Article

Contribution to the Pachylaelapidae (Acari: Mesostigmata) fauna in some parts of Guilan province of Iran

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ABSTRACT
A faunistic study on the family Pachylaelapidae in forest and garden habitats from some regions in Guilan province, northern Iran, was carried out during 2015–2016. The samples were taken from soil, decaying organic matter, especially humus, rotten wood, moss and plant remains. A total of 10 species, belonging to three genera, were collected and identified, among them, Onchodellus squamosus Koroleva is newly recorded from Iran. Onchodellus and Pachylaelaps grandis Koroleva were considered as the most specious genus and the most frequent species, respectively. Some morphological characters and distributions of the species in Iran are discussed herein.

KEY WORDS: Edaphic mites; Eviphidoidea; fauna; forest; Gamasina.

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INTRODUCTION
Mites of the family Pachylaelapidae Berlese, 1913 (Mesostigmata: Eviphidoidea) are relatively poorly known in comparison with other groups of Mesostigmata (Mašán and Halliday 2014a). Members of this group are found in all kinds of decomposing organic matter, especially soil, humus, leaf-litter, moss, dead-wood and plant debris, as well as the nests of mammals, birds and social insects (Mašán 2007). They include a cosmopolitan group of predatory mites with considerable ecological and behavioral diversity (Mašán and Halliday 2014b). They feed on a range of micro-invertebrates and often have common habitat with the family Macrochelidae (Lindquist et al. 2009). Many species are associated with coprophilous insects, especially scarabaeid dung beetles, while some genera appear to be exclusively myrmecophilous (Mašán 2007).

Fauna of the family Pachylaelapidae Berlese, 1913 is poorly known in Iran (Ahadiyat et al. 2014). Kazemi and Rajaei (2013) listed five genera and 18 species from different provinces of the country, among them some species have been currently transferred into another genus and even another family. Recently, one new record, Pachylaelaps (Longipachylaelaps) vicarius Mašán, 2007, and three new species, including Pachyseius masanisimilis Ahadiyat & Ghasemi Moghadam, 2016, P. persicus Babaieian & Mašán, 2016, and P. angustoides Babaieian & Mašán, 2016, have been reported and described from Iran (Ahadiyat et al. 2014, 2016; Babaieian et al. 2016 a, b). Fauna of pachylaelapid mites in Guilan province, as one of the northern provinces of Iran with various microhabitats, is still
unknown. Nejadghanbar et al. (2010) reported an unidentified species of Pachyseius Berlese, 1910 from eastern Guilan, and Nazari-Tajani et al. (2012) found four species of three genera, including Olopachys compositus Koroleva, 1976, Onchodellus procerus Mašán, 2003, Pachylaelaps pectinifer (G. Canestrini, 1881) and P. resinae Karg, 1971 in citrus orchards from Guilan province. The aim of this research is to represent mite species of the Pachylaelapidae in some regions of Guilan province and discuss about their national and worldwide distribution.

