

## Article

### **Oppiid mites (Acari: Oribatida: Oppiidae) from Alborz Province, with a key to the known species and new records for Iran**

Maryam Keshavarz Jamshidian<sup>1</sup>, Mohammad Ali Akrami<sup>2</sup> & Alireza Saboori<sup>1\*</sup>

1. Department of Plant Protection, Faculty of Agriculture, University of Tehran, Karaj, Iran; E-mails: mkjamshidian@gmail.com; saboori@ut.ac.ir

2. Department of Plant Protection, College of Agriculture, Shiraz University, Shiraz, Iran; E-mail: akrami@shirazu.ac.ir

\* Corresponding author

#### **Abstract**

In the course of a faunistic survey on oppiid mites in Alborz Province, 29 oppiid mite species (Oribatida: Oppiidae) belonging to 11 genera were identified from soil and litter samples, of which three species and one subspecies are new records for the mite fauna of Iran. For new species records, a brief diagnostic characterization is provided. A key to the subfamilies, genera and subgenera of Alborz Province is given. Moreover, a key to species for genera with more than one species is presented.

**Key words:** Sarcoptiformes, new records, taxonomy, Iran, Oppioidea.

#### **Introduction**

The family Oppiidae Sellnick, 1937 is the largest family in the superfamily Oppioidea belonging to the suborder Oribatida. This family currently contains 134 genera and more than 1000 species (Subías 2014). Systematics of oppiid mites is difficult and complicated due to the small body size and highly species richness (Ohkubo 2001).

Although these mites are common in moss, humus, litter and pasture (Norton & Behan-Pelletier 2009), some species are found in polar desert habitats (Makarova 2002). Oppiid mites almost are fungivores (Norton & Behan-Pelletier 2009).

Up to now, 11 species of this family have been reported from Iran (Bayartogtokh & Akrami 2000; Haddad Irani-Nejad *et al.* 2002, 2003; Akrami & Subías 2007a, b; 2008a, b, c; Akrami *et al.* 2009; Behmanesh *et al.* 2012; Mirzaie & Akrami 2012; Akrami 2014). Oppiid mites are characterized by the absence of prodorsal lamellae and apodemata III, normal chelicerae, monodactylous legs, 9–12 pairs of notogastral setae and 4–6 pairs of genital setae (Balogh & Balogh 1992).

The majority of Oppiidae mites species is small, varying between 300 and 500  $\mu\text{m}$  and is light brown in colour (Balogh 1983).

#### **Material and methods**

During 2012–2013, fauna of terrestrial oppiid mites from Alborz Province was investigated. Samples of soil and litter were taken under different plants in different

regions of the Province. Mites were extracted from samples in Berlese-Tullgren funnels set over jars of 75% ethanol and cleared in lactophenol. Afterward they were mounted in Faure medium on glass microscope slides.

Body length was measured from the tip of the rostrum to the posterior edge of the notogaster, and body width refers to the maximum width of the notogaster in dorsal aspect. Measurements are given in micrometers ( $\mu\text{m}$ ). The taxonomy of the Oppiidae is not well established and the classification varies among authors. Here, Balogh and Balogh (1992) classification system is followed. The specimens are deposited in the Acarological Collection, Jalal Afshar Zoological Museum, Faculty of Agriculture, University of Tehran, Karaj, Iran. All materials were collected by M. Keshavarz Jamshidian.

## Results

In this study, the fauna of oppiid mites (Acari: Oribatida) from Alborz Province, with a key to the subfamilies, genera and subgenera are presented. Moreover, for genera with more than one species, an identification key to the species is presented. Three species and one subspecies are new records for the mite fauna of Iran. Among new records, *Oxyoppia (Oxyoppiella)* sp., the subgenus is recorded from Iran for the first time. For new records a short diagnostic characterization is provided, with notes on their geographical distribution.

### Key to the subfamilies, genera and subgenera of oppiid mites from Alborz Province, Iran

1. Crista present, setae  $c_2$  well developed, similar to other notogastral setae. Sometimes with one pair of interbothridial tubercles.....2
  - Crista absent, setae  $c_2$  either absent or less developed than the remaining notogastral setae, interbothridial tubercles usually absent.....7
2. Lamellar costulae absent .....Medioppiinae.....3
  - Lamellar costulae present.....Oppiellinae.....5
3. Anterior margin of notogaster with crest .....*Rhinoppia*..... 4
  - Anterior margin of notogaster with two sclerotized apophyses running from dorso-sejugal furrow to basal part of prodorsum..... *Micropoppia*
4. Sensillus bilaterally pectinate, with long ciliae.....*Rhinoppia (Bipectinoppia)*
  - Sensillus fusiform or unilaterally pectinate.....*Rhinoppia (Rhinoppia)*
5. Dorsosejugal furrow convex or semi-rounded, anterior margin of the notogaster penetrates deeply toward the basal part of prodorsum .....*Berniniella*
  - Dorsosejugal furrow straight, anterior margin of the notogaster never penetrate toward the basal part of prodorsum.....6
6. Anterior margin of the notogaster with protruding humeral processes, genital plates with 5 pairs of setae..... *Oppiella*
  - Anterior margin of the notogaster without protruding humeral processes, genital plates with 6 pairs of setae..... *Lauropoppia*
7. Anterior margin of notogaster with protruding humeral processes.....Oxyoppiinae.....*Oxyoppia*.....8
  - Anterior margin of notogaster without protruding humeral processes.....9
8. Sensillus lanceolate or setiform.....*Oxyoppia (Dzarogneta)*
  - Sensillus fusiform.....*Oxyoppia (Oxyoppiella)*

