

Oribatulid mites (Acari, Oribatida, Oribatulidae) from the southwestern region of the Amanos Mountains¹

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ÖZ

Amanos Dağları'nın güneybatı bölgesinden oribatulid akarlar (Acari, Oribatida, Oribatulidae)

Amanos Dağları'nın güneybatı bölgesinde yaşayan oribatulid akarlar 2012 yılında toplanan örneklerle dayanarak değerlendirilmiştir. Oribatulidae familyasına ait yedi takson belirlenmiş, bunlardan *Oribatula (Zygoribatula) exarata* Berlese, 1916, *Oribatula (Zygoribatula) excavata* Berlese, 1916, *Oribatula (Zygoribatula) propinqua* (Oudemans, 1900), *Oribatula (Oribatula) tibialis amblyptera* Berlese, 1916 ve *Oribatula (Oribatula) interrupta interrupta* (Willmann, 1939) Türkiye faunası için yeni kayıt; *Oribatula (Zygoribatula) longisensilla* (Djaparidze, 1985) ve *Oribatula (Zygoribatula) undulata* Berlese, 1916 ise daha önce bilinen türler olarak tespit edilmiştir. Ayrıca bu taksonların tanıtıcı morfolojik özellikleri ve dağılımı da sunulmuştur.

Anahtar kelimeler: Acari, Oribatida, *Oribatula*, yeni kayıtlar, Amanos Dağları, Türkiye

ABSTRACT

Oribatulid mites inhabiting in a southwestern region of Amanos Mountains were evaluated based on samples collected in 2012. Seven taxa belonging to the family Oribatulidae Thor, 1929 were determined. Of these, *Oribatula (Zygoribatula) exarata* Berlese, 1916, *Oribatula (Zygoribatula) excavata* Berlese, 1916, *Oribatula (Zygoribatula) propinqua* (Oudemans, 1900), *Oribatula (Oribatula) tibialis amblyptera* Berlese, 1916 and *Oribatula (Oribatula) interrupta interrupta* (Willmann, 1939) are new records for the Turkish fauna; *Oribatula (Zygoribatula) longisensilla* (Djaparidze, 1985) and *Oribatula (Zygoribatula) undulata*

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Berlese, 1916 have already been determined in Turkey. Their distribution and diagnostic morphological characteristics were also presented.

Keywords: Acari, Oribatida, Oribatula, new records, Amanos Mountains, Turkey

INTRODUCTION

Oribatid mites are a group of mites which live in the soil. They are relatively rich in the number of species and individuals and extremely important as decomposers. The presence of lots of mites is a sign of healthy soil. So it is important to investigate soil mites.

The Oribatulidae Thor, 1929 contain about 16 genera, 5 subgenera, 209 species and 7 subspecies; and have a worldwide distribution (Subías 2004, updated 2017). In Turkey, the family Oribatulidae Thor, 1929 is represented by three genera and one subgenus, namely *Lucoppia* Berlese, 1908, *Oribatula* Berlese, 1896, *Phauloppia* Berlese, 1908 and *Oribatula* (*Zygoribatula*) Berlese, 1916 (Albayrak 2000, Ay and Ayyıldız 2014, Ayyıldız 1988a,b, Ayyıldız and Toluk 2016, Bezci and Baran 2016, Erman et al. 2007, Grobler et al. 2004, Grobler et al. 2005, Özkan et al. 1988, Özkan et al. 1994, Per and Ayyıldız 2004, Taşdemir et al. 2010). The genus *Oribatula* is the most species-rich among them, with 138 species and 7 subspecies (Subías 2004, updated 2017). The systematic status of *Oribatula* has been investigated by Seniczak et al. (2012). The genus *Zygoribatula* has been declared as the junior synonym of *Oribatula* by them. In this study, we have considered currently as *Oribatula* (*Zygoribatula*) according to Subías (2004, updated 2017).

In our country, although many studies on this group exist, they are not sufficient (Albayrak 2000, Ayyıldız 1988a,b, Ayyıldız and Luxton 1989, Erman et al. 2007, Grobler et al. 2004, 2005, Niedbala 1981, 1984, 1992, Özkan et al. 1988, Özkan et al. 1994, Per and Ayyıldız 2004, Taşdemir et al. 2010). Names of species follow Subías (2004, updated 2017). The aim of this study is to contribute to the Turkish fauna.

MATERIALS AND METHODS

The extraction of mites from materials collected from the southwestern region of Amanos Mountains in Iskenderun, Turkey was made by using a Berlese-Tullgren funnel extractor, in 2012. Mites were killed, fixed and stored in 75% ethanol. The light and scanning electron microscopes were used to examine mites. The compound microscopic examinations of specimens were made in lactic acid, mounted in temporary cavity slides.

