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Original article

Oppioid oribatid mites (Acari: Oribatida) of Erciyes Mountain (Kayseri, Turkey)

Erciyes Dağının (Kayseri, Türkiye) oppioid oribatid akarları (Acari: Oribatida)

Ayşe TOLUK [a*], Seval BAYRAM YANMAZ [b], Zeliha ŞAHİN EFE [b]

[a] *Erciyes University, Faculty of Science, Department of Biology, Kayseri, Turkey*

[b] *Erciyes University, Institute of Natural and Applied Sciences, Department of Biology, Kayseri, Turkey*

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* Corresponding author: Ayşe TOLUK

atoluk@erciyes.edu.tr

ABSTRACT

Eight oppioid taxa belonging 7 genera and 4 families of oribatid mites (Acari: Oribatida), namely *Cosmogneta ozkani* Toluk, Ayyıldız and Subías, 2007, *Ramusella (Insculptoppia) insculpta* (Paoli, 1908), *Anomaloppia ozkani* Ayyıldız, 1989, *Oppiella (Oppiella) nova nova* (Oudemans, 1902), *Berniniella (Berniniella) serratirostris hauseri* (Mahunka, 1974), *Berniniella (Berniniella) bicarinata* (Paoli, 1908), *Epimerella subiasi* Toluk and Ayyıldız, 2008 and *Quadroppia (Coronoquadroppia) nasalis* Gordeeva, 1983 collected from Erciyes Mountain, Kayseri in 2012, were evaluated from taxonomically to contribute to the knowledge of the Turkish mite fauna. All of the mites are new records for the Erciyes mountain. Morphological features of the taxa are presented by scanning electron microscopic images according to collected samples. The key for these taxa is also given.

INTRODUCTION

Oribatid mites perform many vital functions including converting dead and decaying matter as well as minerals to plant nutrients. Nutrient exchanges between organic matter, water and soil are essential to soil fertility and need to be maintained for sustainable production purposes. Where the soil is exploited for crop production without restoring the organic matter and nutrient contents and maintaining a good structure, the nutrient cycles are broken, soil fertility declines and the balance in the agro-ecosystem is destroyed. For this reason, these mites have indirect protection for plant health (Kumar and Singh 2016). They are worldwide in distribution and abundant in most of the geographical regions. The superfamily Oppioidea Sellnick, 1937 is the largest superfamily in the suborder Oribatida Dugès, 1834, and occurs in almost all terrestrial habitats, especially in soil and litter. This superfamily comprises 16 families, 162 genera, 49 subgenera and more than 1100 species (Subías 2004, updated 2018). So far, 69 species belong to this superfamily have been recorded from Turkey (Toluk 2016, Toluk and Akin 2017, Toluk and Ayyıldız 2008b). Despite, many studies on oribatid mites of Erciyes Mountain (Ayyıldız et al. 2011, Baştürk and Toluk 2016, Per and Ayyıldız 2004, Per and Ayyıldız 2005a, 2005b, Per et al. 2015), there is no information on the oppioid mites of Erciyes Mountain, so the oppioid oribatid mites inhabiting in the Erciyes Mountain were evaluated from the taxonomic point of view with the aim of contributing to the oribatid fauna of Turkey.

MATERIALS AND METHODS

Erciyes Mountain (ERD) is located within the boundaries of Kayseri province with the coordinates of 38° 32' 01" N and 35° 27' 02" E and an elevation of 3917 m. It is a