9. Lamellar and translamellar lines absent.....Oppiinae.....10  
 – Lamellar and translamellar lines present.....Multioppiinae.....11
10. Sensillus spindle form.....*Lasiobelba*  
 – Sensillus lanceolate or fusiform.....*Oppia*
11. Notogaster with 9 pairs of setae, seta *c*<sub>2</sub> absent (except *R. (Re.) strinatii* with 10 pairs, *c*<sub>2</sub> minute).....12  
 – Notogaster with 10–12 pairs of setae, seta *c*<sub>2</sub> absent, varying numbers of setae in setal row *d* present.....14
12. Rostral setae straight.....*Ramusella (Rectoppia)*  
 – Rostral setae geniculate or arched.....13
13. Rostral setae geniculate, insertions of rostral setae close to each other, sensillus fusiform and ciliate or pectinate.....*Ramusella (Ramusella)*  
 – Rostral setae arched, insertions of rostral setae far from each other, sensillus pectinate.....*Ramusella (Insculptoppia)*
14. Notogaster with 10 pairs of setae, seta *dm* absent.....*Anomaloppia*  
 – Notogaster with 12 pairs of setae, fissure *im* located posterior of seta *dm*.....  
 .....*Multioppia (Hammeroppia)*

### ***Micropoppia minus* (Paoli, 1908)**

*Measurements:* Length 186–196, width 69–87 (n = 21).

#### *Material examined*

Three females from Asara, Chalus road, soil and litter under walnut trees, 36° 01' N, 51° 10' E, 1852 m a.s.l., six females from Chalus road, soil and litter planted with corn, *Zea mays*, 36° 05' N, 51° 10' E, 1862 m a.s.l., 16.07.2012, four (3 males, 1 female) from Morad Tappe village, Eshtehard, soil and litter under cotton *Gossypium hirsutum* L., 35° 44' N, 50° 18' E, 1438 m a.s.l., 28.5.2012; eight females from Jaarou village, Eshtehard, soil and litter under apple trees, *Malus domestica* Borkh, 35° 70' N, 50° 71' E, 1420 m a.s.l., 28.5.2012.

*Distribution:* Cosmopolitan (Subías 2014).

### **Key to species of *Rhinoppia (Bipectinoppia)* of Alborz Province**

1. Rostral setae finely barbed; exobothridial setae with some barbs.....*R. (B.) bipectinata*  
 – Rostral setae smooth; exobothridial setae smooth.....*R. (B.) tasdemiri*

### ***Rhinoppia (B.) bipectinata* (Akrami & Subías, 2007)**

*Measurements:* Length 347–390, width 160–200 (n = 13).

#### *Material examined*

Four females from Kalank, Taleghan, soil and litter of weed, seven females from Barikan village, Taleghan, soil and litter under cherry trees, *Prunus avium* L., 36° 09' N, 50° 44' E, 2350 m a.s.l., 26.05.2013 and two females from Fouyeh village, Savojbolagh, soil and litter under cherry trees 35° 50' N, 50° 48' E, 1275 m a.s.l., 19.05.2013.

*Distribution:* Meridional Palearctic (Caucasus and Iran) (Akrami & Subías 2007a;

Subías 2014).

***R. (B.) tasdemiri* Toluk & Ayyildiz, 2008**

*Measurements:* Length 351–368, width 162–185 (n = 5).

*Material examined*

Three females from Kalank, Taleghan, soil and litter of weed and two females from Barikan village, Taleghan, soil and litter under cherry trees, *Prunus avium* L., 36° 09' N, 50° 44' E, 2350 m a.s.l., 26.05.2013.

*Comment:* The sensilli in our specimens are lanceolate with long ciliae in comparison with the original description.

*Distribution:* Turkey (Toluk & Ayyildiz 2008) and Iran (this study).

**Key to species of *Rhinoppia* (*Rhinoppia*) of Alborz Province**

1. Sensillus fusiform with 7–10 branches.....*R. (R.) obsoleta*
- Sensillus pectinate with 5 branches.....*R. (R.) subpectinata*

***Rhinoppia (R.) subpectinata* (Oudemans, 1900)**

*Measurements:* Length 290–330, width 160–190 (n = 34).

*Material examined*

Seven females from Barikan village, Taleghan, soil and litter under cherry trees, *Prunus avium* L., 36° 09' N, 50° 44' E, 2350 m a.s.l., 26.05.2013, ten females from Kouhsar, Savojbolagh, soil and litter under apple trees, *Malus* sp. 35° 57' N, 50° 47' E, 1489 m a.s.l., 23.04.2013, two females from Fouyeh village, Savojbolagh, soil and litter under cherry trees 35° 50' N, 50° 48' E, 1275 m a.s.l., 19.05.2013, nine females from Asara, Chalus road, soil and litter under Button Wood, *Platanus orientalis* L., 36° 01' N, 51° 10' E, 1852 m a.s.l., 16.07.2012, six females from Faculty of Agriculture, University of Tehran, Karaj, Iran (Botanical garden), soil and litter under pine trees, *Pinus eldarica* Medw., 14.06.2013.

*Comment:* The body dimensions of five specimens were outside the range (length: 272–282, width: 144–153). Moreover in these specimens some characters are different from the original description as follows: stalk of sensillus is shorter, ciliae of sensillus are longer, and interlamellar setae are shorter.

*Distribution:* Holarctic (except east of oriental Palearctic) and Senegal (Subías 2014).