RESULTS AND DISCUSSION

Some morphological features of species reported here are presented below, with their geographical distribution.

Oribatulidae Thor, 1929

Oribatula (Zygoribatula) Berlese, 1916

Oribatula (Zygoribatula) exarata Berlese, 1916

Measurements: Length: 475 (450–490) μm , width: 289 (260–320) μm (n=10).

Diagnostic characters: Lamellae rather narrow, translamella thin. Lamellar setae long, protruding one-third beyond rostrum. Sensillus short, clavate, with finely barbed head. Notogaster with longitudinal and slanting striate and 14 pairs of short setae (p_3 present) (Figure 1).

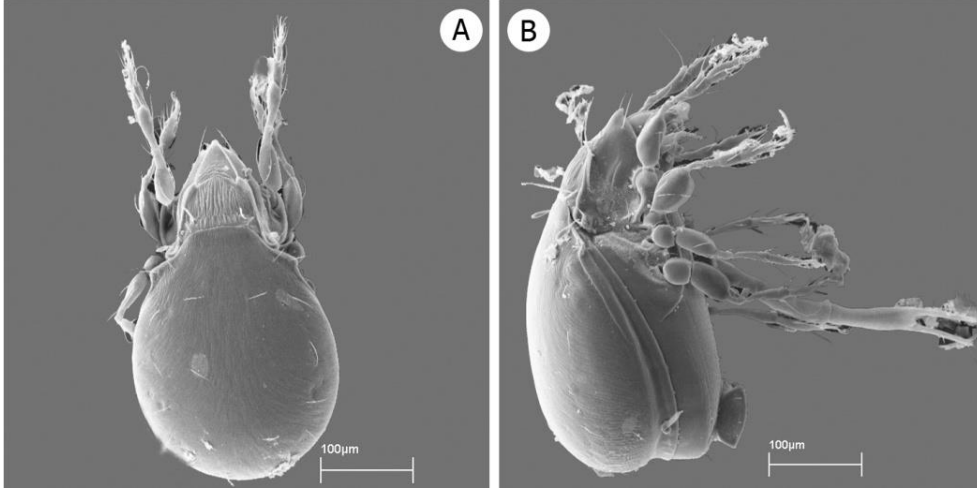


Figure 1. *Oribatula (Zygoribatula) exarata* Berlese, 1916. A) Dorsal view, B) Lateral view.

Material examined: One adult specimen, Kurtbağı village, N36° 24.446', E036° 02.077', 570 m, 10.I.2012, grassy soil; 17 adult specimens, Kurtbağı village, N36° 25.469', E036° 00.403', 314 m, 01.II.2012, soil under shrubs; 5 adult specimens, Kurtlusarımazı village road, N36° 31.480', E036° 15.300', 1432 m, 11.IV.2012, alpine meadows.

Distribution: Palearctic (Subías 2004, updated 2017).

Comment: This is the first record of the species for Turkey.

Oribatula (Zygoribatula) excavata Berlese, 1916

Measurements: Length: 534 (500–560) μm , width: 328 (300–350) μm (n=10).

Diagnostic characters: Lamellae equal in width along their length, and extend to middle of prodorsum, lamellar cusps well observable. Translamella robust, its central portion concave. Sensillus conspicuously narrow, directed towards, clavate, with finely barbed head. Notogaster with longitudinal broken line and 13 pairs of well developed and pilose setae. Humeral setae slightly erect and shorter than the others (Figure 2).