MATERIALS AND METHODS

Mite specimens were collected by the senior author (SM) from soil under the broad- and needle-leaved forests and fruit orchards, decaying organic matter especially humus, rotten wood, moss and plant remains from seven regions in Guilan province, including pine forest of Guilan University (37° 19' N, 49° 63' E, altitude: 29 m a.s.l.), forests of Saravan (37° 06' N, 49° 66' E, altitude: 72 m a.s.l.), Imamzadeh Hashem (37° 02' N, 49° 62' E, altitude: 113 m a.s.l.) in Rasht, Astaneh-Ashrafieh Safrabasteh (37° 34' N, 49° 97' E, altitude: −18 m a.s.l.), Shaft Chubar (37° 17' N, 49° 40' E, altitude: 40 m a.s.l.), Rezvanshahr-Talesh Gisoum (37° 67' N, 49° 02' E, altitude: −10 m a.s.l.) and citrus orchards in east of the province from June 2015 to August 2016. They were extracted using Berlese-Tullgren funnels, preserved in 75% ethanol, cleared in Nesbitt's fluid and then mounted on microscope slides using Hoyer's medium in the Acarology Laboratory of Plant Protection Department of Guilan University. The slides were placed in an oven at 45°C for two weeks. Specimens were identified by the relevant taxonomic keys and papers presented by Koroleva (1977b) and Mašán (2007). Precise observation of morphological details and measurements were made using compound microscope equipped with differential interference contrast and phase contrast optical system, and a drawing tube. Measurements are given in micrometres (μm). Lengths of dorsal, sternal, genitiventral, and genitiventrianal shield were measured from the anterior to posterior margins along their midlines. Maximum widths of dorsal, ventrianal, anal, and genitiventrianal shields were taken at their widest points. Width of sternal shield was measured at the mid-level of coxae II. Lengths of dorsal setae J1–5 were measured from their bases of their insertions to their tips. Photos were taken by a Leica DM1000 light microscopy equipped with a Canon Camera DS126311. More than one photo were taken for some of the species and selected photos were merged together and arranged into a single photo using Photoshop (version CS6) [computer software]. The specimens examined are partly deposited in the Acarology Collection at the Department of Plant Protection, Faculty of Agricultural Sciences, University of Guilan, Rasht, Iran, and partly deposited in the Acarology Collection of the Department of Entomology, College of Agriculture and Natural Resources, Science and Research Branch, Islamic Azad University, Tehran, Iran.

RESULTS

A total of 10 species, belonging to three genera, were collected and identified, among them eight species are reported for the first time from Guilan province and one species is new for Iran mites fauna. Table 1 shows a list of the species, their habitats, the total number of collected specimens, the collected localities of each species in Guilan province, and their altitudinal ranges (m.s.l.). The list of identified species with some morphological characteristics is as follow:

Pachylaelapidae Berlese, 1913
Genus Olopachys Berlese, 1910

Pachylaelaps (Olopachys) Berlese, 1910: 256.
**Type species:** *Pachylaels* (Olopachys) *scutatus* Berlese, 1910, by original designation.

**Diagnosis**


**Olopachys caucasicus** Koroleva, 1976 (Fig. 1)

**Diagnosis**


**Material examined** – 3 females, Saravan forest, from soil under pine trees, 11 July 2015; 1 female, Rezvanshahr-Talesh Gisoum forest, from moss of oak tree, 24 November 2015; 1 female, Guilan University Pine forest, from soil under pine tree, 25 November 2015; 1 female, Saravan forest, from soil under pine tree, 14 June 2016.

**Distribution and habitats in Iran** – This species was previously found in soil, leaf-litter and decaying trunk of trees in Mazandaran (Nowshahr and Ecology Garden of Nowshahr) and East Azerbaijan (Ahangaran *et al.* 2010; Mohammad-Dustar-Sharaf *et al.* 2016a, b; Saberi *et al.* 2016).

**World distribution** – Armenia and Georgia (Koroleva 1976, 1977b).

**Notes** – This is the first record of this species in Guilan province. According to the original description of the species provided by Koroleva (1976) studying an individual female, the length and width of dorsal shield were considered as 690 and 450, respectively, while here we measured six specimens, most of which were longer and wider than the Koroleva's specimen.

**Olopachys compositus** Koroleva, 1976 (Fig. 2)

**Diagnosis**

Material examined – 2 females, Saravan forest, from soil under pine and oak trees, 11 July 2015; 1 female, Saravan forest, from soil under pine and oak trees, 14 June 2016; 4 females, forest areas of the Imamzadeh Hashem, from soil under poplar trees, 17 June 2016.

Distribution and habitats in Iran – This species was found in soil, leaf-litter, plant debris, floor weeds and sheep manure from Golestan (e.g. Minudasht), Guilan (Region not mentioned), Mazandaran (Ecology Garden of Nowshahr, Namak Darreh of Ramsar, Konse Forest of Tonekabon) and Tehran (Rudbar-e Qasran of Shemiranat) provinces (Kazemi and Ahangaran 2011; Ahadiyat and Cheraghali 2012; Kazemi et al. 2012; Nazari-Tajani et al. 2012; Zakeri et al. 2012; Kazemi and Rajaei.