***R. (R.) obsoleta* (Paoli, 1908)**

*Measurements:* Length 347–360, width 150–191 (n = 40).

*Material examined*

22 females from Kalank, Taleghan, soil and litter of weed, 36° 09' N, 50° 44' E,

2350 m a.s.l., 16.05.2012, five females from Asara, Chalus road, soil and litter under Button Wood, 36° 01' N, 51° 10' E, 1852 m a.s.l. and 13 females from Nesa, Chalus road, soil and litter under walnut trees, *Juglans regia*, 36° 05' N, 51° 10' E, 1862 m a.s.l., 16.07.2012.

*Distribution*: Holarctic (except east of oriental Palearctic), Australia, New Zealand and Hawaii (Subías 2014).

### ***Oppiella (Oppiella) nova nova* (Oudemans, 1902)**

*Measurements*: Length 248–296, width 114–150 (n = 20).

#### *Material examined*

Five females from Jey, Chalus road, soil and litter under cherry trees 35° 55' N, 51° 05' E, 2005 m a.s.l., 16.07.2012; three females from Faculty of Agriculture, University of Tehran, Karaj (Botanical garden), soil and litter under pine trees, 14.06.2013, eight females from Kalank, Taleghan, soil and litter of weed, 36° 09' N, 50° 44' E, 2350 m a.s.l., 26.05.2013, four females from Jaarou village, Eshtehard, soil and litter under grape trees, *Vitis vinifera*, 35° 70' N, 50° 71' E, 1420 m a.s.l., 28.5.2012.

*Distribution*: Cosmopolitan (Subías 2014).

### **Key to species and subspecies of *Lauroppia* of Alborz Province**

1. Sensillus fusiform, barbed.....2
  - Sensillus pectinate, bipectinate, fusiform with branches.....3
2. Median apex of rostrum pointed.....*L. doris*
  - Median apex of rostrum triangular.....*L. obscura*
3. Rostrum tricuspidate.....4
  - Rostrum rounded or pointed.....5
4. Median apex of rostrum strong, two lateral spines weak, lamellar setae as long as interlamellar setae, region of insertion of interlamellar setae without ornamentation.....*L. falcata marginedentata*
  - Median apex of rostrum weak, two lateral spines of rostrum well-developed; lamellar setae minute; interlamellar setae long, region of insertion of interlamellar setae with ornamentation.....*L. falcata falcata*
5. Sensillus with bipectinate fusiform head and seven medium long branches, *le* inserted far medially to lamellar costula.....*L. iranica*
  - Sensillus with pectinate head and six long branches, *le* inserted close anteriorly or medially of lamellar costula.....*L. persiangulfia*

### ***L. falcata marginedentata* (Strenzke, 1951)**

*Measurements*: Length 287–301, width 145–156 (n = 2).

#### *Material examined*

Two females from Jey, Chalus road, soil and litter under apple trees, 35° 55' N, 51° 05' E, 2005 m a.s.l., 16.07.2012.

*Distribution:* Meridional Palearctic (central Europe and Iran) (Akrami & Subías 2008a; Subías 2014).

***L. falcata falcata* (Paoli, 1908)**

*Measurements:* Length 300–350, width 150–170 (n= 4).

*Material examined*

Four females from Khour, Savojbolagh, soil and litter under *Astragalus* sp.; 36° 01' N, 50° 46' E, 2000 m a.s.l., 14.05.2012.

*Diagnosis*

Rostrum divided by two incisions, median spine is short and rounded, and two lateral spines of rostrum well-developed. Rostral setae inserted on lateral spines, lamellar setae minute; interlamellar setae long, region of insertion of interlamellar setae with ornamentation; exobothridial setae are very long and barbed; costulae present, sensillus fusiform with 10 long branches. Notogaster elongated. Dorsosejugal furrow straight anteriorly; crista well-developed, 10 pairs of smooth notogastral setae,  $c_2$  minute.

*Comment:* This subspecies is the first record from Iran.

*Distribution:* Palearctic (Subías 2014).

***L. doris* (E. Pérez-Iñigo, 1978)**

*Measurements:* Length 250–297, width 138–160 (n = 20).

*Material examined*

Five females from Khour, Savojbolagh, soil and litter under *Astragalus* plant, *Astragalus* sp.; 36° 01' N, 50° 46' E, 2000 m a.s.l., 14.05.2012, three females from Jey, Chalus road, soil and litter under apple trees 35° 55' N, 51° 05' E, 2005 m a.s.l., 16.07.2012; three females from Asara, Chalus road, soil and litter under walnut trees, 36° 01' N, 51° 10' E, 1852 m a.s.l., 16.07.2012; three females from Kouhsar, Savojbolagh, soil and litter under apricot trees, *Prunus armeniaca* (L.), 35° 57' N, 50° 47' E, 1489 m a.s.l., 23.04.2013, two females from Barikan village, Taleghan, soil and litter under cherry trees, *Prunus avium* L., 36° 09' N, 50° 44' E, 2350 m a.s.l., 26.05.2013, four (3 males, 1 female) from Morad Tappe village, Eshtehard, soil and litter in cotton field, 35° 44' N, 50° 18' E, 1438 m a.s.l., 28.5.2012.

*Distribution:* Meridional Palearctic (Central Europe and Iran) (Subías 2014).

***L. obscura* Mahunka & Mahunka–Papp, 2000**

*Measurements:* Length 262–280, width 138–165 (n = 8).

