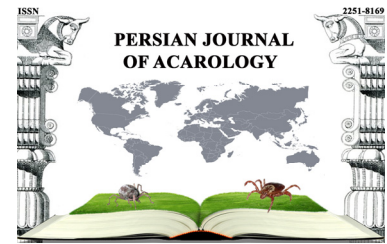




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## Article

### New records of mites of the Heterostigmata (Acari: Prostigmata) associated with insects from Golestan Province, northern Iran

Vahid Rahiminejad<sup>1,2</sup> and Hamidreza Hajiqanbar<sup>1\*</sup>

1. Department of Entomology, Faculty of Agriculture, Tarbiat Modares University, 14115-336, Tehran, Iran; E-mail: [hajiqanbar@modares.ac.ir](mailto:hajiqanbar@modares.ac.ir)

2. Current address: Department of Plant Protection, Faculty of Plant Production, Gorgan University of Agricultural Science and Natural Resource, Golestan, Iran.

\* Corresponding author

#### ABSTRACT

Moderate and humid region in north of Iran is home to a rich arthropod fauna, yet the mite fauna of Golestan province, with moderate Caspian climate, is poorly studied systematically. In this study, we conducted a faunistic study on heterostigmatic mites (Acari: Prostigmata: Eleutherengonides) associated with insects in Golestan Province. We used both day and overnight sampling methods to capture host insects in sampling sites. Thirteen species of seven heterostigmatic families were identified: Dolichocybidae (one species), Carabacaridae (one species), Trochometrididae (one species), Neopygmephoridae (three species), Pygmephoridae (three species), Scutacaridae (two species) and Microdispidae (two species). The genus *Formicomotes* and subgenus *Imparipes* (*Sporichneuthes*) are new records for Iran and Asia, respectively. Beyond this, 13 new insect host records are reported for heterostigmatic mites. Finally, the world distribution of the recovered mites is reviewed.

**KEY WORDS:** Female; insect; new host record; north of Iran; phoresy.

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#### INTRODUCTION

More than 2000 described species of Heterostigmata (Acari: Prostigmata) are classified in eight superfamilies (Walter *et al.* 2009; Zhang *et al.* 2011). This cohort includes primarily fungivorous species, along with other representatives with free-living and parasitic lifestyles. Phoresy is observed in majority of the species, generally in association with insects (Kaliszewski *et al.* 1995; Walter *et al.* 2009). The taxonomical and biological aspects of these small-sized mites (140–600 µm) are poorly studied in most parts of the world (Lindquist 1986; Walter *et al.* 2009). Golestan Province, in northern Iran, is located along southern shore of Caspian Sea and north of Alborz mountains. It has a moderate and humid climate providing an ideal habitat for a diverse arthropod fauna including mites. Nevertheless, around three genera and 17 heterostigmatic species have been described from Golestan so far (see Rahiminejad *et al.* 2011a, b, c; Hajiqanbar *et al.* 2012; Hosseinaveh *et al.* 2013; Hajiqanbar and Hosseinaveh 2014; Rahiminejad and Hajiqanbar 2015; Rahiminejad *et al.* 2015a, b; Hosseinaveh *et al.* 2015; Rahiminejad *et al.* 2016). Such limited faunistic knowledge about these

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mites in this region may prompt more taxonomical studies to better understand their species diversity and complex symbiotic relationships with insects. Pursuant to this objective and along with impact of these mites on the transmission of some plant pathogens and also their beneficiary aspects in biocontrol of agricultural pests (Kaliszewski *et al.* 1995; Moser *et al.* 2010; Rahiminejad *et al.* 2011b), this study was performed in Golestan province, northern Iran.

## MATERIALS AND METHODS

The host insect specimens were captured using light trap, netting or direct sampling from their habitats during spring, summer and autumn 2013 and 2014 from various habitats of Golestan province in northern Iran and preserved in 75% ethanol. Mites were collected from their hosts under an Olympus stereomicroscope and cleared in lactophenol. The mites were mounted in Hoyer's medium and studied with a phase contrast microscope (model BX51, Olympus). The taxonomical hierarchy used here follows that of Kaliszewski *et al.* (1995) and the classification system of Pygmephoroida follows that of Khaustov (2004, 2008b). All obtained specimens were adult females. All materials were collected by the first author. The host insects were identified with the sincere help of some experts: Dr. A. Anichtchenko (Institute of Systematic Biology, Daugavpils University, Latvia) for carabid beetles, Dr. G.V. Nikolajev (Al-Farabi Kazakh National University, Almaty, Kazakhstan) for scarabaeid beetles, Dr. Mikhail Danilevsky (Russian Academy of Sciences, St. Petersburg, Russia) for cerambycid beetles and Dr. Bernhard Seifert (Department of Entomology, Senckenberg Museum für Naturkunde, Berlin, Germany) for ant hosts. All materials are deposited in the Acarological Collection, Department of Entomology, Faculty of Agriculture, Tarbiat Modares University, Tehran, Iran.