2013). It was also found in the nest of an ant, *Tapinoma* sp. (Formicidae), in North Khorasan province (Rezaie et al. 2016).

**World distribution** – Georgia (Koroleva 1976, 1977b)

**Genus Onchodellus Berlese, 1904**

*Pachylaelaps* (*Onchodellus*) Berlese, 1904: 452.

**Type species:** *Pachylaelaps* (*Onchodellus*) *reticulatus* Berlese, 1904, by monotypy.

**Diagnosis**

Dorsal shield with 30 pairs of setae. Setae J5 normally developed, needle-like. Posterolateral margins of dorsal idiosoma with one or two pairs of gland pores. Sternal shield fused to metasternal platelets and endopodal elements, bearing four pairs of setae. Peritrematal shields fused to exopodal elements, and developed posteriorly. Genitiventral shield enlarged, closely adjacent to subtriangular anal shield. Soft integument with 10–15 pairs of setae. Hypostomal corniculi short and horn-like. Palp apotele three-tined. Sperm access system associated with coxae III with long and fine spermathecal tubes. Genu I with 12 setae (2-5/3-2). Female tarsus II with one spur-like distal seta (*pl1*). Genu IV and tibia IV each with seven setae (1-4/1-1 and 1-3/2-1, respectively).

**Onchodellus alpinus** (Willmann, 1953)

**Diagnosis**

Female with dorsal shield middle-sized, 580 long, 420 wide (length/width ratio: 1.38), oval, well-reticulated. Dorsal shield setae J1–2 65, J3–4 68, J5 33 long (*J4/J5* ratio: 2.06). Posterolateral margins of dorsal shield with one pair of slit-shaped gland pores (*gdS4*) close to seta *S4*, glands *gdZ1* circular. Sternal shield 164 long, 100 wide (length/width ratio: 1.64), well reticulated. Genitiventral shield 200 long, 216 wide (length/width ratio: 0.92), reticulate-lineate. Anal shield subtriangular, smooth, 64 long, 100 wide (length/width ratio: 0.64). Soft lateral and opisthogastric integument bearing 12 pairs of smooth setae. Tarsus II with one spur-like distal seta. Sperm access system with a spermathecal tube long and sac-like basally.

**Material examined** – 1 female, Saravan forest, from soil under pine tree, 14 June 2016.

**Distribution and habitats in Iran** – This species was firstly recorded in honey bee hives from Tehran province (Region not mentioned) (Rahmani et al. 2006).

**World distribution** – European countries (e.g. Central Europe, Alps area, Austria, Finland and Slovakia) (Karg 1993; Mašán 2007; Mašán and Mihály 2009; Mašán and Halliday 2014a; Huhta 2016).

**Note** – This is the first record of this species in Guilan province.

**Onchodellus hispani** (Berlese, 1908)

**Diagnosis**

Female with dorsal shield oval, middle-sized, 568 long, 368 wide (length/width ratio: 1.54), marginal section reticulate and median section lineate. Dorsal shield setae J1 40, J2–3 76, J4, J5 long (*J4/J5* ratio: 1.63). Sternal shield 200 long, 100 wide (length/width ratio: 2), lateral and median surfaces reticulate and smooth, respectively. Genitiventral shield 208 long, 224 wide, (length/width ratio: 0.92), median section with no reticulation. Anal shield subtriangular and smooth, 64 long, 120 wide, (length/width ratio: 0.53). Soft lateral and opisthogastric integument with 15 pairs of smooth setae. Tarsus II with one spur-like distal seta.

**Material examined** – 1 female, Saravan forest, from soil and humus under pine tree, 11 July 2015.
**Distribution and habitats in Iran** – This species was found in soil from Kerman province (Region not mentioned) (Ahmadi 2002).

**World distribution** – European countries (e.g. Bulgaria, Italy, Poland and Slovakia) (Karg 1993; Mašán 2007; Mašán and Halliday 2009, 2014a; Mašán and Mihál 2009).