*Material examined*

Four females from Jey, Chalus road, soil and litter under cherry trees 35° 55' N,

51° 05' E, 2005 m a.s.l., 16.07.2012; two females from Asara, Chalus road, soil and litter under pomegranate tree, *Punica granatum* L., 36° 01' N, 51° 10' E, 1852 m a.s.l., 16.07.2012; two females from Kouhsar, Savojbolagh, soil and litter under apricot trees 35° 57' N, 50° 47' E, 1489 m a.s.l., 23.04.2013.

*Diagnosis*

Rostrum divided by two incisions, median apex triangular. The rostral setae barbed, lamellar and interlamellar setae thin and smooth, lamellar setae shorter than the other prodorsal setae, exobothridial setae smooth. Costulae present. Bothridia large with strong posterior apophysis. Sensilli elongate with asymmetrically clavate head, unilaterally spinose. Notogaster elongated, dorsosejugal furrow straight anteriorly. Crista distinct. 10 pairs of smooth notogastral setae,  $c_2$  long. Epimeral setae long and setiform with setal formula 3-1-3-3. Anogenital region normal and setal formula 5-1-2-3. The two anterior pairs of genital setae conspicuously long, directed forwards.

*Comment:* This is the first record of the species from Iran. The interlamellar setae in our specimens are longer and the body sizes are smaller than the original description (280–305 × 148–172).

*Distribution:* Meridional Palearctic (Fischer & Schatz 2013; Subías 2014).

***L. iranica* Akrami & Subías, 2008**

*Measurements:* Length 218–223, width 115–132 (n = 4).

*Material examined*

Four females from Asara, Chalus road, soil and litter planted with corn, *Zea mays* L., 36° 01' N, 51° 10' E, 1852 m a.s.l., 16.07.2012.

*Distribution:* Iran (Akrami & Subías 2008a).

***L. persiangulfia* Akrami & Subías, 2008**

*Measurements:* Length 267–275, width 144–153 (n = 2).

*Material examined*

Two females from Kalank, Taleghan, soil and litter of weed, 36° 09' N, 50° 44' E, 2350 m a.s.l., 26.05.2013.

*Comment:* In our specimens, some characters are different from the original description as follows: the stalk of sensillus is shorter, costulae are longer and lamellar setae situated between costulae (instead of anterior to the costulae).

*Distribution:* Iran (Akrami & Subías 2008a).

***Berniniella iranica* Akrami, 2012**

*Measurements:* Length 215–224, width 112–131 (n = 4).

*Material examined*

Four females from Kalank, Taleghan, soil and litter of weed, 36° 09' N, 50° 44' E, 2350 m a.s.l., 26.05.2013.

*Distribution:* Iran (Akrami 2012).

***Oxyoppia (Dzarogneta) sp.***

*Measurements:* Length 500, width 250 (n = 1).

*Material examined*

One female from Nazar Abad, soil and litter of weed, 35° 54' N, 50° 38' E, 1240 m a.s.l., 20.05.2013.

*Diagnosis*

Rostral tip is pointed, rostral setae thick and densely barbed. Costulae and transcostula absent. Lamellar setae short and ciliate, mutual distance between lamellar setae very long. Interlamellar setae thick and densely bilaterally barbed. Sensilli linear and thin (setiform). Dorsal notogastral setae long, thick and densely bilaterally barbed. Tips of discidium pointed. Anal setae short, thick and ciliate; adanal setae longer than anal setae.

*Comment:* Up to now two species of this subgenus, *O. (D.) intermedia* Subías & Rodríguez, 1986 (Mirzaie & Akrami 2012) and *O. (D.) iranensis* Akrami & Subías, 2008 were recorded from Iran.

***Oxyoppia (Oxyoppiella) sp.***

*Measurements:* Length 310 µm, width 153 µm (n = 1).

*Material examined*

One female from Morad Tappe village, Eshtehard, soil and litter under cotton field, 35° 44' N, 50° 18' E, 1438 m a.s.l., 28.5.2012.

*Diagnosis*

Rostral tip round, rostral setae located far from each other, barbed bilaterally. Costulae and trans-lamellar crest present. Lamellar setae situated between lamellar crest, long and ciliate; interlamellar setae thick and bilaterally barbed, as long as lamellar setae. Sensillus fusiform and round at tip, with 13–14 long branches. Anterior margin of notogaster with protruding humeral processes.

*Comment:* This kind of sensillus, namely round at tip of the club, is rarely seen among *O. (Oxyoppiella)*. This is the first record of the subgenus from Iran.

**Key to species of subgenus *Lasiobelba (Lasiobelba)* of Alborz Province**

1. Rostrum tripartite.....*L. (L.) decui*
- Rostrum nose-like and rounded at tip.....*L. (L.) neonominata*

***Lasiobelba (L.) decui* (Vasiliu & Ivan, 1995)**

*Measurements:* Length 540–553, width 322–334 (n = 4).

*Material examined*

Two females from Sibestan village, Savojbolagh, soil and litter under apple trees 36° 02' N, 50° 48' E, 2147 m a.s.l., and two females from Fouyeh village, Savojbolagh, soil and litter under cherry trees, 35° 50' N, 50° 48' E, 1275 m a.s.l., 19.05.2013.

*Diagnosis*

Rostrum tripartite. Costulae and transcostula absent. Interlamellar setae longer or similar in length to lamellar setae. Sensilli spindle-form. Interbothridial region with three pairs of muscle sigilla. Notogastral setae (9–10 pairs) of medium size or short, setae *c* short but present, *lm* not reaching the insertions of *lp*. Genital plates with five pairs of genital setae. Adanal lyrifissures located near to anal aperture.

*Distribution:* Israel (Subías 2014).