## NOTES ON THE RESULTS

The mites are arranged alphabetically by families within superfamilies, genera within families and species within genera.

**World distribution** – Country(ies), host(s) [as given in source publication], source publication(s).

**Material examined** – All available data about species, host(s), sampling method(s) and location(s).

**Remarks** – Any relevant information [new record for fauna of Iran and/or new host record(s)].

## RESULTS

### Cohort Heterostigmata

#### Superfamily Dolichocyboidea Mahunka, 1970

#### Family Dolichocybidae Mahunka, 1970

#### Genus *Formicomotes* Sevastianov, 1980

#### *Formicomotes octipes* Sevastianov, 1980

**World distribution** – Ukraine, 14 females associated with *Lasius fuliginosus* (Latreille) (Hym.: Formicidae) (Sevastianov 1980). Crimea, 31 females in wet forest litter under oriental beech *Fagus orientalis* Lipsky (Khaustov and Frolov 2018).

**Material examined** – Two females removed from a vial containing 22 *Tetramorium* sp. (Hym.: Formicidae) and 2 females extracted from a vial containing 11 *Tetramorium* sp., both captured by a light trap in shore of Caspian Sea, Bandar-E-Turkmen, 36.89 N, 54.05 E, and altitude 1 m a.s.l., 6 May 2013 and in Oak forest in the Alang-Dareh forest, Gorgan, 36.46 N, 54.26 E, and altitude 301 m a.s.l., 16 August 2014, respectively.

**Remarks** – Genus *Formicomotes* is new for mite fauna of Asia. Also, this is a new association between this mite and the ant genus *Tetramorium*. Another species of this genus, *F. heteromorphus* Magowski, 1988 reported from Thailand as a pest of cultivated mushroom, *Auricularia polytricha* (Walter *et al.* 2009). Third species of the genus, *Formicomotes brasiliensis* Khaustov and Forolov, 2018 was described associated with termite workers, *Nasutitermes* sp., from Brazil (Khaustov and Frolov 2018).

**Superfamily Pygmephoroidae Cross, 1965**  
**Family Microdispidae Cross, 1965**  
**Genus Premicrodispus Cross, 1965**

***Premicrodispus longicaudus* Khaustov, 2006**

**World distribution** – Crimea, in a soil sample (Khaustov 2006); Iran, in a soil sample of pomegranate orchards (Filekesh *et al.* 2014).

**Material examined** – Three colonies of females were obtained in the vials containing beetles *Geotrupes spiniger* (Col.: Geotrupidae) and *Lucanus ibericus* (Col.: Lucanidae) during over-night samplings by a light trap in Alang-Dareh forest, Gorgan, HezarPich hill 36.83 N, 54.39 E, and altitude 430 m a.s.l., Gorgan and Kordkuy forest 36.75 N, 54.11 E, and altitude 50 m a.s.l., during Summer 2014.

**Remarks** – This is the first phoresy record for this mite.

***Premicrodispus rackae* Khaustov, 2006**

**World distribution** – Crimea, in nest of an undetermined small mammal (Khaustov 2006); Iran, Golestan province, in bottom of a vial containing ethanol and two beetles *Oryctes nasicornis* L. (Coleoptera: Scarabaeidae) (Badoodam *et al.* 2015).

**Material examined** – Several colonies of this species were extracted from vials containing beetles of the *Geotrupes spiniger* (Col.: Geotrupidae) during over-night samplings by a light trap in Alang-Dareh forest, Gorgan, AliAbad forest 36.88 N, 54.89 E, and altitude 155 m a.s.l., during Spring and Summer 2013.

**Remarks.** The *G. spiniger* is a new host record for this mite.

**Family Neopygmephoridae Cross, 1965**  
**Genus Kerdabania Khaustov, 2009**

***Kerdabania minuta* Khaustov, 2009**

**World distribution** – Ukraine, from soil (Khaustov 2009); Iran, associated with *Ophion obscuratus* Fabricius (Hym.: Ichneumonidae) (Loghmani *et al.* 2014a).

**Material examined** – One mite colony including four specimens of the mite associated with *Geotrupes spiniger* (Marsham, 1802) (Col.: Geotrupidae) was found. The hosts captured by a light trap in AlangDareh forest, Gorgan, 08 August 2014.