**Note** – This is the first record of this species in Guilan province.

*Onchodellus siculus* (Berlese, 1892)

**Diagnosis**


**Material examined** – 1 male, forest areas of the Imamzadeh Hashem, from soil under poplar tree, 18 January 2016; 1 male, Astaneh-Ashrafieh Safrabasteh forest, from soil under oak tree, 14 June 2016.

**Distribution and habitats in Iran** – This species was found in soil, foliage, and in association with a scarabaeid beetle, *Pentodon* sp., from Chaharmahal and Bakhtiari (Shahrekord), Hamedan (Region not mentioned), Kerman (Region not mentioned), West Azerbaijan (Miandoab Plain) provinces (Ahmadi 2002; Haddad Irani-Nejad et al. 2003; Rostami et al. 2010; Babaeian and Kazemi 2011).

**World distribution** – Finland, Germany, Hungary, Korea, Latvia and Slovakia (Karg 1993; Salmane 2001; Salmane and Kontschán 2005; Haddad Irani-Nejad et al. 2003; Rostami et al. 2010; Babaeian and Kazemi 2011).

**Note** – This is the first record of this species in Guilan province.

*Onchodellus squamosus* (Koroleva, 1977) (Fig. 4)

**Diagnosis**

Female with dorsal shield 576 long, 379 wide, (length/width ratio: 1.51). Dorsal shield setae J1, J3–4 80, J2 86, J5 52 (J4/J5 ratio: 1.53). Sternal shield 200 long, 120 wide (length/width ratio: 1.66). Genitiventral shield 200 long, 216 wide (length/width ratio: 0.92). Anal shield 76 long, 120 wide (length/width ratio: 0.63). All idiosomal shields well reticulated. Soft lateral and opisthogastric integument with 14 pairs of smooth setae. Tarsus II with one spur-like distal seta p1l, 35 long. Sperm access system with a long and thin spermathecal tube which widened distally, basal section of the sperm access system indistinct in the specimen examined.

**Material examined** – 1 female, forest areas of the Imamzadeh Hashem, from soil under poplar tree, 17 June 2016.

**World distribution** – Georgia and Taiwan (Koroleva 1977a, b; Ma et al. 2008; Mašán and Halliday 2014a).

**Note** – This is the first record of this species in Iran.

*Onchodellus strigifer* (Berlese, 1892)

**Diagnosis**

Female with dorsal shield 568 long, 340 wide (length/width ratio: 1.67), reticulate posteriorly. Setae J1–2 39, J3 40, J4 52, J5 24 (J4/J5 ratio: 2.16). Sternal shield 164 long, 81 wide (length/width
ratio: 2.02). Genitiventral shield 208 long, 204 wide (length/width ratio: 1.01). Anal shield 76 long, 120 wide (length/width ratio: 0.63). Two pairs of slightly adjacent slit-shaped gland pores (gδZ1, gδS4) on posterolateral margins of dorsal shield. Peritreme extending anteriorly to the level between setae z1 and z2. Soft lateral and opisthogastric integument bearing 11 pairs of smooth setae. Tarsus II with one spur-like distal seta.

**Material examined** – 1 female, Saravan forest, from soil under oak tree, 11 July 2015.

**Distribution and habitats in Iran** – This species was found in soil, leaf-litter, plant debris, orchards, green spaces and parks from Tehran province (e.g. Rudbar-e Qasran of Shemiranat) (Ahadiyat and Cheraghali 2012; Baroozeh and Ahadiyat 2012).

**World distribution** – European countries (e.g. Italy) (Karg 1993; Mašán 2007; Mašán and Halliday 2014a).

**Note** – This is the first record of this species in Guilan province.

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**Figure 4.** Ventral idiosoma of *Onchodellus squamosus* (female). Scale bar = 100 μm.

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**Genus *Pachylaelaps* Berlese, 1888**

*Pachylaelaps* Berlese, 1888: 196.

