suski (1972), Doberski (1986), Bolland (1983, 1986, 1991), Smiley (1992), Kehl and Weigmann (1992), Weigmann and Jung (1992) studied the mites on bark of trees and shrubs. Their results proved the considerable richness of corticolous acarofauna.

A part of cortex-dwelling mites is algae and lichens feeder. An other group is fungivorous and saprophagous. The third group is predaceous upon the smallest arthropods. In Belgium, André (1986) reported 22 species of Tydeidae and 6 species of Stigmaeidae from bark of different tree species. In Bulgaria, Nachev and Trenchev (1987), while in Italy, Vacante (1989) as well as Vacante and Gerson (1987) reported the mites found associated with coccids from fruit trees. Nachev and Trenchev (1987) observed *Thyreophagus entomophagus* (Laboulbene), *Cheletogenes ornatus* (Canestrini et Fanzago), *Cheyletia flabellifera* (Michael), *Hemisarcoptes malus* (Shimer), *Amblyseius cucumeris* (Oudemans) and *Bdella iconica* Berlese under the shields of *Sphaerolecanium prunastri* (Fonscolombe), *Parlatoria oleae* (Colvée), *Quadraspidiotus marani* Zahradnik and *Quadraspidiotus pyri* (Lichtenstein). *Th. entomophagus* was the most frequent species. Vacante (1989) reported *H. malus* from *Lepidosaphes beckii* (Newman), *Aonidiella aurantii* (Maskell), *Parlatoria pergandii* Comstock and *Aspidiotus nerii* Bouché. Several members of Stigmaeidae, Eupalopsellidae, Cunaxidae and Camerobiidae are predators of armored scale insects and can be found on the bark of trees (Cooreman,

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1958, Meyer and Ueckermann, 1984, Bolland, 1986, Vacante and Gerson, 1987). Smiley and Knutson (1983), also Gerson (1973, 1985) summarized the knowledge on the role and biology of predatory mites of coccids. Fain et al. (1995) as well as Fain and Ripka (1998) reported new species of the genus *Hemisarcoptes* that predaceous upon diaspidids.

The present knowledge of corticolous mites in Hungary remains scanty. Balogh and Mahunka (1980) reported oribatids, Komlovszky (1980, 1984) recorded cunaxid and cheyletid species. Lucza et al. (1996) found 4 cheyletid species on tree bark infested with armored scale insects. Ripka et al. (1997) collected the following 6 tarsonemid species: *Tarsonemus nodosus* Schaarschmidt, 1959, *Tarsonemus lobosus* Suski, 1965, *Tarsonemus karli* Sharonov et Mitrofanov, 1986, *Tarsonemus waitei* Banks, 1912, *Dendroptus willmanni* (Schaarschmidt, 1959) and an other *Dendroptus* sp. together with coccids. *Aceria heteronyx* (Nalepa, 1891) causes small stem galls on twigs and branches of *Acer platanoides.* An other eriophyoid mite, *Acalitus phloeocoptes* (Nalepa, 1890) causes stem galls on *Prunus domestica* and *Prunus spinosa* (Ripka and de Lillo, 1997). Ripka and Kaźmierski (1998a) recorded the following 8 tydeid species in association with scale insects: *Lorryia reticulata* (Oudemans,1928), *Lorryia obliqua* (Kuznetzov, 1973), *Lorryia* cf. *woolleyi, Triophtydeus immanis* Kuznetzov, 1973, *Triophtydeus triophthalmus* (Oudemans, 1929), *Tydeus caudatus* (Duges, 1834), *Tydeus californicus* (Banks, 1904) and *Homeopronematus staerki* (Schruft, 1972). Out of them *T. immanis* was the most frequent mite. The following two tydeids: *Lorryia reticulata* and *L. obliqua* were found solely on bark. Ripka and Kaźmierski (1998b) found *Mediolata maria-efrancae* André, 1977 on the bark of tree infested with scale insects.