**Remarks** – This is a newly uncovered association between this mite and a beetle.

**Genus Petalomium Cross, 1965**

***Petalomium crinitus* Khaustov and Trach, 2013**

**World distribution** – Ukraine, associated with *Lasius* sp. (Hym.: Formicidae) (Khaustov and Trach 2013). It was also recorded from Western Siberia, Russia in association with *Lasius niger* (Khaustov and Tolstikov 2016). This species is also reported from an unidentified species of *Lasius* from Isfahan, Iran (Tajodin 2013).

**Material examined** – One specimen associated with *Tetramorium* sp. (Hym.: Formicidae) was found, the hosts captured by a light trap in Alang-Dareh forest, Gorgan, 30 June 2014.

**Remarks** – This is the first known phoretic association between the mite and the ant genus *Tetramorium*.

#### *Petalomium nataliae* (Sevastianov, 1967)

**World distribution** – This species was described from Belarus and Ukraine where it was collected from the ant *Lasius niger* (L.) (Hym.: Formicidae) (Sevastianov 1967). It was also recorded from Japan (Kurosa 1980), Hungary (Mahunka 1986) and Switzerland (Mahunka 1977) from *L. niger*. Finally, Khaustov (2014) reported it from Russia associated with *Tetramorium caespitum* (L.) and *Lasius niger*.

**Material examined** – Six specimens obtained from *Tetramorium* sp. (Hym.: Formicidae). The hosts captured by a light trap in Nokandeh forest, Bandar-E-Gaz, 36.70 N, 53.94 E, and altitude 15 m a.s.l., 05 July 2014.

**Remarks** – This is a new record for mite fauna of Iran.

#### Family Pygmephoridae Cross, 1965 Genus *Elattoma* Mahunka, 1969

#### *Elattoma kornilovi* Khaustov, 2000

**World distribution** – Crimea, in association with beetles *Dryocoetes villosus* (Fabricius) and *Taphrorychus villifrons* (Dufour) (Col.: Curculionidae: Scolytinae) (Khaustov 2000).

**Material examined** – One mite colony including six specimens attached to ventral body surface (around coxae II-III) of *Morimus verecundus* (Faldermann) (Col.: Cerambycidae) was found. The hosts captured directly in forest of Gorgan, Bandar-E-Gaz, Nokandeh and Kordkoy during Summer 2013–14.

**Remarks** – *Morimus verecundus* is a new host record for this mite. Also, this species is a new record for mite fauna of Asia.

#### Genus *Pediculaster* Vitzthum, 1931

#### *Pediculaster camerikae* Khaustov, 2008

**World distribution** – Crimea, in cow dung (Khaustov 2008a); Western Siberia, in cow dung (Khaustov 2020).

**Material examined** – One mite colony including 21 specimens attached to ventral body surface of *Helina* sp. (Diptera: Muscidae) was found. The hosts captured by a light trap in shore of Caspian Sea, Bandar-E-Turkmen, 30 May 2014.

**Remarks** – This species is recorded from Iran for the first time. Also, it is the first record of phoresy for this mite.

#### *Pediculaster pseudomanicatus* Camerik, 2001

**World distribution** – This species was described from the USA for the first time (Camerik 2001). It also was reported from Germany (Rack 1974) as *P. manicatus* (Berlese, 1904). Then, Khaustov (2008a) found it in the soil and reported for the Ukrainian fauna. The species reported from Iran in several cases (Hajiqanbar 2002; Haddad Irani-Nejad *et al.* 2005).

**Material examined** – One mite colony including 12 specimens detached from ventral body surface of *Helina* sp. (Diptera: Muscidae). The hosts captured by a light trap in shore of Caspian Sea, Bandar-E-Turkmen, 06 June 2013.

**Remarks** – The genus *Helina* is a new host record for this mite.

### Family Scutacaridae Oudemans, 1916

#### Genus *Archidispus* Karafiat, 1959

#### *Archidispus szaboi* Mahunka, 1977

**World distribution** – Hungary and Ukraine, under elytra of *Pogonistes rufoaeneus* Dej (Col.: Carabidae) (Khaustov 2008b).

**Material examined** – Three females of the species extracted from *Amara* sp. (Col.: Carabidae) which were collected by a light trap in shore of Caspian Sea, Bandar-E-Turkmen, 15 September 2013.

**Remarks** – This is a new record for mite fauna of Iran.

#### Genus *Imparipes* Berlese, 1903

#### *Imparipes (Sporichneuthes) intermedius* Paoli, 1911

**World distribution** – Italy and Ukraine, collected from forest soil and litter (Khaustov 2008b).

**Material examined** – One specimen of the species was obtained in a vial containing alcohol and beetles *Onthophagus* sp. (Col.: Scarabaeidae) during over-night sampling by a light trap in Alang-Dareh forest, Gorgan, 5 August 2014.

**Remarks** – This is the first record of phoresy for this mite species. The subgenus *Imparipes (Sporichneuthes)* is reported from Asia for the first time.