Table 1. A list of sampling sites in the Erciyes Mountain, Turkey

Site code	Habitat	Date
1 (ERD-1 to 46)	Grassy soil	24.IV.2012
2 (ERD- 47 to 91)	Litter and soil under bush, *Pinus nigra* J.F. Arnold and *Populus* sp.; grassy soil	24.V.2012
3 (ERD- 92 to 138)	Litter and soil under *Pinus nigra* and *Quercus* spp.; grassy soil	01.VI.2012
4 (ERD-139 to 184)	Litter and soil under *Pinus nigra* and *Populus* sp.; grassy soil	05.VII.2012
5 (ERD-185 to 230)	Litter and soil under bush, *Pinus nigra* and *Populus* sp.; grassy soil	04.X.2012

volcanic mountain with a diameter of 35 km. The study was carried out in 2012. Soil and litter samples were taken using a 10 cm long by 10 cm diameter a cylindrical soil corer randomly from 230 locations (Table 1). Mites were extracted by using a Berlese-Tullgren funnel and preserved in 70% ethanol. The specimens were cleared in lactic acid and mounted on temporary slides. Mites were examined under light and scanning electron microscopes (SEM). The unit of measurement is micrometer (µm). All specimens are deposited in the Acarological Collection of the Zoological Museum, Erciyes University, Kayseri, Turkey. The morphological terminology follows that of Norton and Behan-Pelletier (2009). Species were identified following Golosova (1975), Subias and Arillo (2001), Weigmann (2006) and Woas (1986).

RESULTS AND DISCUSSION

Eight oppioid taxa from seven genera and four families of oribatid mites (Acari: Oribatida) from Erciyes mountain of Turkey were determined. These taxa are given below.

Key to the oppioid mites species and subspecies of Erciyes Mountain

1 - Epimera III and IV separated from each other medially
E. subiasi Toluk & Ayyıldız, 2008

- Epimera I meeting medially 2

2 - Costula present and long..... 3

- Costula absent or short if present 4

3 - Costulae parallel anteriorly, sensilli with elliptical heads
ozkani Toluk, Ayyıldız, Subías, 2007

- Costulae convergent anteriorly, sensilli clavate.....
Q. (C.) nasalis Gordeeva, 1983

4 - Costula present.....5

- Costula absent 7

5 - Rostrum rounded, dorsosejugal suture straight and .....
notogaster with cristae.....
(O.) nova nova (Oudemans, 1902)

- Rostrum dentate, anterior part of notogaster penetrating into basal part of prodorsum.....6

6 - Central rostrum with 3 teeth.....
B. (B.) serratirostris hauseri (Mahunka, 1974)

- Central rostrum with 1 tooth .....
B. (B.) bicarinata (Paoli, 1908)

7 - Notogaster with nine pairs of setae.....
R. (I.) insculpta (Paoli, 1908)

- Notogaster with ten pairs of setae.....
A. ozkani Ayyıldız, 1989

Checklist of Erciyes Mountain oppioid oribatid mites

Family Autognetidae Grandjean, 1960

Genus *Cosmogneta* Grandjean, 1960

Cosmogneta ozkani Toluk, Ayyıldız and Subías, 2007

Measurements: Body length 220-240, width 102-112 (n=10).

Diagnostic characters (Figure 1A-D): Rostrum divided by deep median incision; costula long, parallel, widened at their median parts; sensilli with long stalk and little dilated, strongly barbed elliptical heads; anterior margin of notogaster straight, with one pair of prominent humeral processes; ten pairs of notogastral setae, thick and unilaterally barbed; five pairs of genital setae; lyrifissures iad paraanal.

Material examined: **1**- 3 specimens, **2**- 47 specimens, **3**- 58 specimens, **4**- 38 specimens, **5**-69 specimens (Table 1).

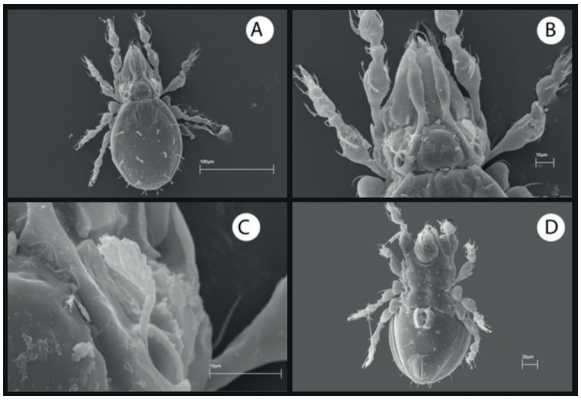

Figure 1. *Cosmogneta ozkani* Toluk, Ayyıldız and Subias, 2007, A) dorsal view, B) prodorsum, C) sensillus, D) ventral view

Distribution: Turkey (Subías 2004, updated 2018).