**Type species:** *Gamasus pectinifer* G. Canestrini, 1881, by subsequent designation (Berlese 1904).
Diagnosis

Dorsal shield with 30 pairs of setae. Setae J5 minute as microsetae or normal in length. Posterolateral margins of dorsal idiosoma with one or two pairs of hypertrophied slit-shaped gland pores. Sternal shield fused to metasternal platelets and endopodal elements, bearing four pairs of setae. Peritrematal shields fused to exopodal elements, and developed posteriorly. Genitiventral shield enlarged, closely adjacent to subtriangular anal shield. Soft integument usually with 14–16 pairs of setae. Hypostomatal corniculi long and sword-like. Palp apotele three-tined. Sperm access systems associated with coxae IV with variably formed spermathecal tubes. Femur I and genu I each with 13 setae (2-5/4-2 and 2-6/3-2, respectively). Tibia I with 12 setae (2-5/3-2). Female tarsus II with two spur-like distal setae (pl1 and pl2). Genu III with seven setae (1-4/1-1).

**Pachylaelaps grandis** Koroleva, 1977

Diagnosis

Female with dorsal shield 920–1040 long, 632–704 wide (length/width ratio: 1.45–1.47). Most of dorsal idiosomal setae long, extending well behind the insertion of next setae. Sternal shield 256–304 long, 128–160 wide (length/width ratio: 1.90–2), reticulated almost in two third anterior half, smooth posteriorly. Genitoventral shield wider than long, 320–360 long, 384–456 wide (length/width ratio: 0.78–0.83), posterior margin straight. Anal shield 96–152 long, 232–256 wide (length/width ratio: 0.41–0.59). Two pairs of adjacent slit-shaped gland pores (gdZ1, gdS4) on posterolateral margins of dorsal shield. Soft lateral and opisthogastric integument bearing 15 pairs of smooth setae, containing eight and seven pairs of opisthogastric and marginal setae, respectively. Tarsus II with two spur-like distal setae.


**Distribution and habitats in Iran** – This species was found in soil, leaf-litter and plant debris in Golestan (Kalale, Minudasht), Mazandaran (Ecology Garden of Nowshahr) and Tehran (Rudbar-e Qasran of Shemiranat) provinces (Ahadiyat and Cheraghali 2012; Zakeri et al. 2012; Saberi et al. 2016).

**World distribution** – Armenia, Georgia and Russia (Koroleva 1977a, b; Mašán and Halliday 2014a).

**Note** – This is the first record of this species in Guilan province.

**Pachylaelaps imitans** Berlese, 1920

Diagnosis

Male with dorsal shield 880 long, 608 wide (length/width ratio: 1.44). Two pairs of closely adjacent slit-shaped gland pores on posterolateral margins of dorsal shield. Tarsus II with two spur-like distal setae. Palptibia with two outgrowths, one of which with needle-like apex. Cheliceral spermatodactyl with one small and lobe-like projection.

**Material examined** – 1 male, Saravan forest, from soil under ironwood, 15 June, 2015.

**Distribution and habitats in Iran** – This species was found from soil in Kerman province (Region not mentioned) (Ahmadi 2002).
World distribution – Georgia, Israel, Italy, Latvia, Russia, Ukraine and Western Europe (Koroleva 1977b; Salmane 2001; Mašán 2007; Mašán and Halliday 2014a).

Note – This is the first record of this species in Guilan province.

**Pachylaelaps pectinifer (G. Canestrini, 1881) (Fig. 3)**

Diagnosis


Material examined – 4 females and 1 male, Astanee-Ashrafieh Safrabasteh forest, from soil under oak trees, 2 July 2015; 1 male, Shaft Chubar forest, from soil under pine tree, 9 June 2016; 1 female, Astanee-Ashrafieh Safrabasteh forest, from soil under oak trees, 14 June 2016.