Materials and Methods

Between 1990 and 1998, a mite survey was made on ornamental trees and shrubs of streets, squares, parks, botanical gardens, private gardens, and green areas of housing estates in all districts of Budapest (in some other localities in Hungary and Croatia, also herbaceous plants were occasionally examined). Plant samples from 301 woody plant species (minimum 5 shoots, branches or bark/plant or 25 leaves/plant) were taken in plastic bags from January to late November. During plant examination with binocular microscope (upper and lower surfaces of the leaves, petioles, buds, bark, flowers, galls, etc.), all the mites found on the plant samples were put into AGA solution or directly into lactic acid. After the clearing of mites in the lactic acid, they were placed into Keifer's medium 2 following the Keifer's mounting method for eriophyoid mites (Keifer, 1952). The cleaned and dyed mites were then placed into Keifer's medium 3. The Hoyer's medium with sorbitol (Keifer, 1975), and Heinze's polyvinyl alcohol (PVA) medium (Schmutterer, 1959) were used alternatively for mounting the specimens. The slide preparations were dried in thermostat at 32 ºC and then sealed with nail varnish. Specimens were examined with a phase contrast microscope. For mite determination the keys of Fain (1982), Bolland (1991), Smiley (1992) as well as several original species descriptions and other available reports were used.

Results

Corticolous mites were collected on 48 woody plant species out of 301 studied belonging to 19 families. These mites were found in 90 plant samples. A total of 19 mite species were identified belonging to 14 families (see Table 1 for the exact host/locality data). The following species were new for the Hungarian fauna: *Cunaxoides kielczewskii* Michocka, *Eupalopsis maseriensis* (Canestrini et Fanzago), *Hericia hericia* Robin, *Mediolata vandergeesti* (Gomaa et Bolland), *Michaelopus corticalis* (Michael). *M. corticalis, Hemisarcoptes budensis* Fain et Ripka and *Cheletogenes ornatus* were the most frequent species in the mite fauna associated with scale insects. Corticolous mites occurred on 16 species of family Rosaceae, on 8 species of family Oleaceae, and on 4 species of family Salicaceae. *Ch. ornatus* was collected on coccid infested cortex, exceptionally on leaves. *H. budensis, C. kielczewskii, E. maseriensis, M. mariaefrancae, M. vandergeesti, Neophyllobius* sp. near *sturmerwoodi* and *Neophyllobius* spec. nov. were found on branches infested with the following scale insects: *Pseudaulacaspis pentagona* (Targioni-Tozzetti), *Unaspis euonymi* (Comstock), *Epidiaspis leperii* (Signoret), *Chionaspis salicis* (Linnaeus), *Aulacaspis rosae* (Bouché), *Diaspidiotus gigas* (Thiem et Gerneck), *Diaspidiotus ostreaeformis* (Curtis), *Diaspidiotus perniciosus* (Comstock), and *Lepidosaphes ulmi* (Linnaeus) (for more data on Coccoidea see Ripka et al., 1996). The cortex-dwelling camerobiid, cheyletid, cunaxid, eupalopsellid and stigmaeid mites usually occurred in low numbers, but the coccid infestations were severe. Phoretic hypopodes (entomophilous deuteronymphs) of *H. budensis* were collected on *Chilocorus renipustulatus* (Scriba) and *Chilocorus bipustulatus* (L.) (Coleoptera: Coccinellidae).

M. corticalis was found under the scales of dead *P. pentagona, E. leperii, U. euonymi, Ch. salicis, Diaspidiotus marani* Zahradnik, *D. gigas, D. perniciosus, L. ulmi* and colonies of *Pseudochermes fraxini* (Kaltenbach). *H. hericia* was collected under the peeling (loose) bark of London plane trunk. Since the paper of Ripka et al. (1997) an other tarsonemid mite was found associated with coccid. *Tarsonemus bachmaieri* Cooreman, 1958 was found under the scales of *Carulaspis juniperi* (Bouché). Oribatids were found only on bark of twigs in parks, cemetery and arboreta. They could not be found on street trees. The oribatid mites do not tolerate the aerial pollution in urban habitat. The vast majority of corticolous mite species is slow-moving, exception *T. immanis.*

Table 1

Corticolous mite species collected from ornamental trees and shrubs
(*= new species for the Hungarian fauna)