Turkey locality: Yozgat province (Toluk et al. 2007).

Family Oppiidae Sellnick, 1937

Genus *Ramusella* Hammer, 1962

Subgenus *Ramusella (Insculptoppia)* Subías, 1980

Ramusella (Insculptoppia) insculpta (Paoli, 1908)

Measurements: Body length 216-260, width 110-124 (n=10).

Diagnostic characters (Figure 2A-D): Rostral setae distant, arching forward and converging distally; lamellar lines extend near the lamellar setae; sensilli fusiform; nine pairs of smooth, thin notogastral setae; five pairs of genital setae; lyrifissures iad paraanal.

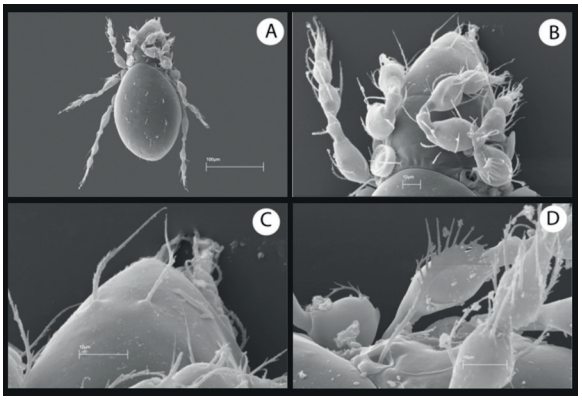

Figure 2. *Ramusella (Insculptoppia) insculpta* (Paoli, 1908). A) dorsal view, B) prodorsum, C) rostrum, D) sensillus

Material examined: **1**- 7 specimens, **2**- 38 specimens, **3**- 73 specimens, **4**- 96 specimens, **5**-112 specimens (Table 1).

Distribution: Palaearctic (except north) and Vietnam (Subías 2004, updated 2018).

Turkey locality: Yozgat and Samsun provinces (Ayyıldız 1989, Toluk and Ayyıldız 2008a).

Genus *Anomaloppia* Subías, 1978

Anomaloppia ozkani Ayyıldız, 1989

Measurements: Body length 262-276, width 124-134 (n=10).

Diagnostic characters (Figure 3A-D): Rostrum rounded; rostral setae straight divergent outwards; lamellar line present; sensilli long, fusiform and unilaterally ciliate; ten pairs of fine, smooth notogastral setae; five pairs of genital setae; lyrifissures iad paraanal.

Material examined: **1**- 3 specimens, **2**- 30 specimens, **3**- 21 specimens, **4**- 10 specimens, **5**-28 specimens (Table 1).

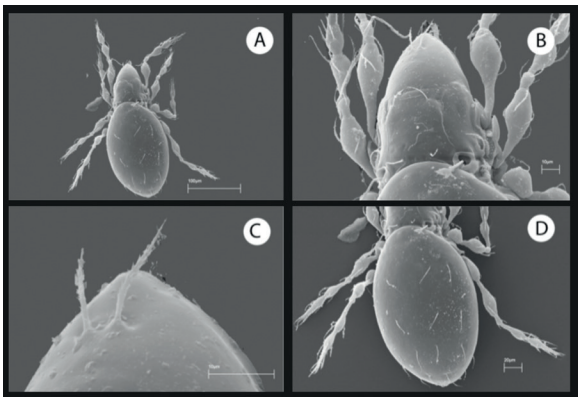

Figure 3. *Anomaloppia ozkani* Ayyıldız, 1989. A) dorsal view, B) prodorsum, C) rostrum, D) notogaster

Distribution: Palaearctic (Subias 2004, updated 2018).