Distribution and habitats in Iran – This species is widely distributed in Iran. It was found in soil, leaf-litter, plant debris, and in association with a scarabaeid beetle, *Copris hispanus* (Linnaeus, 1764), in Chaharmahal and Bakhtiyari (Saman, Shahrekord), Fars (Northwestern area), Golestan (Marzankalateh), Guilan (Region not mentioned), Isfahan (Najaf Abad, Mobarakhe, Kashan), Kerman (Baft, Jiroft), Lorestan (Khorramabad), Mazandaran (Nowshahr), Tehran (e.g. Rudbar-Qasran of Shemiranat), West Azerbaijan (Miandoab, Urmia) provinces (Jalaeian et al. 2004; Ahangaran et al. 2010; Babaeian and Kazemi 2011; Bahrami et al. 2011; Rajaei et al. 2011; Rezaie et al. 2011; Sekonji et al. 2011; Ahadiyat and Cheragholi 2012; Balouch Shahryari et al. 2012; Ghasemi Moghadam and Ahadiyat 2012; Nazari-Tajani et al. 2012; Hasanvand et al. 2014; Zarei and Kazemi 2014; Abolghasemi and Kazemi 2016; Abutaleb Kermani et al. 2017; Shariati et al. 2017).


**DISCUSSION**

Before the present study, only two publications reported four pachylaelapid species (namely *Olopachys compositus, Onchodellus procerus, Pachylaelaps pectinifer* and *P. resinæ*) and one unidentified species of *Pachyseius* from Guilan province (Nejadghanbar et al. 2010; Nazari-Tajani et al. 2012), while this research shows that soil-inhabiting fauna of the family is relatively highly diversified with 10 species reported. Therefore, this research increases the number of the species of Pachylaelapidæ in Guilan to 12 (*Olopachys* with two, *Onchodellus* with six and *Pachylaelaps* with four species). Since the family is widely distributed in many provinces in Iran (e.g. Ahmadi 2002;
Jalaian et al. 2004; Ahangaran et al. 2010; Babaian and Kazemi 2011; Ahadiyat and Cheraghali 2012; Baroozeh and Ahadiyat 2012), Guilan can be considered as one of the most diverse region in the species of Pachylaelapidae in soil microhabitats. The results showed that Onchodellus was considered as the most specious genus (five species), and Pachylaelaps grandis, as the most frequent species, was widely distributed in Guilan province (in five regions) with the greatest numbers (26 specimens) comparing the other species (Table 1). Saberi et al. (2016) found it as one of the most frequent species among the mesostigmatic mites in the same climatic area in the Ecology Garden of Nowshahr, north of Iran. This species is originally collected and described from Georgia, Armenia and Russia (Koroleva 1977a, b; Mašán and Halliday 2014a), which are almost close to the northern regions of Iran. Our study shows that it is distributed in very lowland areas in Guilan province (at the altitudes of −18–72 m a.s.l.) and sounds to prefer to be distributed in north provinces of Iran, containing Golestan, Guilan, Mazandaran and Tehran.

Table 1. Distribution of the pachylaelapid mites collected from various habitats in Guilan province.

<table>
<thead>
<tr>
<th>Species</th>
<th>Habitat</th>
<th>Number of collected specimens</th>
<th>Collected areas in Guilan province</th>
<th>Altitudinal ranges (m a.s.l.)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Olopachys caucasicus</strong></td>
<td>Moss of oak tree, soil under pine tree</td>
<td>6 ♀</td>
<td>Rezvanshahr- Talesh Gisoum forest, Guilan University pine forest, Saravan forest</td>
<td>−10–72</td>
</tr>
<tr>
<td><strong>Ol. compositus</strong></td>
<td>Soil under poplar tree, soil under pine and oak tree</td>
<td>7 ♀</td>
<td>Forest areas of the Imamzadeh Hashem, Saravan forest</td>
<td>72–113</td>
</tr>
<tr>
<td><strong>Onchodellus alpinus</strong></td>
<td>Soil under pine tree</td>
<td>1 ♀</td>
<td>Saravan forest</td>
<td>72</td>
</tr>
<tr>
<td><strong>On. hispani</strong></td>
<td>Soil and humus under pine tree</td>
<td>1 ♀</td>
<td>Saravan forest</td>
<td>72</td>
</tr>
<tr>
<td><strong>On. siculus</strong></td>
<td>Soil under oak tree, soil under poplar tree</td>
<td>2 ♂</td>
<td>Astaneh-Ashrafieh Safrabasteh forest, forest areas of the Imamzadeh Hashem</td>
<td>−18–113</td>
</tr>
<tr>
<td><strong>On. squamosus</strong></td>
<td>Soil under poplar tree</td>
<td>1 ♀</td>
<td>Forest areas of the Imamzadeh Hashem</td>
<td>113</td>
</tr>
<tr>
<td><strong>On. strigifer</strong></td>
<td>Soil under oak tree</td>
<td>1 ♀</td>
<td>Saravan forest</td>
<td>72</td>
</tr>
<tr>
<td><strong>Pachylaelaps grandis</strong></td>
<td>Soil under ironwood, hawthorn, oak and pine tree, soil under pine, oak and poplar tree, soil under pine trees and moss of pine tree</td>
<td>26 ♀</td>
<td>Saravan forest, Shaft Chubar forest, Guilan University pine forest, Rezvanshahr-Tales Gisoum forest, Astaneh-Ashrafieh Safrabasteh forest</td>
<td>−18–72</td>
</tr>
<tr>
<td><strong>P. imitans</strong></td>
<td>Soil under iron tree</td>
<td>1 ♂</td>
<td>Saravan forest</td>
<td>72</td>
</tr>
<tr>
<td><strong>P. pectinifer</strong></td>
<td>Soil under pine tree, soil under oak tree</td>
<td>2 ♂, 5 ♀</td>
<td>Shaft Chubar forest, Astaneh-Ashrafieh Safrabasteh forest</td>
<td>−18–40</td>
</tr>
</tbody>
</table>