Mite species	Plant species	Sampling place	Sampling date
Acari: Prostigmata			
fam. **Cheyletidae**			
Cheletacarus raptor Volgin, 1961			
	Populus x *canescens*	Óbuda	25.08. 1998
	Populus simonii	Vérmező	25.01. 1991
	Rhamnus catharticus	Józsefváros	04.01. 1995
Cheletogenes ornatus (Canestrini et Fanzago, 1876)			
	Celastrus orbiculatus	Gellérthegy	09.09. 1997
	Crataegus laevigata	Gellérthegy	05.02. 1991
		Pestszentlőrinc	02.09. 1992
	Ilex aquifolium	Városliget	04.02. 1995
	Jasminum beesianum	Gellérthegy	27.01. 1995
	Populus x *canescens*	Óbuda	25.08. 1998
	Populus simonii	Sasad	13.09. 1991
	Populus tremula	Újpalota	30.08. 1994
	Prunus avium	Kispest	02.04. 1992
	Thuja occidentalis	Budaörs (Pest c.)	07.03. 1995
Prosocheyla traubi (Baker, 1949)			
	Populus simonii	Sasad	13.09. 1991
fam. **Eupalopsellidae**			
**Eupalopsis maseriensis* (Canestrini et Fanzago, 1876)			
	Crataegus laevigata	Gellérthegy	24.01. 1995
	Crataegus monogyna	Gellérthegy	26.01. 1995
	Malus pumila var. *niedzwetzkyana*	Gellérthegy	26.01. 1995
fam. **Stigmaeidae**			
Mediolata mariaefrancae André, 1977			
	Euonymus europaeus	Gellérthegy	15.06. 1997
	Jasminum beesianum	Gellérthegy	27.01. 1995
	Rhamnus catharticus	Józsefváros	04.01. 1995
	Tilia x *euchlora*	Józsefváros	29.06. 1994
**Mediolata vandergeesti* (Gomaa et Bolland, 1982)			
	Crataegus monogyna	Gellérthegy	26.01. 1995
	Ribes uva-crispa	Széchenyi-hegy	04.02. 1991
fam. **Camerobiidae**			
**Neophyllobius* sp. near *sturmerwoodi* Bolland, 1991			
	Juglans nigra	Kőbánya	29.03. 1995
**Neophyllobius* sp. nov.			
	Euonymus europaeus	Gellérthegy	15.06. 1997
	Euonymus europaeus	Gellérthegy	09.09. 1997

Table 1 (cont.)

Mite species	Plant species	Sampling place	Sampling date
fam. **Cunaxidae**			
**Cunaxoides kielczewskii* Michocka, 1982			
	Picea pungens	Orosháza (Békés c.)	07.07. 1998
	Rhus typhina	Kőbánya	04.01. 1995
	Taxus baccata	Orbán-hegy	25.08. 1994
fam. **Tarsonemidae**			
Tarsonemus bachmaieri Cooreman, 1958			
	Thuja sp.	Józsefváros	28.10. 1991
Tarsonemus nodosus Schaarschmidt, 1959			
	Celastrus orbiculatus	Gellérthegy	09.04. 1997
	Euonymus europaeus	Rákoskeresztúr	17.08. 1997
		Rákoskeresztúr	17.10. 1997
Tarsonemus waitei Banks, 1912			
	Euonymus europaeus	Rákoskeresztúr	17.08. 1997
		Rákoskeresztúr	17.10. 1997
Acari: Astigmata			
fam. **Hemisarcoptidae**			
Hemisarcoptes budensis Fain et Ripka, 1998			
	Celastrus orbiculatus	Gellérthegy	09.09. 1997
	Crataegus laevigata	Gellérthegy	24.01. 1995
	Euonymus europaeus	Gellérthegy	27.01. 1995
		Gellérthegy	15.06. 1997
	Fraxinus angustifolia	Víziváros	08.02. 1991
		Óbuda	11.09. 1991
	Fraxinus pennsylvanica	Víziváros	08.02. 1991
	Malus baccata	Gellérthegy	24.01. 1995
	Phellodendron amurense	Margitsziget	21.02. 1991
	Populus x *canescens*	Óbuda	03.04. 1991
		Óbuda	25.08.1998
	Populus simonii	Lágymányos	05.02. 1991
		Sasad	13.09. 1991
	Prunus domestica	Újpalota	12.02. 1991
	Pyrus betulifolia	Gellérthegy	18.01. 1995
	Pyrus pyraster	Józsefváros	04.01. 1995
	Rhus typhina	Kőbánya	04.01. 1995
	Sophora japonica	Víziváros	11.02. 1991
fam. Acaridae			
**Michaelopus corticalis* (Michael, 1885)			
	Acer platanoides	Orosháza (Békés c.)	07.07. 1998
	Acer pseudoplatanus	Csongrád (Csongrád c.)	26.05. 1998
	Celastrus orbiculatus	Gellérthegy	07.08. 1998
	Celastrus scandens	Józsefváros	04.01. 1995
	Cornus alba	Őrmező	28.03. 1995

Table 1 (cont.)