Turkey locality: Yozgat and Erzurum provinces (Ayyıldız 1989, Toluk and Ayyıldız 2008a).

Genus *Oppiella* Jacot, 1937

Subgenus *Oppiella (Oppiella)* Jacot, 1937

Oppiella *(Oppiella) nova nova* (Oudemans 1902)

Measurements: Body length 220-300, width 100-140 (n=10).

Diagnostic characters (Figure 4A-D): All prodorsal setae short and smooth; sensilli fusiform; costula end about midway anterior border of notogaster; dorsosejugal suture straight; notogaster with protruding humeral processes anteriorly; notogaster with ten pairs of setae; five pairs of genital setae; lyrifissures iad paraanal.

Material examined: **2**- 629 specimens, **3**- 261 specimens, **4**- 567 specimens, **5**- 799 specimens (Table 1).

Distribution: Cosmopolitan (Subías 2004, updated 2018).

Turkey locality: Yozgat and Erzurum provinces (Toluk and Ayyıldız 2008a).

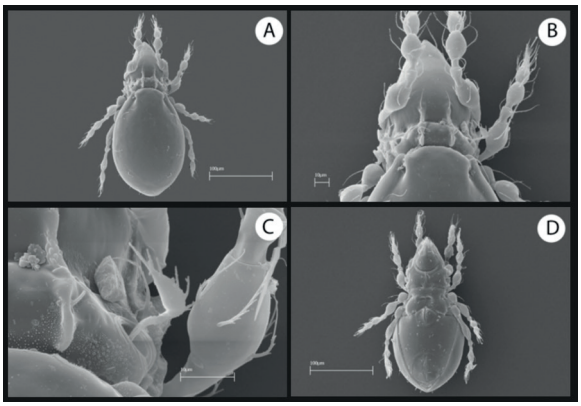

Figure 4. *Oppiella (O.) nova nova* (Oudemans, 1902). A) dorsal view, B) prodorsum, C) sensillus, D) ventral view

Genus *Berniniella* Balogh, 1983

Subgenus *Berniniella (Berniniella)* Balogh, 1983

Berniniella (Berniniella) serratirostris hauseri (Mahunka, 1974)

Measurements: Body length 210-280, width 100-140 (n=10).

Diagnostic characters (Figure 5A-D): Rostrum tridentate, central rostrum with 3 teeth; sensilli clavate radiate, with a long stalk, the head with six long ciliae; anterior margin of notogaster with two sclerotized apophyses running from dorsosejugal suture to basal part of prodorsum; 10 pairs of notogastral setae short, thin and smooth, seta c2 well-developed; four pairs of genital setae; lyrifissures iad paraanal.

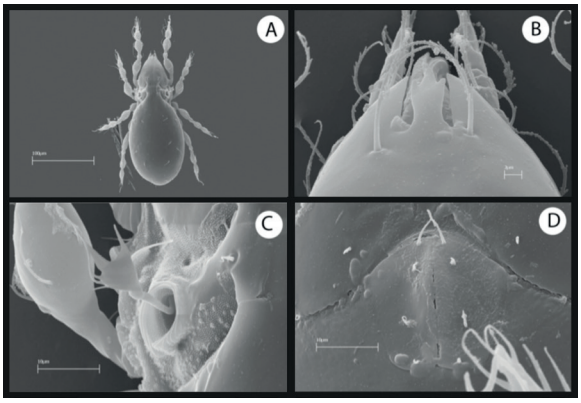

Figure 5. *Berniniella (B.) serratirostris hauseri* (Mahunka, 1974). A) dorsal view, B) rostrum, C) sensillus, D) genital plate

Material examined: **2**- 118 specimens, **3**- 38 specimens, **4**- 17 specimens, **5**- 604 specimens (Table 1).

Distribution: Palaearctic (except north) and Asia (Subías 2004, updated 2018).

Turkey locality: Yozgat province (Toluk and Ayyıldız 2008c).