Olopachys caucasicus was previously recorded in two north and northwest provinces of Iran. Here, Guilan province is considered as the third province for its dispersion. It was originally found in Armenia and Georgia (Koroleva 1976, 1977b), which are located close to the northwestern borders of Iran. The altitudinal distribution of this species is 61–1675 m a.s.l. in Nowshahr County, Mazandaran province (Ahangaran et al. 2012), while it was found in very lowland areas at the altitudes of −10–72 m a.s.l. in this research. It is concluded that this species sounds to live in wide ranges of altitudes from low to midland areas. Regarding Olopachys compositus, it was originally described from Georgia (Koroleva 1976, 1977b), and reported from five north and northeast provinces of Iran. The species prefers to live in lowland areas at the altitudes of 64–156 m a.s.l. (Ahangaran et al. 2012) and 72–113 m a.s.l. (this study), although Koroleva (1976) found an individual specimen at the altitude around 2000 m a.s.l.
Only one individual specimen of *Onchodellus alpinus* was found during the current research (altitude: 72 m a.s.l.). It was distributed in lowland (mostly) to mid or highland areas of Slovakia at the altitudes of 100–1100 m a.s.l. (Mašán 2007; Mašán and Mihál 2009). Ahangaran et al. (2012) found some specimens of *On. alpinus*\(^1\) at the altitude of 1410 m a.s.l. in Nowshahr County, Mazandaran province. It seems that this species can live in low to midland areas. This species is a euryhygrophilous edaphic detriticole mite with wide ecological plasticity (Mašán 2007). Although the habitats of *Onchodellus hispani* is only associated with adults and subterraneous nests of coprophagous beetles of the genus *Copris* (Mašán 2007; Mašán and Halliday 2009), an individual specimen of this species was here found in soil and humans in a pine forest. The microhabitat of this species was not clearly determined in the forest, but it may be randomly observed in that environment. This species occurs on warm lowland pastures at the altitudes of 170–250 m a.s.l. in Slovakia (Mašán 2007; Mašán and Mihál 2009). The individual specimen of this species was here found at the altitude of 72 m a.s.l. *Onchodellus siculus* is found in different microhabitats, containing compost, moss (Karg 1993), horse excrement, tussock of grass plants, nests of small mammals (Mašán 2007), meadows (Salmane 2001), soil (Rostami et al. 2010), seabird nests, seashores, meadows (Huhta 2016), and in association with two scarabaeid species: *Pentodon* sp. (Babaeian and Kazemi 2011) and *Copris ochus* Motschulsky, 1860 (Keum et al. 2016). It is distributed in lowland areas at the altitudes of 170–895 m a.s.l. (Mašán 2007), while it was here found in very lowland areas at the altitudes of −18–113 m a.s.l in Guilan province. Up to now, it has been recorded from five provinces of Iran. *Onchodellus squamosus* was found in soil substrates of forests and different plants (Koroleva 1977a, b; Ma et al. 2008). Here, the species was collected from soil under a poplar tree. *Onchodellus strigifer*, which is found in agricultural soils and in high lime content substrates (Karg 1993), was only found in soil in Tehran province (Ahadiyat and Cheraghali 2012; Baroozeh and Ahadiyat 2012). Here, Guilan is considered as the second province for its dispersal.

