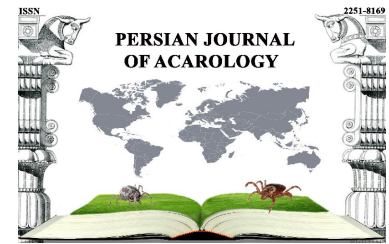




Persian J. Acarol., 2019, Vol. 8, No. 4, pp. 343–352.
<http://dx.doi.org/10.22073/pja.v8i4.56685>
Journal homepage: <http://www.biotaxa.org/pja>



Article

Heterostigmatic mites (Acari: Trombidiformes: Prostigmata) associated with Coleoptera and Hymenoptera in Mazandaran province, northern Iran

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ABSTRACT

In a study on insect-associated heterostigmatic mites (Acari: Trombidiformes: Prostigmata) carried out in Mazandaran province, northern Iran, during spring and summer 2016–2017, a total of 13 species from 11 genera of six families were identified. Among them, three species *Imparipes sevastianovi* Khaustov, 2008, *Scutacarus hystrichocentrus* Sevastianov, 1983 (Scutacaridae), and *Petalomium kurosai* Khaustov, 2014 (Neopygmephoridae) are new records for mite fauna of Iran. The *S. hystrichocentrus* is also new for Asian mite fauna. Eight new host records are documented and the distributions of the mites are revised. Beetles of the family Cerambycidae are recorded as host of the mite families Microdispidae and Scutacaridae for the first time.

KEY WORDS: Ant; bee; beetle; new record; new host record.

PAPER INFO.: Received: 24 August 2019, Accepted: 26 September 2019, Published: 15 October 2019

INTRODUCTION

Association with arthropods, mostly insects, have been evolved in many Heterostigmata (Acari: Trombidiformes: Prostigmata) (Kaliszewski *et al.* 1995; Mortazavi *et al.* 2018). For some fungivorous families, this association is restricted to phoresy including Dolichocybidae, most Microdispidae, Neopygmephoridae, Pygmephoridae and Scutacaridae (Kaliszewski *et al.* 1995; Walter *et al.* 2009). Females of the family Trochometriviidae appear to be kleptoparasites of their bee associates (Cross and Bohart 1969, 1978) however, in recent years, they have been found on some other insects as well (Hajiqanbar *et al.* 2009; Mortazavi *et al.* 2011; Loghmani *et al.* 2014a; Jacinavicius *et al.* 2018; Khaustov and Frolov 2018).

During a survey on heterostigmatic mites associated with insects in Mazandaran province, northern Iran, in 2016 and 2017, a total of 13 species from 11 genera of six families were identified. Among them, three species *Imparipes sevastianovi* Khaustov, 2008, *Scutacarus hystrichocentrus* Sevastianov, 1983 (Scutacaridae), and *Petalomium kurosai* Khaustov, 2014 (Neopygmephoridae) are new records for mite fauna of Iran. The *S. hystrichocentrus* is also new for Asia. Eight new host records are documented and the distributions of the mites are revised.

How to cite: Hajiqanbar, H. & Arjomandi, E. (2019) Heterostigmatic mites (Acari: Trombidiformes: Prostigmata) associated with Coleoptera and Hymenoptera in Mazandaran province, northern Iran. *Persian Journal of Acarology*, 8(4): 343–352. www.SID.ir

MATERIALS AND METHODS

The study was carried out from 2016 to 2017 in Mazandaran province, northern Iran. The host insects were collected directly in their habitats, by sweeping or light traps. Mite specimens were removed using an Olympus stereomicroscope, cleared in a mixture of lactophenol and Nesbitt's solution and mounted in Hoyer's medium. The morphology of mites was studied using a light microscope (model BX51, Olympus, Tokyo, Japan) equipped with phase contrast illumination. The systematics of Heterostigmata follows that of Khaustov (2008). All materials are deposited in the Acarological Collection, Department of Entomology, Faculty of Agriculture, Tarbiat Modares University, Tehran, Iran.

Superfamily Dolichocyboidea Mahunka, 1970 Family Dolichocybidae Mahunka, 1970 Genus *Pvania* Lombardini, 1949

Pvania kamalii Hajiqanbar & Khaustov, 2010

Material examined – 7 ♀, Mazandaran province, Noor, forest park, from under elytra of the beetle *Scarabaeus* sp. (Col.: Scarabaeidae), 4 August 2016, collected from livestock dung.

World distribution – Iran, North Khorasan province, phoretic on *Scarabaeus* spp. (Hajiqanbar and Khaustov 2010); Mazandaran province (current study).

Superfamily Trochometrдиоidea Mahunka, 1970 Family Trochometridiidae Mahunka, 1970 Genus *Trochometridium* Cross, 1965

Trochometridium kazachstanicum Khaustov & Eidelberg, 2002

Material examined – 5 ♀, Mazandaran province, Miankaleh, 15 August 2016, from under elytra of *Copris lunaris* (L.) (Col.: Scarabaeidae) attracted to light trap.