Berniniella (Berniniella) bicarinata (Paoli, 1908)

Measurements: Body length 200-280, width 72-152 (n=10).

Diagnostic characters (Figure 6A-D): Rostrum tridentated; sensilli clavate radiate, with a long stalk, the head with six long ciliae; anterior margin of notogaster with two sclerotized apophyses running from dorsosejugal suture to basal part of prodorsum; 10 pairs of notogastral setae short, thin and smooth, seta c2 well-developed; four pairs of genital setae; lyrifissures iad paraanal.

Material examined: **1**- 41 specimens, **2**- 392 specimens, **3**- 25 specimens, **4**- 55 specimens, **5**- 12 specimens (Table 1).

Distribution: Palaearctic (Subías 2004, updated 2018).

Turkey locality: Yozgat province (Toluk and Ayyıldız 2008c).

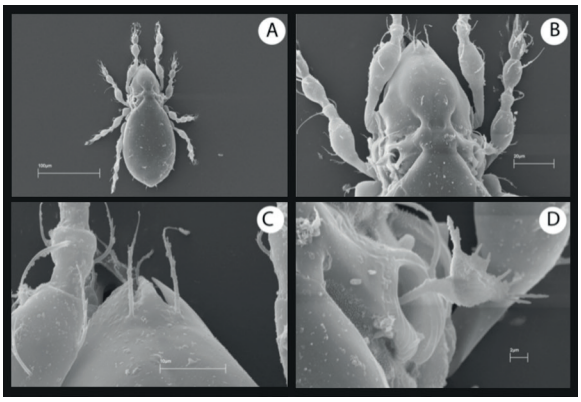

Figure 6. *Berniniella (B.) bicarinata* (Paoli, 1908). A) dorsal view, B) prodorsum, C) rostrum, D) sensillus

Family Epimerellidae Ayyıldız and Luxton, 1989

Genus *Epimerella* Kulijev, 1967

Epimerella subiasi Toluk and Ayyıldız, 2008

Measurements: Body length 244-280, width 129–138 (n=10).

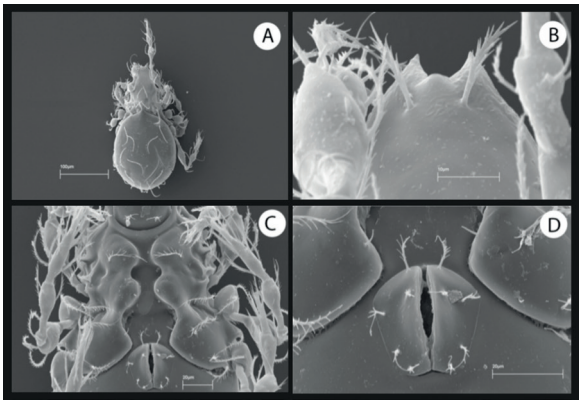

Figure 7. *Epimerella subiasi* Toluk and Ayyıldız, 2008. A) dorsal view, B) rostrum, C) epimeral region, D) genital plate

Diagnostic characters (Figure 7A-D): Rostrum incised; costula present originating from in front of the bothridia; sensilli fusiform, half of its distal part, slightly dilated, each with seven long and three short cilia unilaterally; crista well developed, projecting anteromedially; ten pairs of long, ciliated notogastral setae; five pairs of genital setae; lyrifissures iad paraanal.

Material examined: **2**- 5 specimens, **3**- 9 specimens, **4**- 7 specimens, **5**- 8 specimens (Table 1).

Distribution: Turkey (Subías 2004, updated 2018).

Turkey locality: Yozgat province (Toluk et al. 2008).