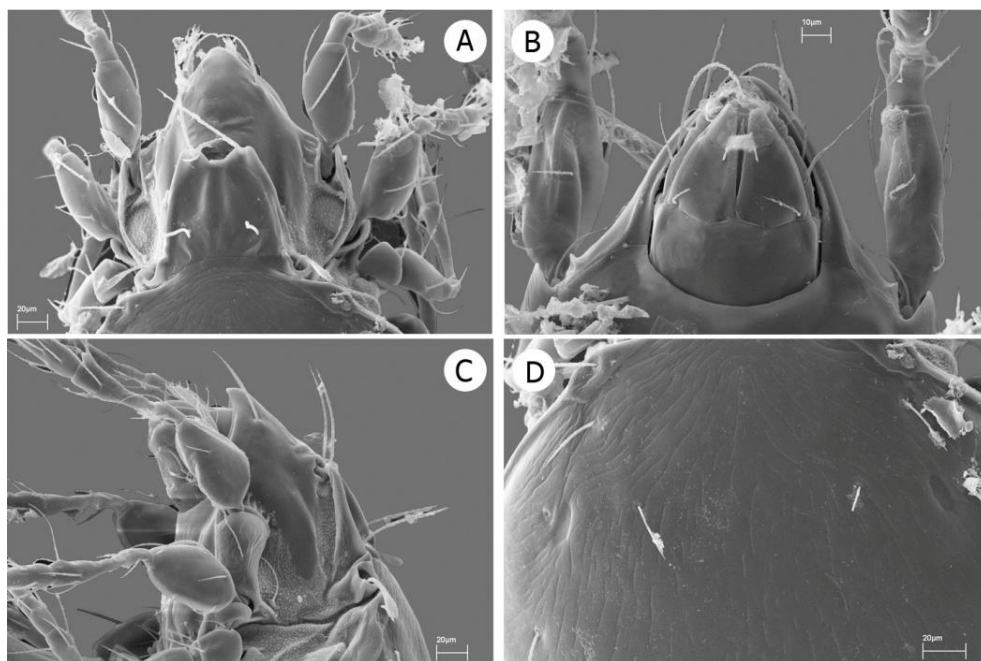


Figure 2. *Oribatula (Zygoribatula) excavata* Berlese, 1916. A) Prodorsum, B) Infracapitulum, C) Lateral view of prodorsum, D) Anterior part of notogaster.

Material examined: Eighty-four adult specimens, Kurtbağı village, N36° 24.446', E036° 02.077', 570 m, 10.I.2012, grassy soil; one adult specimen, Atik village, N36° 31.210', E036° 14.560', 1328 m, 11.IV.2012, soil and litter under cedar tree (*Cedrus* sp.).

Distribution: Europe (Weigmann 2006).

Comment: This is the first record of the species for Turkey.

***Oribatula (Zygoribatula) propinqua* (Oudemans, 1900)**

Measurements: Length: 349 (320–390) µm, width: 212 (170–240) µm (n=10).

Diagnostic characters: Lamellae slightly convergent from posterior to anterior. Translamella distinct, approximately as wide as lamella in medial part. Sensillus short, clavate, with finely barbed head. Notogaster with 13 pairs of short setae (p_3 absent) (Figure 3).

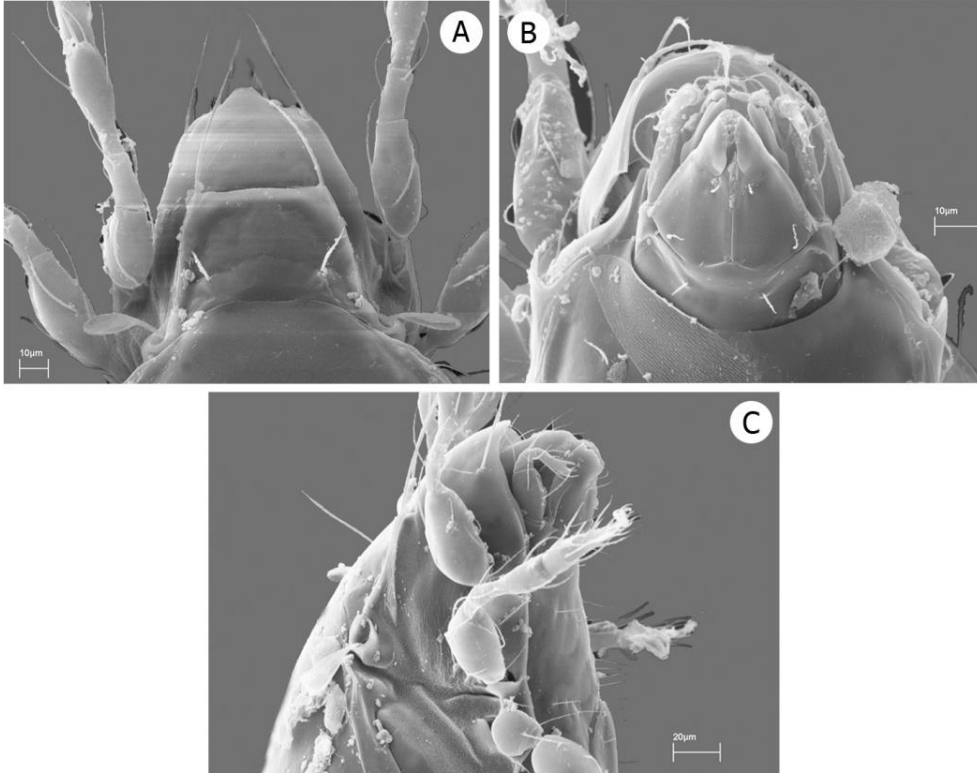


Figure 3. *Oribatula (Zygoribatula) propinqua* (Oudemans, 1900). A) Prodorsum, B) Infracapitulum, C) Lateral view of prodorsum.