World distribution – Kazakhstan, associated with a carabid beetle *Machozetus* sp. (Khaustov and Eidelberg 2002); Iran, Razavi Khorasan province, phoretic on ventral body surfaces of *Gymnopleurus* (s. str.) *mopsus persianus* Reitter (Coleoptera: Scarabaeidae) (Hajiqanbar *et al.* 2009); Mazandaran province (current study).

Remarks – The *Copris lunaris* is a new host record for this mite.

Trochometridium kermanicum Mortazavi & Hajiqanbar, 2011

Material examined – 3 ♀, Mazandaran province, Miankaleh peninsula, 15 August 2016, from under elytra of *Coccobius schreberi* (L.) (Col.: Scarabaeidae), collected from cows dung.

World distribution – Iran, Kerman province, associated with *Paulusiella* sp. (Coleoptera: Elateridae) (Mortazavi *et al.* 2011); Razavi Khorasan province, associated with *Komarowia tartara* (Saussure) (Hymenoptera: Tiphidae) (Loghmani *et al.* 2014a); Golestan province, associated with *Labidura riparia* (Pallas) (Dermaptera: Labiduridae) (Rahiminejad *et al.* 2014); Mazandaran province (current study).

Remarks – The *Coccobius schreberi* is a new host record for this mite.

Superfamily Pygmephoroidae Cross, 1965
Family Microdispidae Cross, 1965
Genus Paramicrodispus Khaustov, 2009

***Paramicrodispus crenulatus* (Savulkina, 1978)**

Material examined – 5♀, Mazandaran province, Noor Forest, 17 May 2016, under elytra of *Gnorimus subcostatus* (Mentries) (Col.: Scarabaeidae), collected from rotten logs; 4♀, Mazandaran Province, vicinity of Behshahr, 17 July 2016, under elytra of *Parandra caspia* Ménériès, 1832 (Col.: Cerambycidae).

World distribution – Bulgaria, in the nest of a small mammal (Savulkina 1978); Crimea, beneath elytra of a carabid beetle *Pterostichus niger* (Schaller) and in a rotten log of *Fagus orientalis* (Khaustov 2009). Iran, Gorgan province, phoretic on *Oryctes nasicornis* L. (Col.: Scarabaeidae) (Hajiqanbar *et al.* 2012); Mazandaran province (current study).

Remarks – This is the first report of the relationship between mites of family Microdispidae and beetles of the family Cerambycidae. Also, *Gnorimus subcostatus* is new host record for the mite *Paramicrodispus crenulatus*.

Family Neopygmephoridae Cross, 1965
Genus Petalomium Cross, 1965

***Petalomium kurosai* Khaustov, 2014**

Material examined – 3♀, Mazandaran province, Neka Forest, 14 August 2016, associated with *Lasius turcicus* Santschi (Hymenoptera: Formicidae).

World distribution – Russia (Western Siberia), associated with *Lasius niger* (L.) and *Tetramorium caespitum* (L.) (Khaustov 2014); Iran (current study).

Remarks – This species is a new record for mite fauna of Iran. *Lasius turcicus* is also a new host record for this mite species.

Family Pygmephoridae Cross, 1965
Genus Elattoma Mahunka, 1969

***Elattoma cerambycidum* Rahiminejad & Hajiqanbar, 2011**

Material examined – 7♀, Mazandaran province, Neka forest, 4 July 2016, from under elytra of *Morimus verecundus* (Falderman) (Coleoptera: Cerambycidae).

World distribution – Iran, Golestan province, phoretic on *Morimus verecundus* (Coleoptera: Cerambycidae) (Rahiminejad *et al.* 2011); Mazandaran province (current study).

Genus *Metapygmephorellus* Rahiminejad, Hajiqanbar & Khaustov, 2015

***Metapygmephorellus colydius* Rahiminejad & Hajiqanbar, 2015**

Material examined – 1♀, Mazandaran province, Noor forest, 12 June 2016, from under elytra of

Parandra caspia Ménériès (Coleoptera: Cerambycidae).

World distribution – Iran, Golestan province, phoretic on *Colydium elongatum* (F.) (Coleoptera: Zopheridae) and *Dorcus parallelipedus* (L.) (Coleoptera: Lucanidae) (Rahiminejad *et al.* 2015); Mazandaran province (current study).

Remarks – Cerambycid beetle *Parandra caspia* is a new phoretic host for mites of the genus *Metapygmephorellus*.

Genus *Propygmephorus* Cross, 1974

Propygmephorus crossi Katlav & Hajiqanbar, 2016

Material examined – 2♀, Mazandaran province, Sisangan forest, 19 May 2016, associated with *Lucanus ibericus* Motschulsky (Coleoptera: Lucanidae).