### Superfamily Pyemotoidea Oudemans, 1937

#### Family Caraboacaridae Mahunka, 1970

#### Genus *Caraboacarus* Krczal, 1959

#### *Caraboacarus stammeri* Krczal, 1959

**World distribution** – The species has been recorded from Holarctic, and has the most distribution and least host specificity among all caraboacarid mites (Katlav *et al.* 2015).

**Material examined** – Three large colonies of females obtained under the elytra of ground beetles of *Calosoma* Weber, 1801 and *Harpalus* Latreille, 1802. The host beetles were collected from all over the Golestan Province during Summer 2014.

**Remarks** – This is the first report of the family Caraboacaridae in Golestan Province.

### Superfamily Trochometrдиоidea Mahunka, 1970

#### Family Trochometridiidae Mahunka, 1970

#### Genus *Trochometridium* Cross, 1965

***Trochometridium kermanicum* Mortazavi & Hajiqanbar, 2011**

**World distribution** – Iran: Kerman Province, collected from *Paulusiella* sp. (Col.: Elateridae); Razavi Khorasan Province, ex. *Komarowia tartara* (Saussure) (Hym.: Tiphidae); Mazandaran Province, under elytra of *Coccobius schreberi* (L.) (Col.: Scarabaeidae) (Mortazavi *et al.* 2011; Loghmani *et al.* 2014b; Hajiqanbar and Arjomandi 2019).

**Material examined** – Two specimens of the mite *Trochometridium kermanicum* found in a vial containing ethanol 75% and five earwigs of the *Labidura riparia* (Pallas, 1773) (Derm.: Labiduridae) and three specimens of the mite associated with *Gryllus desertus* Pall (Orthoptera: Gryllidae) in shore of Caspian Sea, Bandar-E-Turkmen, 36.89 N, 54.05 E, and altitude 1 m a.s.l., 12 July 2013 and three September 2014.

**Remarks** – The *G. desertus* is a new host record for the mites of the family Trochometridiidae. This is the first record of phoresy of this mite on earwigs. Also, this is the second report of phoresy of the family Trochometridiidae and the order Dermoptera. Previously, *T. chinensis* (Mahunka, 1966) was reported in association with an earwig belonging to the family Labiduridae from North Khorasan province (Hajiqanbar *et al.* 2009; Mortazavi *et al.* 2011).

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## گزارش‌های جدید از کنه‌های هترواستیگما (*Acari: Prostigmata*) مرتبط با حشرات از استان گلستان، شمال ایران

وحید رحیمی نژاد<sup>۱</sup> و حمیدرضا حاجی‌قنبر<sup>۱\*</sup>

۱- گروه حشره‌شناسی کشاورزی، دانشکده کشاورزی، دانشگاه تربیت مدرس، تهران، ایران؛ رایانامه: [hajiqanbar@modares.ac.ir](mailto:hajiqanbar@modares.ac.ir)

۲- آدرس فعلی: گروه گیاه پزشکی، دانشکده تولیدات گیاهی، دانشگاه علوم کشاورزی و منابع طبیعی گرگان، گلستان، ایران.

\* نویسنده مسئول

### چکیده

ناحیه مرطوب و معتدل در شمال ایران فون غنی از بندپایان را در خود جای داده است، با این حال فون کنه‌های استان گلستان، با آب و هوای معتدل خزری، به میزان اندکی مطالعه شده و بررسی‌های سیستماتیک بیشتری نیاز دارد. در این مطالعه، فون کنه‌های هترواستیگما (*Acari: Prostigmata: Eleutherengonides*) مرتبط با حشرات در استان گلستان بررسی شد. از هر دو روش نمونه‌برداری روزانه و شبانه برای به دام انداختن حشرات در مناطق نمونه برداری استفاده شد. سیزده گونه از هفت خانواده هترواستیگما شناسایی شدند: *Dolichocybidae* (یک گونه)، *Carabacaridae* (یک گونه)، *Trochometridiidae* (یک گونه)، *Neopygmephoridae* (سه گونه)، *Pygmephoridae* (سه گونه)، *Scutacaridae* (دو گونه) و *Microdispidae* (دو گونه). جنس *Formicomotes* و زیرجنس *Imparipes (Sporichneuthes)* به ترتیب گزارش‌های جدید برای ایران و آسیا هستند. افزون بر این، ۱۳ رکورد میزبانی جدید از حشرات برای کنه‌های هترواستیگما گزارش می‌شود. همچنین، مناطق انتشار جهانی کنه‌های جمع‌آوری شده مرور شده است.

**واژگان کلیدی:** ماده؛ حشره؛ گزارش میزبانی جدید؛ شمال ایران؛ همسفری.

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