Material examined: Two hundred and six adult specimens, Kurtbağı village, N36° 25.088', E036° 02.629', 321 m, 29.IX.2012, soil and litter under pine trees (*Pinus* sp.); sixty-six specimens, Bey village, N36° 23.964', E035° 58.662', 190 m, 28.VIII.2012, soil and litter under pine trees (*Pinus* sp.); twenty-one adult specimens, Karagöz village road, N36° 22.657', E035° 57.573', 375 m, 28.VIII.2012, soil and litter under pine trees (*Pinus* sp.).

Distribution: Palearctic (Seniczak et al. 2012, Weigmann 2006).

Comment: This is the first record of the species for Turkey.

***Oribatula (Zygoribatula) longisensilla* (Djaparidze, 1985)**

Measurements: Length: 408 (400–440) µm, width: 249 (240–260) µm (n=10).

Diagnostic characters: Lamellae narrow, equal in width along their length, lamellar cusps absent. Translamella slightly narrower than lamellae. Sensillus long, lanceolate, ciliate. Notogaster with 13 pairs of thin and sparsely barbed setae. Areae porosae small, round to oval shaped (Figure 4).

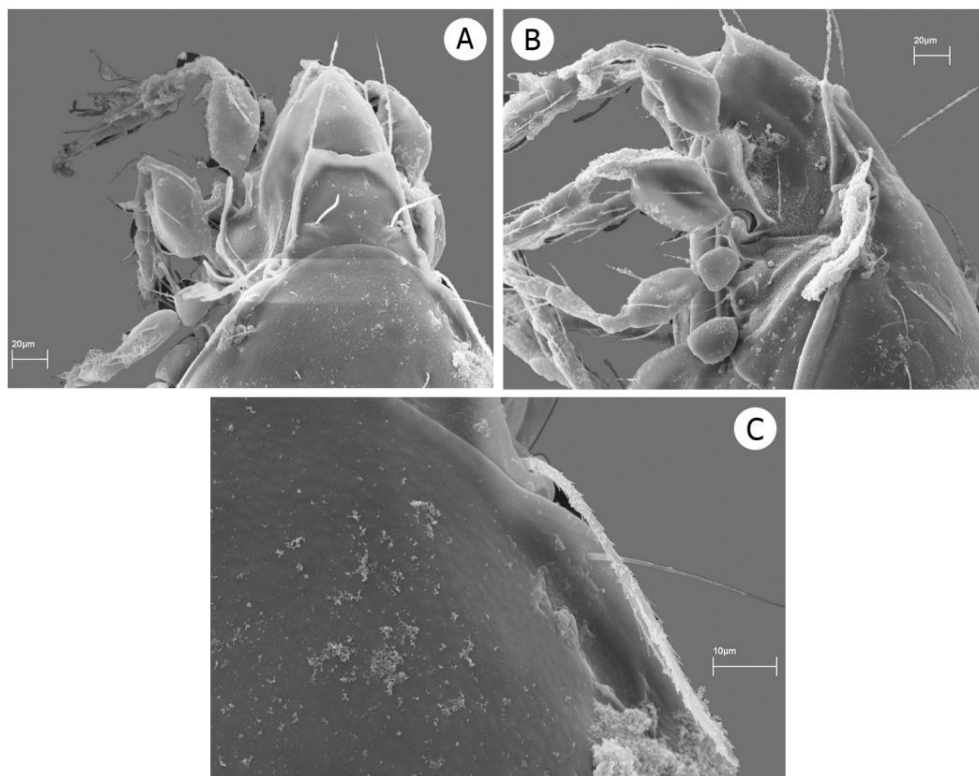


Figure 4. *Oribatula (Zygoribatula) longisensilla* (Djaparidze, 1985). A) Prodorsum, B) Lateral view of prodorsum, C) Humeral region.

Material examined: Twenty six adult specimens, Atik village, N36° 31.210', E036° 14.560', 1328 m, 11.IV.2012, soil and litter under cedar tree (*Cedrus* sp.); 3 adult specimens, Bey village, N36° 24.036', E036° 00.038', 467 m, 11.IV.2012, soil and litter under pine trees (*Pinus* sp.); 21 adult specimens, Kurtbağı village, N36° 24.009', E036° 00.319', 472 m, 11.IV.2012, soil and litter under pine trees (*Pinus* sp.); a totally of 128 adult specimens from the stations close to the previous locality at different times (from January to November in 2012); 1 adult specimen, Karagöz village road, N36° 22.646', E035° 57.653', 408 m, 28.VIII.2012, soil and litter under pine trees (*Pinus* sp.).

Distribution: Eastern Mediterranean (Subías 2004, updated 2017).

***Oribatula (Zygoribatula) undulata* Berlese, 1916**

Measurements: Length: 543 (500–590) µm, width: 346 (310–380) µm (n=10).