World distribution – Iran, Mazandaran province, phoretic on carabid beetles *Pseudoophonus rufipes* (De Geer) and *Pterostichus caspius* (Menetries) (Coleoptera: Carabidae) (Katlav *et al.* 2016); and current study.

Remarks – Lucanid beetle *Lucanus ibericus* is a new phoretic host for mites of the genus *Propygmephorus*.

Genus *Pseudopygmephorellus* Khaustov, 2008

Pseudopygmephorellus mazandaranicus Katlav & Hajiqanbar, 2015

Material examined – 7♀, Mazandaran province, Mazichal elevations, 14 June 2016, from under elytra of *Onthophagus* sp. (Coleoptera: Scarabaeidae), collected from cow's dung.

World distribution – Iran, Mazandaran province, phoretic on scarabaeid beetles *Onthophagus* sp., *Aphodius depressus* (Kugelann) and *A. varians* Dufschmid (Coleoptera: Scarabaeidae) (Katlav *et al.* 2015); and current study.

Family Scutacaridae Oudmans, 1916

Genus *Archidispus* Karafiat, 1959

Archidispus minor Karafiat, 1959

Material examined – 2♀, Mazandaran province, Miankaleh, 6 August 2016, from under elytra of *Harpalus* sp. (Coleoptera: Carabidae), attracted to light trap.

World distribution – Austria, Germany, Greece, Hungary, India, Poland, Ukraine and Iran (Razavi Khorasan province) associated with several beetles of the family Carabidae including *Acupalpus* spp., *Agonum* spp., *Amara* spp., *Anisodactylus binotatus*, *Calathus* spp., *Harpalus* spp., *Poecilus* spp., *Pterostichus* spp., *Pseudoophonus calceatus* Duft, *Stenolophus* spp. (Ebermann 1991; Khaustov 2008; Loghmani *et al.* 2014b); Mazandaran province (current study).

Genus *Imparipes* Berlese, 1903

***Imparipes sevastianovi* Khaustov, 2008**

Material examined – 2♀, Mazandaran province, Behshahr, Abbas-Abad forest, 16 August 2016, associated with *Lasius flavoniger* Seifert (Hymenoptera: Formicidae).

World distribution – Ukraine, associated with *Lasius fuliginosus* Latreille (Khaustov 2008); Russia (Western Siberia) associated with *L. fuliginosus* (Khaustov 2016); Iran (current study).

Remarks – This is the first record of *I. sevastianovi* from Iran. Moreover, *Lasius flavoniger* is a new host record for *I. sevastianovi*.

Genus *Scutacarus* Gros, 1845

***Scutacarus acarorum* (Goeze, 1780)**

Material examined – 2♀, Mazandaran province, Behshahr, 19 July 2017, phoretic on *Bombus* sp. (Hymenoptera: Apidae).

World distribution – Holarctic, associated with various bumblebees or their nests (Khaustov 2008) and sometimes as hyperphoresy on deutonymphs of *Parasitellus* mites (Mesostigmata: Parasitidae) (Schousboe 1986). Iran, Ardabil province, associated with *Bombus argillaceus* (Scopoli) (Kazemi and Kamali 2006); Mazandaran province (current study).

***Scutacarus hystrichocentrus* Sevastianov, 1983**

Material examined – 1♀, Mazandaran province, Behshahr, Abbas-Abad forest, 16 August 2016, associated with *Parandra caspia* (Coleoptera: Cerambycidae).

World distribution – Ukraine, associated with *Lasius niger* (L.) and *L. alienus* (Foerster) (Khaustov 2008); Iran (current study).

Remarks – This is a new record for mite fauna of Asia. Moreover, *Parandra caspia* is a new host record for mites of the family Scutacaridae.

DISCUSSION

This study revealed one of representatives of the beetle family Cerambycidae, *Parandra caspia*, hosting three species of pygmephoroids belonging to three different families. They are *Paramicrodispus crenulatus* (Microdispidae), *Metapygmephorellus colydius* (Pygmephoridae) and *Scutacarus hystrichocentrus* (Scutacaridae). *Parandra caspia* is distributed in Azerbaijan (Europe) and Iran (Asia) with a three-year life cycle and is polyphagous in deciduous trees. This beetle usually attacks two-year old dead host plants which are first attacked by other wood boring insects. Therefore, such habitat can probably provide a suitable niche for their progeny and also some fungivorous mites phoretic on adult beetles.