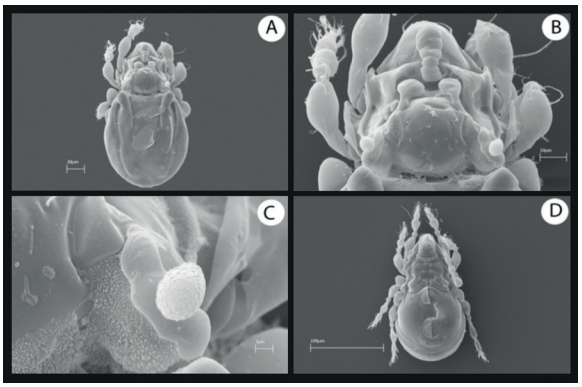

Figure 8. *Quadroppia (Coronoquadroppia) nasalis* Gordeeva, 1983. A) dorsal view, B) prodorsum, C) sensillus, D) ventral view

Family Quadroppiidae Balogh, 1983

Genus *Quadroppia* Jacot, 1939

Subgenus *Quadroppia (Coronoquadroppia)* Ohkubo, 1995

Quadroppia (Coronoquadroppia) nasalis Gordeeva, 1983

Measurements: Body length 184-200, width 104-110 (n=10).

Diagnostic characters (Figure 8A-D): Rostrum wide, rounded; frontal process with cylindrical shape, narrowing in middle; costula anteriorly closing to each other; sensilli clavate; anterior margin of notogaster straight; notogastral cristae well developed and inner ridges of notogastral cristae longer than the outer one; nine pairs of notogastral setae; five pairs of genital setae; lyrifissures iad paraanal.

Material examined: **2**- 13 specimens, **3**- 18 specimens, **4**- 9 specimens, **5**- 12 specimens (Table 1).

Distribution: Eastern Mediterranean (Subías 2004, updated 2018).

Turkey locality: Artvin and Yozgat provinces (Baran et al. 2009, Toluk and Ayyıldız 2008a).

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ÖZET

Türkiye oribatid akar faunasına katkı sağlamak amacıyla 2012 yılında Erciyes Dağından toplanan 4 familyaya ait 7 cinsten sekiz takson; *Cosmogneta ozkani* Toluk, Ayyıldız ve Subías, 2007, *Ramusella (Insculptoppia) insculpta* (Paoli, 1908), *Anomaloppia ozkani* Ayyıldız, 1989, *Oppiella (Oppiella) nova nova* (Oudemans, 1902), *Berniniella (Berniniella) serratirostris hauseri* (Mahunka, 1974), *Berniniella (Berniniella) bicarinata* (Paoli, 1908), *Epimerella subiasi* Toluk ve Ayyıldız, 2008 ve *Quadroppia (Coronoquadroppia) nasalis* Gordeeva, 1983 taksonomik bakımdan değerlendirilmiştir. Tespit edilen taksonların hepsi Erciyes dağı için yeni kayıttır. Toplanan örneklere dayanarak bu taksonların tanıtıcı morfolojik özellikleri SEM fotoğraflarıyla birlikte sunulmuştur. Aynı zamanda bu taksonlar için anahtar verilmiştir.

Anahtar kelimeler: Acari, Oribatida, Oppioidea, Erciyes Dağı, Türkiye

REFERENCES

Ayyıldız N., 1989. Mites of the family Oppiidae (Acari, Oribatida) from Turkey. Journal of Natural History, 23, 1373-1379.

Ayyıldız N., Per S., Taşdemir A., 2011. A new record for the oribatid mite fauna of Turkey: *Lepidozetes singularis* Berlese, 1910 (Acari, Oribatida, Tegoribatidae). Çankaya University Journal of Science and Engineering, 8 (2), 183-187.

Baran Ş., Toluk A., Ayyıldız N., 2009. Mites of the genus *Quadroppia* Jacot, 1939 (Acari: Oribatida; Quadroppiidae) from Turkey, with zoogeographical remarks. Entomological News, 120 (3), 240-252.

Baştürk V., Toluk A., 2016. Oribatid mites and their associated fungi from Erciyes mountain, Turkey. Fresenius Environmental Bulletin, 25 (12a), 5722-5728.