Diagnostic characters: Lamellae long, broad; translamella broad. Sensillus clavate, with finely barbed head. Notogaster with 14 pairs of long and barbed setae. Areae porosae A_4 and A_1 elongated, A_2 and A_3 oval (Figure 5).

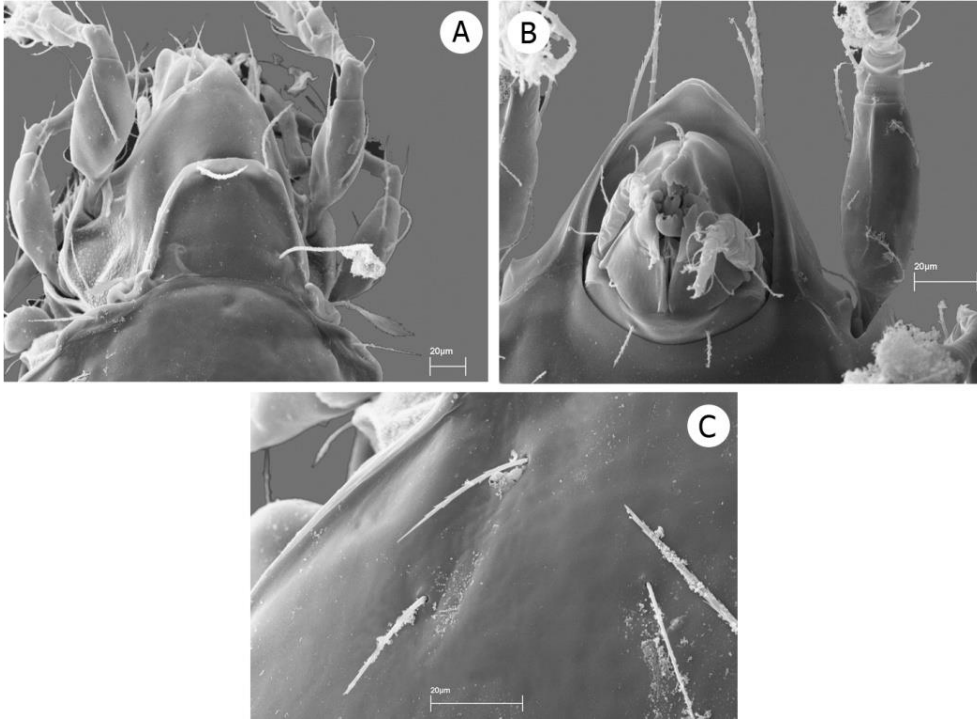


Figure 5. *Oribatula (Zygoribatula) undulata* Berlese, 1916. A) Prodorsum, B) Infracapitulum, C) Humeral region.

Material examined: Seventy-seven adult specimens, İskenderun, Kurtbağı village, N36° 24.941', E036° 01.472', 414 m, 10.I.2012, mossy soil.

Distribution: Pantropical and Subtropical except Neotropical; Turkey (Ayyıldız 1988b, Subías 2004, updated 2017).

Oribatula (Oribatula) Berlese, 1896

***Oribatula (Oribatula) tibialis amblyptera* Berlese, 1916**

Measurements: Length: 373 (340–400) µm, width: 232 (220–250) µm (n=10).

Diagnostic characters: Lamellae ribbon-shaped; lamellar apex concave, and its median angle prominent. Sensillus short and fusiform clavate, with rounded end. Notogaster with 13 pairs of setae, often hardly observable. The four pairs of area porosae round and small (Figure 6).

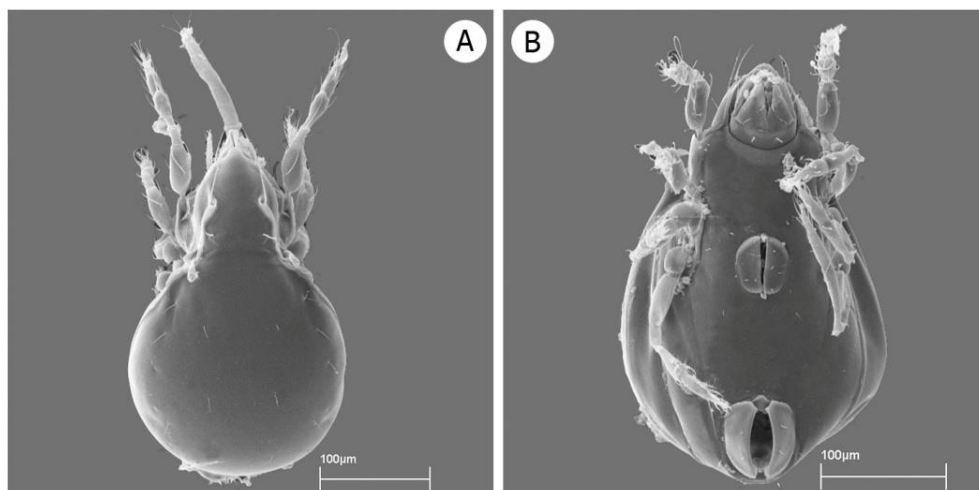


Figure 6. *Oribatula (Oribatula) tibialis amblyptera* Berlese, 1916. A) Dorsal view, B) Ventral view.