Previously, mites of the families Microdispidae and Scutacaridae were never found to be associated with beetles of the family Cerambycidae [see Hajiqanbar and Hosseininaveh (2014) for microdispids; and Khaustov (2008) and Baumann (2018) for scutacarids]. In Pygmephoridae, only some members of the genus *Elattoma* have been recorded from cerambycids (see Rahiminejad *et al.* 2011, 2016). *Paramicrodispus crenulatus* and *Metapygmephorellus* spp. have been earlier recovered from xylophagous or subcortical beetles (Hajiqanbar *et al.* 2012; Rahiminejad *et al.* 2016), although

S. hystrichocentrus has been collected from some ants (Khaustov 2008). Rotten woods and coarse woody debris mostly contain a large diversity of saproxylic fungi in forest ecosystems (like northern forests of Iran) and discovery of different fungivorous mites on any xylophagous, subcortical and saproxylic insects is quite possible.

Eleven genera of different families of Heterostigmata have been found in this study. In Table 1, numbers of included species of these genera in the world and Iran have been compared. It can be concluded that scutacarid species-rich genera (*Archidispus*, *Imparipes* and *Scutacarus*) need more attention and are to be further collected in various parts of Iran.

Table 1. Comparison of species number of some heterostigmatic genera in the world and Iran.

Genus name	No. of world species	Reference	No. of Iranian species	Reference
<i>Pavana</i>	27	Hajiqanbar <i>et al.</i> (2019)	15	Sobhi <i>et al.</i> (2017b); Hajiqanbar <i>et al.</i> (2019)
<i>Trochometruidium</i>	6	Loghmani <i>et al.</i> (2014a)	5	Loghmani <i>et al.</i> (2014a)
<i>Paramicrodispus</i>	3	Hajiqanbar <i>et al.</i> (2012)	2	Hajiqanbar and Sobhi (2018)
<i>Petalomium</i>	50	Silva <i>et al.</i> (2019)	10	Abbasi-Moqadam <i>et al.</i> (2018); Navabi <i>et al.</i> (2018); this study
<i>Elattoma</i>	10	Rahiminejad <i>et al.</i> (2011)	3	Rahiminejad <i>et al.</i> (2011, 2014)
<i>Metapygmephorus</i>	3	Rahiminejad <i>et al.</i> (2015)	1	Rahiminejad <i>et al.</i> (2015)
<i>Propygmephorus</i>	2	Katlav <i>et al.</i> (2016)	1	Katlav <i>et al.</i> (2016)
<i>Pseudopygmephorus</i>	8	Khaustov and Frolov (2019)	2	Katlav <i>et al.</i> (2015); Sobhi <i>et al.</i> (2017b)
<i>Archidispus</i>	>70	Khaustov (2008); Kurosa (2009); Katlav <i>et al.</i> (2016); Baumann (2018)	7	Sobhi <i>et al.</i> (2017a)
<i>Imparipes</i>	>160	Ebermann (1998); Khaustov (2008); Baumann and Ferrugut (2019)	17	Sobhi <i>et al.</i> (2017a); this study
<i>Scutacarus</i>	>400	Khaustov (2008); Khaustov and Minor (2018)	18	Sobhi <i>et al.</i> (2017a); this study

ACKNOWLEDGEMENTS

We are grateful to the following entomologists for help to identify different host insects: A. Anichtchenko (Latvia), A. Frolov (Russia), A. Radchenko (Ukraine), and B. Seifert (Germany).

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کنه‌های هترواستیگما (Acari: Trombidiformes: Prostigmata) مرتبط با سخت‌بالپوشان و

بال‌غشائیان در استان مازندران، شمال ایران

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چکیده

در مطالعه‌ای که در مورد کنه‌های هترواستیگمای مرتبط با حشرات در استان مازندران، شمال ایران، طی سال‌های ۱۳۹۵ و ۱۳۹۶ انجام گرفت در مجموع ۱۳ گونه متعلق به ۱۱ جنس از شش خانواده شناسایی شد. در بین آنها سه گونه *Imparipes sebastianovi* Khaustov, 2008 و *Petalomium kurosai* Khaustov, 2014 و *Scutacaridae* *Scutacarus hystrichocentrus* Sevastianov, 1983 (Neopygmephoridae) گزارش‌های جدیدی برای فون کنه‌های ایران هستند. گونه *S. hystrichocentrus* نیز برای فون کنه‌های آسیا جدید است. هشت گزارش میزبانی جدید مورد استناد قرار گرفته و مناطق انتشار کنه‌ها بازبینی شده است. سوسک‌های خانواده *Cerambycidae* برای نخستین بار به عنوان میزبان کنه‌های خانواده *Microdispidae* و *Scutacaridae* در جهان گزارش می‌شوند.

واژگان کلیدی: مورچه؛ زنبور؛ سوسک؛ گزارش جدید؛ گزارش میزبانی جدید.

اطلاعات مقاله: تاریخ دریافت: ۱۳۹۸/۶/۲، تاریخ پذیرش: ۱۳۹۸/۷/۴، تاریخ چاپ: ۱۳۹۸/۷/۲۳