Golosova L.D., 1975. Family Oppiidae Grandjean, 1954. In: A key to soil inhabiting mites, Sarcoptiformes. Ghilarov, M.S. (Ed.). Izdatel' stvo "Nauka", Moscow, 206-223 p.

Kumar U., Singh R., 2016. Soil fauna: A retrospection with reference to Indian soil. International Journal of Research Studies in Zoology, 2 (3), 1-22.

Norton R.A., Behan-Pelletier V.M., 2009. Oribatida. In: A manual of Acarology. Krantz G.W., Walter D.E. (Eds.). Lubbock, TX, USA, Texas Tech University Press, 430-564 p.

Per S., Ayyıldız N., 2004. Erciyes Dağı'nın (Kayseri) epifitik oribatid akarları üzerine sistematik araştırmalar-III. Erciyes Üniversitesi Fen Bilimleri Enstitüsü Dergisi, 20, 119–128.

Per S., Ayyıldız N., 2005a. Erciyes Dağı'nın (Kayseri) epifitik oribatid akarları üzerine sistematik araştırmalar-I. Türkiye Entomoloji Dergisi, 29, 69-80.

Per S., Ayyıldız N., 2005b. Erciyes dağının (Kayseri) epifitik oribatid akarları üzerine sistematik araştırmalar-II. Çankaya Üniversitesi Fen-Edebiyat Fakültesi, Journal of Arts and Sciences, 3, 95–106.

Per S., Taşdemir A., Ayyıldız N., 2015. Türkiye faunası için yeni oribatid akarlar (Acari, Oribatida). Türkiye Entomoloji Bülteni, 5 (1), 29-34.

Subías L.S., 2004. 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 (Accessed date: 25.05.2018).

Subías L.S., Arillo A., 2001. Acari, Oribatei, Gymnonota II. In: Fauna Iberica. Vol. 15. Ramos, M.A.J.A., Tercedor, X.B., Ros, J.G., Noguera, A.G., Sierra, E.M., Mayol, F.M., Piera, J.S., Marino, and J.T. González (Eds). Museo Nacional de Ciencias Naturales, Madrid, 289 p.

Toluk A., 2016. A new species of the genus *Rhinoppia* (Acari, Oribatida, Oppiidae) from Turkey. Acarologia, 56 (1), 91-99.

Toluk A., Akin A.T., 2017. Oribatid mite fauna (Acari) of the Çat Forest (Sivas, Turkey). Turkish Journal of Entomology, 41 (3), 293-307.

Toluk A., Ayyıldız N., 2008a. Yozgat Çamlığı Milli Parkı'nın oppioid oribatid akarları (Acari: Oribatida) üzerine sistematik çalışmalar. Erciyes Üniversitesi Fen Bilimleri Enstitüsü Dergisi, 24 (1-2), 52-81.

Toluk A., Ayyıldız N., 2008b. Türkiye Oppiidae familyası türleri ve oppiid akar (Acari, Oribatida) faunasına katkılar. Türkiye Entomoloji Dergisi, 32 (2), 131-141.

Toluk A., Ayyıldız N., 2008c. New and unrecorded oppioid mites (Acari: Oribatida) from Yozgat Pine Grove National Park, Turkey. Acarologia, 68 (3-4), 209-223.

Toluk A., Ayyıldız N., Baran Ş., 2008. Two new species of *Epimerella* Kulijev, 1967 (Acari, Oribatida, Epimerellidae) from Turkey. Journal of Natural History, 42 (39), 2537-2546.

Toluk A., Ayyıldız N., Subias L.S., 2007. Two new species of oppioid mites from Turkey (Acari: Oribatida). Zootaxa, 1551, 61-68.

Weigmann G., 2006. Hornmilben (Oribatida). Die tierwelt Deutschlands, Begründet 1925 von Friedrich Dahl, 76. Teil. Goecke & Evers, Keltern, 520 p.

Woas S., 1986. Beitrag zur revision der Oppioidea sensu Balogh, 1972 (Acari, Oribatei), Andrias, 5, 21-224.