Mite species	Plant species	Sampling place	Sampling date
	Cornus stolonifera	Őrmező	10.02. 1995
	Crataegus laevigata	Gellérthegy	24.01. 1995
	Crataegus monogyna	Gellérthegy	26.01. 1995
	Crataegus succulenta	Gellérthegy	24.01. 1995
	Daphne mezereum	Gellérthegy	24.01. 1995
	Euonymus europaeus	Gellérthegy	27.01. 1995
		Gellérthegy	09.09. 1997
	Forsythia suspensa	Pasarét	17.09. 1990
		Belváros	10.04. 1993
	Fraxinus excelsior	Pasarét	17.05. 1991
	Ilex aquifolium	Városliget	04.02. 1995
	Jasminum beesianum	Gellérthegy	27.01. 1995
	Ligustrum vulgare	Tabán	08.05. 1991
	Malus baccata	Gellérthegy	24.01. 1995
	Malus halliana	Tabán	05.05. 1992
	Malus x *purpurea*	Vérmező	05.05. 1992
	Phellodendron amurense	Margitsziget	21.02. 1991
	Populus alba	Budafok	07.02. 1995
		Őrmező	12.05. 1995
	Populus x *canescens*	Óbuda	25.08. 1998
	Populus simonii	Vérmező	25.01. 1991
		Sasad	23.09. 1991
	Prunus cerasifera	Tabán	07.02. 1991
		Gellérthegy	08.05. 1991
	Prunus fruticosus	Zugló	18.03. 1995
	Prunus spinosa	Vérmező	07.03. 1993
	Pyrus betulifolia	Gellérthegy	18.01. 1995
	Pyrus pashia	Gellérthegy	18.01. 1995
	Pyrus pyraster	Józsefváros	04.01. 1995
	Rhus typhina	Kőbánya	04.01. 1995
	Syringa vulgaris	Tabán	12.02. 1991
fam. **Glycyphagidae**			
[*]*Hericia hericia* Robin, 1868			
	Platanus x *hispanica*	Józsefváros	16.05. 1991
Acari: Oribatida			
fam. **Micreremidae**			
Micreremus brevipes (Michael, 1888)			
	Crataegus monogyna	Gellérthegy	26.01. 1995
	Daphne mezereum	Gellérthegy	24.01. 1995
	Malus spectabilis	Törökvész	03.04. 1992
	Prunus spinosa	Vérmezõ	07.03. 1993
	Quercus ilex	Lanterna (Croatia)	05.07. 1996
fam. **Oribatulidae**			
Phauloppia conformis (Berlese, 1895)			
	Juglans nigra	Kőbánya	29.03. 1995

Table 1 (cont.)

Mite species	Plant species	Sampling place	Sampling date
fam. **Cymbaeremaeidae**			
Scapheremaeus reticulatus (Berlese, 1910)			
	Ilex aquifolium	Városliget	04.02. 1995
	Malus pumila var. *niedzwetzkyana*	Gellérthegy	26.01. 1995
fam. Ceratozetidae			
Trichoribates trimaculatus (C. L. Koch, 1836)			
	Jasminum beesianum	Gellérthegy	27.01. 1995
fam. **Scheloribatidae**			
Scheloribates latipes (C. L. Koch, 1844)			
	Jasminum beesianum	Gellérthegy	27.01. 1995

Discussion

The corticolous fauna of species Acari has not been so far investigated extensively in Hungary.

The studies of Lebrun (1976), André (1986), also Momen and Lundqvist (1996) testify that the expected mite species living in a relatively small area can appear surprisingly rich.

The bark and bark crevices are the most important overwintering sites of foliage-dwelling mites. Some of them viz. tetranychid, tenuipalpid, phytoseiid, stigmaeid, tydeid, winterschmidtiid species overwinter under the shield of dead coccids (Ripka, 1998a, b, Ripka and Kaźmierski, 1998a, b). There is a closer association between some members of family Tarsonemidae and coccids. *Tarsonemus nodosus, T. lobosus, T. karli, T. waitei* and *Dendroptus willmanni* also an other *Dendroptus* sp. quite often were found together with scale insects (Ripka et al., 1997). Fungivorous tarsonemid mites prefer this microhabitat. They feed on microscopic fungi.

Some tydeid species gave definite preference to cortex.

The predaceous members of corticolous camerobiid, cheyletid, cunaxid, eupalopsellid, hemisarcoptid, stigmaeid and tydeid mite fauna cannot play a great role in regulating numbers of phytophagous insects and mites because of their low densities. But the knowledge on the predatory activities of these mites is sparse and mostly brief.

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