*Pachylaelaps imitans* was firstly collected by Ahmadi (2002) from Iran with no additional information on its collection sites. Here, it was collected from soil in a forest. The localities, in which it has been previously found, are soil, compost, moss, forest litter and rodents’ nests (Koroleva 1977b; Karg 1993; Salmane 2001). *Pachylaelaps pectinifer* is a hygrophilous edaphic species (Mašán 2007) with almost worldwide distribution. This species is found in woodland and non-woodland areas (Mašán 2007). It prefers open wet substrates (Karg 1993; Mašán 2007; Mašán and Mihál 2009), and occurs in various microhabitats, in 10 provinces of Iran (The names of the provinces and the related references are presented under the name of the species in the section “Distribution and habitats in Iran”). In the current research, it was found in very lowland areas at the altitudes of −18–40 m a.s.l. According to Mašán (2007) and Mašán and Mihál (2009), it is mostly distributed in lowland areas at the altitudes of 120–850 m a.s.l., while Abutaleb Kermani et al. (2017) found it at the altitude 1581 m a.s.l. It shows that this species occurs in a wide range of altitudes.

Concerning a widespread pachylaelapid species, *Onchodellus karawaiwei* (Berlese, 1920), which is widely distributed in the Palaearctic region (Koroleva 1977b; Karg 1993; Salmane 2001; Mašán 2007; Mašán and Halliday 2014a), surprisingly no specimens were found during the current research. It has been previously recorded from 16 provinces of Iran (e.g. Kamali et al. 2001; Ahmadi 2002; Khademi et al. 2006; Seifori et al. 2006; Babakfard et al. 2008; Babaeian and Kazemi 2011; Rezaie et al. 2011; Salarzehi et al. 2011; Ahadiyat and Cheraghali 2012; Ahangaran et al. 2012; Mahpikaran et al. 2012; Zakeri et al. 2012; Hasanvand et al. 2014; Abutaleb Kermani et al. 2017). Although this species can be found in lowland areas in dark and peat soils with high capacity of humus (Karg 1993; Mašán 2007), we could not find it in such similar localities in Guilan province. Moreover, the

\(^1\) According to the description presented in Ahangaran et al. (2012), the specimens recorded in that paper as *Onchodellus* cf. *alpinus* was absolutely similar in all morphological characters to *On. alpinus*. Since the authors did not consider any difference between their species with *On. alpinus* there, we here considered it as *On. alpinus*.
previous study carried out by Nazari-Tajani et al. (2012) did not record this species in this province. Some factors may be involved in this case. This mite is considered as a euryhygrophilous species growing in humid conditions (Mašán 2007), but during the present study, the soil substrates, in which the pachylaelapid specimens were collected, had been dry in some areas during the spring and summer. In addition, in this study, mite samples were collected only from forest areas, while On. karawaiwei is not only found in hard-wood flood-plain forests, but also in non-woodland area (Mašán 2007).

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REFERENCES


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Pachylaelapidae Acari: Mesostigmata) in some parts of Guilan Province

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Abstract

A study on the fauna of Pachylaelapidae (Acari: Mesostigmata) in some parts of Guilan Province, North Iran, during 1394-1395. In this study, samples were collected from soils, litter, leaves, dried leaves, and other materials. A total of 10 species were recorded, belonging to the genus Onchodelellus. One species, Onchodelellus squamosus Koroleva, was new to Iran. The other species, Pachylaelaps grandis Koroleva, was common in the studied area. The occurrence of these species is reported for the first time in Iran. Further studies are needed to investigate the distribution and ecology of these species in Iran.