*Comment:* This is the first record of the species from Iran.

***L. (L.) neominata* Subías, 2004**

*Measurements:* Length 619–643, width 47–396 (n = 2).

*Material examined*

Two females from Sibestan village, Savojbolagh, soil and litter under apple trees, 36° 02' N, 50° 48' E, 2147 m a.s.l., 19.05.2013.

*Distribution:* Ethiopia, South Africa, Madagascar, Hawaii and Mediterranean (Subías 2014).

*Comment:* The body dimensions of our specimens are clearly larger than previously collected specimens from Iran.

***Oppia nitens* Koch, 1836**

*Measurements:* Length 542–550, width 290–301 (n = 2).

*Material examined*

Two females from Barikan village, Taleghan, soil and litter under cherry trees, *Prunus avium* L., 36° 09' N, 50° 44' E, 2350 m a.s.l., 26.05.2013.

*Comment:* The body dimensions of *O. nitens* have been given as (510 × 290) by Michael (Woas, 1986), (540 × 300) by Woas (1986) and (509 × 284) by Baran & Ayyildiz (2004). According to our data the dimensions of the specimens are similar to that given by Woas (1986).

*Distribution:* Cosmopolitan except Australia (Baran & Ayyildiz 2004; Subías 2014).

**Key to species of the subgenus *Ramusella* (*Rectoppia*) of Alborz Province**

1. With 10 pairs of notogastral setae,  $c_2$  minute, without chitinous structures between the bothridia; sensillus fusiform, with 12–13 long branches.....*R. (Re.) strinatii*  
– With 9 pairs of notogastral setae,  $c_2$  absent .....2
2. Rostral setae heavily plumose, straight; sensillus fusiform, with more than 12 branches on head.....3  
– Rostral setae sparsely ciliate, apically divergent; sensillus with 7–9 long branches on head.....*R. (Re.) fasciata*
3. Body dimensions (252–285 × 120–136); the stalk of sensillus short with short branches on head.....*R. (Re.) damavandica*  
– Body dimensions (290–310 × 124–139); the stalk of sensillus long with 15 long branches on clubbed head.....*R. (Re.) cf. damavandica*

***Ramusella (Re.) damavandica* Akrami & Subías, 2008**

*Measurements:* Length 252–285, width 120–136 (n = 6).

*Material examined*

Two females from Khouzankola, Chalus road, soil and litter under *Platanus orientalis* L., 35° 55' N, 51° 05' E, 2000 m a.s.l., 16.07.2012, three females from Asara, Chalus road, soil and litter, 36° 01' N, 51° 10' E, 1852 m a.s.l., 16.07.2012, one female from Faculty of Agriculture, University of Tehran, Karaj, Iran (Botanical garden), soil and litter under plane trees, 14.06.2013.

*Distribution:* Iran (Akrami & Subías 2008b).

***Ramusella (Re.) cf. damavandica***

*Measurements:* Length 290–310, width 124–139 (n = 9).

*Material examined*

Nine females from Nesa, Chalus road, soil and litter under apple trees, 36° 03' N, 51° 20' E, 1862 m a.s.l., 16.07.2012.

*Diagnosis*

Tip of rostrum rounded; rostral setae heavily plumose, long, straight and situated very near to each other; lamellar and interlamellar setae nearly as long as rostral setae, exobothridial setae short, all finely barbed; sensillus fusiform, its head with 15 long branches; trans-lamellar crest present.

***R. (Re.) fasciata* (Paoli, 1908)**

*Measurements:* Length 302–332, width 149–168 (n = 8).

*Material examined*

Six females from Kouhsar, Savojbolagh, soil and litter under apple trees 35° 57' N, 50° 47' E, 1489 m a.s.l., 23.04.2013, two females from Jaarou village, Eshtehard, soil and litter under apple trees, *Malus domestica* Borkh, 35° 70' N, 50° 71' E, 1420 m a.s.l., 28.10.2012.

*Distribution:* Semicosmopolitan (Western Palearctic: except in the north, U.S.A.: Florida, Somalia. India: Tripura, and sub–Antarctic: Amsterdam Island) (Subías 2014).

***R. (Re.) strinatii* (Mahunka, 1980)**

*Measurements:* Length 270–335, width 124–149 (n = 8).

*Material examined*

Eight females from Khoranak, Taleghan, soil and litter under *Robinia* sp., 36° 08' N, 50° 39' E, 2250 m a.s.l., 26.05.2013.

*Distribution:* Mediterranean (Subías 2014).

**Key to species of subgenus *Ramusella* (*Ramusella*) of Alborz Province**

1. Prodorsum with lamellar crest; sensillus narrowly pectinate with 6 long branches.....*R. (Ra.) puertomonttensis*
- Prodorsum with lamellar line; sensillus fusiform or radiat.....2
2. Rostral setae near to each other, apical half smooth; notogastral setae smooth.....*R. (Ra.) sengbushii*
- Rostral setae situated far from each other, entirely ciliate; notogastral setae ciliate.....*R. (Ra.) persica*

***Ramusella* (*Ramusella*) *puertomonttensis* Hammer, 1962**

*Measurements:* Length 270–312, width 150–175 (n = 25).

*Material examined*

Ten females from Sibdaarak, Savojbolagh, soil and litter under apple trees 36° 02' N, 50° 43' E, 2047 m a.s.l., 19.05.2013, five females from Faculty of Agriculture, University of Tehran, Karaj, Iran (Botanical garden), soil and litter under *Juniperus oxycedrus* L., 14.06.2013, 10 females from Barikan village, Taleghan, soil and litter of the sheep pasture, 36° 09' N, 50° 43' E, 2300 m a.s.l., 26.05.2013.