Material examined: Forty adult specimens, Kurtlusarımazı village road, N36° 31.480', E036° 15.300', 1432 m, 11.IV.2012, alpine meadows; three adult specimens, Kurtbağı village, N36° 24.837', E036° 02.900', 390 m, 29.IX.2012, soil and litter under pine trees (*Pinus* sp.).

Distribution: Italy, Switzerland, Austria and Romania (Ivan 2013, Weigmann 2006).

Comment: This is the first record of the species for Turkey.

***Oribatula (Oribatula) interrupta interrupta* (Willmann, 1939)**

Measurements: Length: 374 (350–400) µm, width: 230 (200–250) µm (n=10).

Diagnostic characters: Sensillus short, clavate, with finely barbed head. Lamellae rather narrow, with seta *le* in anterior part; cusp of lamella longer or shorter. Translamella usually incomplete. Notogaster oval, with 13 pairs of short setae (*p*₃ absent) (Figure 7).

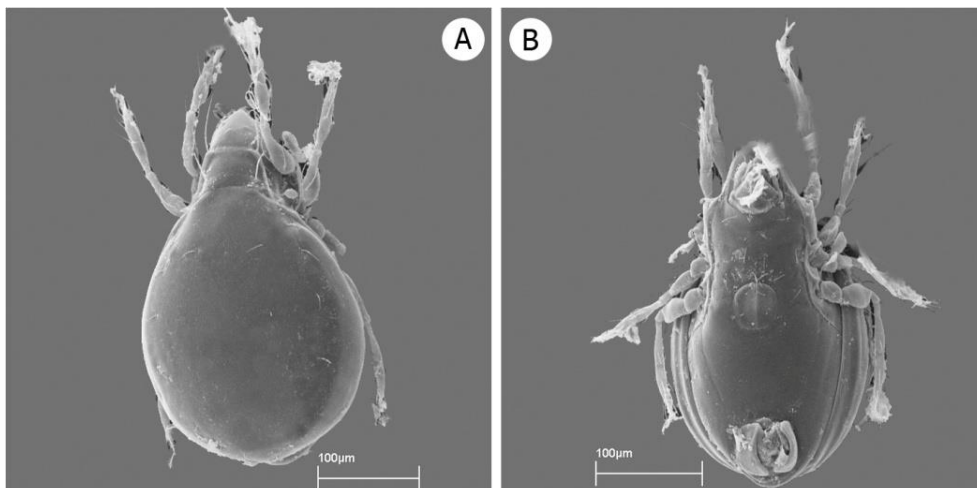


Figure 7. *Oribatula interrupta* (Willmann, 1939). A) Dorsal view, B) Ventral view.

Material examined: Twenty three adult specimens, Karagöz village road, N36° 22.647', E035° 57.380', 370 m, 28.VIII.2012, soil and litter under brush and pine trees (*Pinus* sp.); a totally of 26 adult specimens from the stations close to the previous locality at different times (from January to November in 2012); thirty seven adult specimens, Bey village, N36° 23.944', E035° 58.847', 224 m, 28.VIII.2012, soil and litter under pine trees (*Pinus* sp.); fifty four adult specimens, Kurtbağı village, N36° 24.744', E036° 02.924', 429 m, 29.IX.2012, soil and litter under pine trees (*Pinus* sp.); a totally of 196 adult specimens from the stations close to the previous locality at different times (from January to November in 2012).

Distribution: Holarctic and Ethiopian (Subías 2004, updated 2017).

Comment: This is the first record of the species for Turkey.

Key to species and subspecies of the genus *Oribatula* Berlese, 1916 known from Turkey

- 1. Translamella present2
- Translamella absent10
- 2. Notogaster striate 3
- Notogaster not striate4
- 3. Interlamellar region lineate; porose areas rounded
.....*Oribatula* (*Zygoribatula*) *exarata* Berlese, 1916
- Interlamellar region smooth; porose areas ovate*Oribatula* (*Zygoribatula*) *connexa connexa* Berlese, 1904
- 4. Translamella very thin, linear.....
.....*Oribatula* (*Zygoribatula*) *exilis exilis* (Nicolet, 1855)
- Translamella equal in width to the lamellae or only a little thinner.....5

5. Lamellar cuspis short and narrow; sensillus short stalked, clavate
*Oribatula (Zygoribatula) propinqua* (Oudemans, 1902)
 - Lamellar cuspis not short or not so narrow6
6. Lamellar cuspis very broad and short prominent; sensillus long stalked,
 clavate*Oribatula (Zygoribatula) excavata* Berlese, 1916
 - Lamellar cuspis not broad and prominent.....7
7. Rostrum pointed; porose areas Aa and A₁ about 3 times as long as broad
*Oribatula (Zygoribatula) undulata* Berlese, 1916
 - Rostrum rounded; porose areas Aa and A₁ about 1-1.5 times as long as
 broad.....8
8. Sensillus very long, lanceolate
 *Oribatula (Zygoribatula) longisensilla* (Djaparidze, 1985)
 - Sensillus short and clavate9
9. Lamella and translamella wide; length 440-465 µm
 *Oribatula (Zygoribatula) cognata* (Oudemans, 1902)
 - Lamella and translamella narrow; length 315-450 µm
 *Oribatula (Zygoribatula) frisiae* (Oudemans, 1900)
10. Sensillus rather short stalked and clavate; translamella usually incomplete,
 broken in middle, but can also be thin or rarely absent
*Oribatula (O.) interrupta interrupta* (Willmann, 1939)
 - Sensillus longer stalked and clavate or fusiform11
11. Lamella moderately broad, slightly dilated in front; no lamellar cuspis,
 sensillus moderately long stalked clavate.....
*Oribatula (O.) pannonica* Willmann, 1949
 - Lamella very much widened in front; rounded lamellar cuspis not protruding
 or very little protruding 12
12. Sensillus long stalked, clavate; length 410-530 µm
 *Oribatula (O.) tibialis tibialis* (Nicolet, 1855)
 - Sensillus moderately long stalked, fusiform; length 335-405 µm
*Oribatula (O.) tibialis amblyptera* Berlese, 1916

CONCLUSION

Electron microscope photos of all determined taxa were taken. All species reported here are well recognizable (Ayyıldız 1988b, Bernini et al. 1987, Grobler and Kok 1993, Grobler et al. 2004, Ivan 2013, Mahunka 1994, Pérez-Iñigo 1993, Sellnick 1960, Seniczak et al. 2012, Subías 2004, updated 2017, Weigmann 2006). Due to the synonymy of previously recorded species, the number of known taxa of the genus *Oribatula* from Turkey has risen to 13, with the data presented in this study. *Zygoribatula lanceolata* (Grobler et al. 2004), previously defined from Çamlidere, Ankara (Turkey), was considered as synonym of *Oribatula (Zygoribatula) longisensilla* (Djaparidze, 1985) by Subías (2004, updated 2017). The Amanos Mountains are reported as a second locality record for *Oribatula (Zygoribatula) longisensilla* (Djaparidze, 1985).

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REFERENCES

- Albayrak N. 2000. Erzurum ili *Zygoribatula* (Acari, Oribatida, Oribatulidae) türleri üzerine sistematik araştırmalar. Yüksek lisans tezi, Atatürk Üniversitesi, Fen Bilimleri Enstitüsü, Erzurum, 32 s.
- Ay Y. and Ayyıldız N. 2014. Taxonomic investigations on oribatid mites (Acari, Oribatida, Oribatulidae) from the southwestern region of the Amanos Mountains. IUFRO Joint Meeting, 7.03.14 "Entomological Research in Mediterranean Forest Ecosystems" MEDINSECT, 09-14 April, Antalya, 80.
- Ayyıldız N. 1988a. Erzurum Ovası Oribatid Akarları (Acari, Oribatida) Üzerine Sistematik Araştırmalar. III. Yüksek oribatidler. Doğa Türk Zooloji Dergisi, 12, 145 – 155.
- Ayyıldız N. 1988b. Türkiye Faunası İçin Yeni *Zygoribatula* Berlese (Acari, Oribatulidae) Türleri. Doğa Türk Zooloji Dergisi, 12, 204 – 209.
- Ayyıldız N. and Luxton M. 1989. New and Unrecorded Oribatid Mites (Acari) from Turkey. Zoologischer Anzeiger, 222 (5/6), 294 – 300.
- Ayyıldız N. and Toluk A. 2016. Contributions to the Turkish oribatid mite fauna (Acari: Oribatida). Turkish Journal of Entomology, 40 (1), 73-85.
- Bernini F., Avanzati A.M. and Bernini S. 1987. Notulae Oribatologicae XXXVII. Gli Acari Oribatei del Massiccio del Pollino (Italia Meridionale): Aspetti Faunistici e Biogeografici. Lavori della Società Italiana di Biogeografia, Nuova Serie, 10, 379–488.
- Bezi T. and Baran Ş. 2016. First record of the genus *Lucoppia* (Acari: Oribatida) from Turkey. Turkish Journal of Zoology, 40 (5), 765-768.
- Erman O., Özkan M., Ayyıldız N. and Doğan S. 2007. Checklist of the Mites (Arachnida: Acari) of Turkey. Second supplement. Zootaxa, 1532, 1-21.
- Grobler L. and Kok D.J. 1993. Species of the Genus *Zygoribatula* Berlese, 1916 (Acari, Oribatida, Oribatulidae) from South Africa II. New and Existing Species. Navorsinge Van Die Nasionale Museum, Bloemfontein, 9 (6), 181–212.
- Grobler L., Bayram Ş. and Çobanoğlu S. 2004. Two New Species and New Records of Oribatid Mites from Turkey. International Journal of Acarology, 30 (4), 351–358.
- Grobler L., Bayram S. and Çobanoğlu S. 2005. Two New Records of *Oribatula* (*Zygoribatula*) Species (Acari: Oribatida) from Turkey, with Redescriptions. Zoological Science, 22, 1347–1351.
- Ivan O. 2013. Genus *Oribatula* s. str. Berlese, 1896 (Oribatida, Oribatulidae) in Romanian Fauna. Acarologia, 53 (2), 175–184.