*Distribution:* Cosmopolitan (Subías 2014).

***R. (Ra.) persica* Akrami, Behmanesh & Subías, 2015**

*Measurements:* Length 290–299, width 121–136 (n = 17).

*Material examined*

Five (3 males, 2 females) from Morad Tappe village, Eshtehard, soil and litter under cotton field and 10 females, soil and litter in wheat field, 35° 44' N, 50° 18' E, 1438 m a.s.l., 28.5.2012; two females from Jaarou village, Eshtehard, soil and litter under apple trees, *Malus domestica* Borkh, 35°70'N, 50°71'E, 1420 m a.s.l., 28.05.2012.

*Distribution:* Iran (Behmanesh *et al.* 2012).

*Comment:* This species was described as *Ramusella* (*Ra.*) *iranica* Behmanesh, Akrami

& Subías, 2012, which was a junior homonym of *Ramusella (Re.) iranica* Akrami & Subías, 2008. The authors of species proposed a new replacement name, *R. (Ra.) persica* (Akrami *et al.* 2015).

***R. (Ra.) sengkushii* Hammer, 1968**

*Measurements:* Length 287, width 149 (n = 1).

*Material examined*

One female from Khour, Savojbolagh, soil and litter under *Astragalus* sp.; 36° 01' N, 50° 46' E, 2000 m a.s.l., 14.05.2012.

*Distribution:* Pantropical (except Ethiopian region) and subtropical (Subías 2014).

***R. (Insculptoppia) insculpta* (Paoli, 1908)**

*Measurements:* Length: 247–342, width 126–186 (n = 13).

*Material examined*

Six females from Faculty of Agriculture, University of Tehran, Karaj, Iran (Botanical garden) soil and litter under pine trees and five specimens under *Robinia* sp., 14.06.2013, two females from Fashand village, Savojbolagh, soil and litter under apple trees, 36° 00' N, 50° 46' E, 1262 m a.s.l., 19.05.2013.

*Distribution:* Western Palearctic (except North), oriental Palearctic, Iran and Vietnam (Subías 2014).

**Key to the species of *Anomaloppia* of Alborz Province**

1. Notogastral setae smooth.....*A. iranica*
- Notogastral setae ciliate.....*A. mazandarunica*

***Anomaloppia iranica* Bayartogtokh & Akrami, 2000**

*Measurements:* Length 270–312, width 136–188 (n = 16).

*Material examined*

One female from Khouzankola, Chalus road, soil and litter under *Platanus orientalis* L., 35° 55' N, 51° 05' E, 2000 m a.s.l., 16.07.2012; one female from Barikan village, Taleghan, soil and litter under cherry trees, *Prunus avium* L., 36° 09' N, 50° 44' E, 2350 m a.s.l., 26.05.2013; six (5 females, 1 male) from Jaarou village, Eshtehard, soil and litter under apple trees, *Malus domestica* Borkh, 35° 70' N, 50° 71' E, 1420 m a.s.l., 28.10.2012, six (3 females, 3 males) from Sibestan village, Savojbolagh, soil and litter under apple trees 36° 02' N, 50° 48' E, 2147 m a.s.l., 8.07.2012, two (females) from Fashand village, Savojbolagh, soil and litter under apple trees, 36° 00' N, 50° 46' E, 1262 m a.s.l., 19.05.2013.

*Distribution:* Iran (Bayartogtokh & Akrami 2000).

***Anomaloppia mazandaranica* Akrami & Subías, 2007**

*Measurements:* Length 297–314, width 144–173 (n = 10).

*Material examined*

One (female) from Khouzankola, Chalus road, soil and litter under *Platanus orientalis* L., 35° 55' N, 51° 05' E, 2000 m a.s.l., 16.07.2012; one (female) from Asara, Chalus road soil and litter under Pomegranate tree, soil and litter, 36° 01' N, 51° 10' E, 1420 m a.s.l., 16.07.2012; four (3 females, 1 male) from Jaarou village, Eshtehard, soil and litter under apple trees, *Malus domestica* Borkh, 35° 70' N, 50° 71' E, 1420 m a.s.l., 28.10.2012, four (2 females, 2 males) from Sibestan village, Savojbolagh, soil and litter under apple trees 36° 02' N, 50° 48' E, 2147 m a.s.l., 8.07.2012.

*Distribution:* Iran (Akrami & Subías 2007b).

***Multioppia (Hammeroppia) wilsoni laniseta* Moritz, 1966**

*Measurements:* Length 287–322 µm, width 141–176 µm (n = 8).

*Material examined*

Eight females from Barikan village, Taleghan, soil and litter of the sheep pasture 36° 09' N, 50° 43' E, 2300 m a.s.l., 26.05.2013.

*Distribution:* Western and oriental Palearctic, USA and Venezuela (Subías 2014).

### Discussion

It seems that the oppiid mite fauna of Alborz Province is similar to oppiid fauna of Mazandran Province, because of the 60% similarities between collected species in present study and results of Akrami, & Subías (2007a; 2007b; 2008a; 2008b) and Akrami (2012), with 18 same species. The highest density of oppiid mites was collected in soil and litter under apple trees. Among the collected species, the most abundant oppiid mite species was *R. (Ra.) puertomontensis* (300 specimens) and the least abundant species were *R. (Ra.) sengbushii*, *Oxyoppia (Dzarogneta)* sp. and *O. (Oxyoppiella)* sp. (each with one specimen).