- Mahunka S. 1994. Further Notes, Additions and Redescriptions of the Oribatid Species Preserved in the Berlese Collection (Acari, Oribatida) I. *Acta Zoologica Academiae Scientiarum Hungaricae*, 40 (1), 29-49.
- Niedbala W. 1981. Deux Nouveaux Phthiracaroidae de Turquie (Acari, Oribatida). *Polskie Pismo Entomologiczne*, 51, 501-510.
- Niedbala W. 1984. Phthiracaroidae (Acari, Oribatida) Nouveaux d' Asia Occidentale. *Annales Zoologici*, 38, 225-241.
- Niedbala W. 1992. Phthiracaroidae (Acari, Oribatida): Systematic Studies. PWN- Polish Scientific Publishers, Warszawa, 612 p.
- Özkan M., Ayyıldız N. and Erman O. 1994. Check List of the Acari of Turkey. First Supplement. *EURAAC News Letter*, 7 (1), 4 - 12.
- Özkan M., Ayyıldız N. and Soysal Z. 1988. Türkiye Akar Faunası. *Doğa Türk Zooloji Dergisi*, 12, 75 - 85.
- Per S. and Ayyıldız N. 2004. Erciyes Dağının (Kayseri) Epifitik Oribatid Akarları Üzerine Sistematik Araştırmalar-III. *Erciyes Üniversitesi Fen Bilimleri Enstitüsü Dergisi*, 20, 119-128.
- Pérez-Iñigo C. 1993. Acari Oribatei, Poronota. Fauna Iberica, Vol.3. Museo Nacional de Ciencias Naturales, CSIC, Madrid, 320 p.
- Sellnick M. 1960. Formenkreis: Hornmilben, Oribatei. In: Brohmer P., Ehrmann P., Ulmer (eds). *Die Tierwelt Mitteleuropas* 3, 4. Lief (Ergänzung), pp. 45-134. Quelle & Meyer, Leipzig.
- Seniczak S., Seniczak A., Kaczmarek S. and Żelazna E. 2012. Systematic Status of *Oribatula* Berlese, 1895 (Acari: Oribatida: Oribatulidae) in the Light of the Ontogeny of Three Species. *International Journal of Acarology*, 38 (8), 664-680.
- Subías L. S. 2004, updated 2017. Listado sistemático, sinonímico y biogeográfico de los ácaros oribátidos (Acariformes, Oribatida) del Mundo (1758-2002). *Graellsia*, 60 (núm. extr.), 3-305. http://bba.bioucm.es/cont/docs/RO_1.pdf (Date accessed: 07.07.2017)
- Taşdemir A., Sarı E. and Ayyıldız N. 2010. Yozgat Çamlığı Milli Parkı'ndan *Zygoribatula* Berlese, 1916 ve *Eupelops* Ewing, 1917 (Oribatida: Oribatulidae, Phenopelopidae) Türleri Üzerine Sistematik ve Ekolojik Araştırmalar. *Süleyman Demirel Üniversitesi Fen Dergisi*, 5 (1), 47-59.
- Weigmann G. 2006. Hornmilben (Oribatida). *Die Tierwelt Deutschlands, Begründet 1925 von Friedrich Dahl*, 76. Teil. Goecke & Evers, Keltern, 520 p.