### Acknowledgements

This study was supported by a grant (No. 7110018/8/16) from University of Tehran which is appreciated.

### References

- Akrami, M.A. (2012) A new species Oribatid mites genus *Berniniella* Balogh, 1983 from Iran (Acari: Oribatida: Oppiidae). *Zoology in the Middle East*, 55: 139–140.
- Akrami, M.A. (2014) Redescription of *Moritzoppia (Moritzoppia) unicarinata unicarinata* (Acari: Oribatida: Oppiidae) collected from Iran. *Persian Journal of Acarology*, 3(3): 171–176.
- Akrami, M.A., Behmanesh, M. & Subías, L.S. (2015) *Ramusella (Ramusella) persica* (Acari: Oribatida: Oppiidae) a new replacement name for *Ramusella (Ramusella) iranica*. *Persian Journal of Acarology*, 4 (1): 137–138.
- Akrami, M.A. & Subías, L.S. (2007a) Oppiid mites (Acari: Oribatida: Oppiidae) from

- Mazandaran Province (Northern Iran), with a description of *Medioppia bipectinata* sp. n. *Systematic & Applied Acarology*, 12: 237–243.
- Akrami, M.A. & Subías, L.S. (2007b) *Anomaloppia mazandaranica* (Acari: Oribatida: Oppiidae) n. sp. from Iran. *Zootaxa*, 1523: 65–68.
- Akrami, M.A. & Subías, L.S. (2008a) New species of the genus *Lauroppia* Subías & Minguez, 1986 (Acari, Oribatida, Oppiidae) from Iran. *Graellsia*, 64(2): 275–279.
- Akrami, M.A. & Subías, L.S. (2008b) Two new species of the subfamily Multioppiinae Balogh, 1983 (Acari: Oribatida: Oppiidae) from Iran. *Journal of the Acarological Society of Japan*, 17(2): 93–99.
- Akrami, M.A. & Subías, L.S. (2008c) *Oxyoppia (Dzarogneta) iranensis* (Oppiidae: Oxyoppiinae), a new species of oribatid mite from Iran. *Systematic & Applied Acarology*, 13: 248–251.
- Akrami, M.A., Subías, L.S. & Saboori, A. (2009) *Serratoppia iranica* (Acari: Oppiidae), a new species of oribatid mite from Iran. *Systematic & Applied Acarology*, 14: 171–176.
- Balogh, J. (1983) A partial revision of the Oppiidae Grandjean, 1954 (Acari: Oribatei). *Acta Zoologica Academia Scientiarum Hungaricae*, 29(1–3): 1–79.
- Balogh, J. & Balogh, P. (1992) *The oribatid mites genera of the world (Vol. 1)*. Budapest, Hungarian Natural History Museum Press, 263 pp.
- Baran, S. & Ayyildiz, N. (2004) *Oppia nitens* C.L. Koch, 1836, (Acari, Oribatida, Oppiidae) a new species for the Turkish fauna. *Turkish Journal of Zoology*, 28: 111–113.
- Bayartogtokh, B. & Akrami, M.A. (2000) Oribatid mites (Acari: Oribatida) from Iran, with descriptions of two new species. *Journal of the Acarological Society of Japan*, 9(2): 129–145.
- Behmanesh, M., Akrami, M.A. & Subías, L.S. (2012) A new oribatid mite of the genus *Ramusella* (Acari: Oribatida) from Iran. *Persian Journal of Acarology*, 1(1): 53–58.
- Fischer, B.M. & Schatz, H. (2013) Biodiversity of oribatid mites (Acari: Oribatida) along an altitudinal gradient in the Central Alps. *Zootaxa*, 3626 (4): 429–454.
- Haddad Irani-Nejad, K., Hajiqanbar, H. & Talebi Chaichi, P. (2003) Oribatid mites of the sugarbeet fields in Miandoab plain. *Agricultural Science*, 14(1): 55–67 (In Persian with English abstract).
- Haddad Irani-Nejad, K., Kamali, K. & Maleki Milani, H. (2002) Some pycnonotic brachypyline oribatid mites of cotton field in Moghan plain. *Applied Entomology and Phytopathology*, 69(2): 17–47 (In Persian with English abstract).
- Hammer, M. (1962) Investigations on the oribatid fauna of the Andes Mountains. III. Chile. *Biologiske Skrifter Kongelige Danske Videnskabernes Selskab*, 12 (3): 1–96.
- Hammer, M. (1968) Investigations on the oribatid fauna of New Zealand, III. *Biologiske Skrifter det Kongelige Danske Videnskabernes Selskab*, 16 (2): 1–97.
- Koch, C.L. (1836) *Deutschlands Crustaceen, Myriapoden und Arachniden*, Vol. 3, No. 24, Regensburg.
- Mahunka, S. (1980) Neue und interessante Milben aus dem Genfer Museum XLII. Erster Beitrag zur Kenntnis der Oribatiden –Fauna der Hölen Marokkos (Acari: Oribatida). *Revue de Suisse Zoologie*, 87 (3): 797–805.
- Mahunka, S. & Mahunka-Papp, L. (2000) Oribatids from Switzerland III (Acari, Oribatida, Oppiidae and Quadropiidae) (Acarologica Genavensia XCIII). *Revue Suisse de Zoologie*, 107: 49–79.
- Makarova, O.L. (2002) Acarocenoses (Acariformes, Parasitiformes) in polar deserts. I,


- Mites assemblages in the Severanaya Zemlya Archipelago. Structure of fauna and abundance. *Zoologicheskii Zhurnal*, 81: 165–181.
- Mirzaie, M. & Akrami, M.A. (2012) New records of the family Oppiidae (Acari: Sarcoptiformes: Oribatida) for the fauna of Iran. *Persian Journal of Acarology*, 1(2): 101–108.
- Moritz, M. (1966) Neue Oribatodean (Acari) aus Deutschland. II. *Multioppia laniseta* n. sp. *Zoologischer Anzeiger*, 176 (2): 127–132.
- Norton, R.A. & Behan-Pelletier, V.M. (2009) Oribatida. In: Krantz, G.W. & Walter, D. E. (Eds.), *A manual of acarology*. Texas Tech University Press, Lubbock, pp. 430–564.
- Ohkubo, N. (2001) A revision of Oppiidae and its Allies (Acarina: Oribatida) of Japan 1. Genus *Lasiobelba*. *Journal of the Acarological Society of Japan*, 10(2): 97–109.
- Oudemans, A.C. (1900) New list of Dutch Acari. 1st part. *Tijdschrift Voor Entomologie*, 43: 150–171.
- Oudemans, A.C. (1902) Entomologische Aanteekeningen. *Entomologische Berichten*, 1(3): 16–17.
- Paoli, G. (1908) Monografia del genere *Dameosoma* Berl. e generi affini. *Redia*, 5: 31–91.
- Pérez-Iñigo, E. (1978) Tres nuevas especies de oribatideos de Espana central (Acari, Oribatei). *Eos*, 52: 175–182.
- Sellnick, M. (1937) Die Gattung *Trizetes* Berlese und ihre Stellung im System der Oribatei (Acar.). *Zoologischer Anzeiger*, 120: 76–79.
- Strenzke, K. (1951) Some new central European moss mites (Acarina: Oribatei). *Annals and Magazine of Natural History*, 12 (4): 719–726.
- Subías, L.S. (2004) Listado sistemático, sinonímico y biogeográfico de los ácaros oribátidos (Acariformes, Oribatida) del mundo (1758–2002). *Graellsia*, 60 (Número extraordinario): 3–305.
- Subías, L.S. and Rodríguez, P. (1986) Oppiidae (Acari, Oribatida) de los sabinares (*Juniperus thurifera*) de España, VI. *Neotrichoppia* (*Confinoppia*) n. subg. y *Moritzella* Balogh, 1983. *Redia*, 69: 115–130.
- Subías, L.S. (2014) *Listado sistemático, sinonímico y biogeográfico de los ácaros oribátidos (Acariformes: Oribatida) del mundo (excepto fósiles)*. Available from: [http://escalera.bio.ucm.es/usuarios/bba/cont/docs/RO\\_1.pdf](http://escalera.bio.ucm.es/usuarios/bba/cont/docs/RO_1.pdf) (accessed on February 2014).
- Toluk, A. & Ayyildiz, N. (2008) Two new species of the genus *Rhinoppia* Balogh, 1983 (Acari: Oribatida) from Turkey. *Entomological News*, 119 (3): 263–270.
- Vasiliu, N.A. & Ivan, O. (1995) Oribatid mites from Israel. In: Nitzu, E. (Ed.), *Soil fauna of Israel*. Editura Academiei Romane, Bucuresti, pp. 69–86.
- Woas, S. (1986): Beitrag zur revision der Oppioidea sensu J. Balogh, 1972 (Acari, Oribatei). *Andrias*, 5: 21–224.

Received: 23 November 2014

Accepted: 25 December 2014

Published: 15 January 2015

#### COPYRIGHT

 Keshavarz Jamshidian *et al.* Persian Journal of Acarology is under free license. This open-access article is distributed under the terms of the Creative Commons -BY-NC-ND which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original author and source are credited.

## فون کنه‌های خانواده *Oppiidae* (Acari: Oribatida) استان البرز، کلید شناسایی گونه‌ها و معرفی گزارش‌های جدید برای ایران

مریم کشاورز جمشیدیان<sup>۱</sup>، محمدعلی اکرمی<sup>۲</sup> و علی‌رضا صبوری<sup>۱\*</sup>

۱. گروه گیاه‌پزشکی، دانشکده کشاورزی، دانشگاه تهران، کرج، ایران؛ رایانامه:

*saboori@ut.ac.ir mkjamshidian@gmail.com*

۲. گروه گیاه‌پزشکی، دانشکده کشاورزی، دانشگاه شیراز، ایران؛ رایانامه: *akrami@shirazu.ac.ir*

\* نویسنده مسئول

### چکیده

بررسی فون کنه‌های خانواده *Oppiidae* استان البرز، در سال‌های ۹۲-۱۳۹۱ با نمونه‌برداری از باغ‌ها، مزارع و مراتع انجام گرفت. در مجموع، ۲۹ گونه متعلق به ۱۱ جنس از خاک و خاکبرگ شناسایی شد که سه گونه و یک زیرگونه برای فون ایران جدیدند. برای گزارش‌های جدید صفات تشخیصی مختصری ارائه شده است. کلید شناسایی زیرخانواده‌ها، جنس‌ها و زیرجنس‌های استان البرز تهیه شده است. افزون بر این، کلید شناسایی گونه‌ها برای جنس‌های دارای بیش از یک گونه، ارائه شده است.

واژگان کلیدی: فون، گزارش جدید، استان البرز، ایران

تاریخ دریافت: ۱۳۹۳/۹/۲

تاریخ پذیرش: ۱۳۹۳/۱۰/۴

تاریخ چاپ: ۱۳۹۳/۱۰/۲۵