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New Data on The Soil Mite Fauna (Acari: Oribatida) from Soğucak Plateau (Turkey)

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ABSTRACT
During the investigations of soil mites of the Soğucak Plateau, three species belonging to families Oribotritiidae, Neoliodidae, and Collohmanniidae (Acari: Oribatida) were found. *Oribotritia* (*O.*) *krivolutskyi* Liu, Niedbała, and Starý, 2011 is secondly recorded throughout the world. SEM images of the species are also provided.

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Soğucak Yaylası'ndan (Türkiye) Toprak Akarı Faunası (Acari: Oribatida) Üzerine Yeni Veriler

ÖZET
Soğucak Yaylası toprak akarları üzerinde yapılan araştırmalarda Oribotritiidae, Neoliodidae ve Collohmanniidae (Acari:Oribatida) familyalarına ait üç tür tespit edilmiştir. *Oribotritia* (*O.*) *krivolutskyi* Liu, Niedbała ve Starý, 2011 dünyada ikinci kez kaydedilmiştir. Ayrıca türlerin SEM görüntüleri de verilmiştir.

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INTRODUCTION

Oribatid mites are one of the major microarthropod groups in soil organic horizons, and they perform vital roles during litter decomposition (Norton, 1990; Scheu *et al.*, 2005). While this taxa includes more than 11,000 species in 162 families (Subias, 2004, updated 2021), the fauna of Turkey is little known with around 250 species (Baran *et al.*, 2018).

The genus *Oribotritia* Jacot, 1924 has 95 known species and only four of them (*O. hermanni*, *O. schusteri*, *O. turcica* and *O. berlesei*) previously recorded from Turkey (Gümüş, 2002; Niedbala, 2006, 2008). The genus *Neoliodes* Berlese, 1888 has 39 known species and only two of them (*N. theleproctus* and *N. ionicus*) previously recorded from Turkey (Per *et al.*, 2015; Sevimli and Baran, 2016). The genus *Collohmannia* Sellnick, 1922 has 3 known species and one of them (*C. gigantea*) previously recorded from Turkey (Baran and Bezci, 2017).

During the investigations of soil mites of the Soğucak Plateau in Turkey, three species belonging to the families Oribotritiidae, Neoliodidae, and Collohmanniidae were found. These species are *Oribotritia (O.) krivolutskyi* Liu, Niedbała and Starý, 2011, *Neoliodes theleproctus* (Hermann, 1804), and *Collohmannia gigantea* Sellnick, 1922. The first one has been recorded only from Caucasus up to date and secondly recorded throughout the world from Turkey. The species *N. theleproctus* has a semicosmopolitan and *C. gigantea* has a Southern Palearctic distribution and both of them previously recorded from Turkey. The SEM images of *O. (O.) krivolutskyi*

firstly given in this paper.

The Marmara Region constitutes a transition area between the two continents, namely Europe and Asia. Soğucak plateau is well represented by moist forests. Beech (*Fagus* sp.) is the most common tree among the moist forests in these regions and it has a wide distribution on the Soğucak plateau. Sessile oak (*Quercus petraea*) and chestnut (*Castanea sativa*) are also occasionally mixed into these forests. The latest supplementary checklist of oribatid mite species in Turkey has already been published by Baran *et al.* (2018). When compared with the number of species known from the world, it is seen that the number of species known from Turkey is quite low. We estimate that with sufficient taxonomic research, the number of oribatid mites in Turkey, located at the junction of the Asian and European continents, will be much higher. The main goal of the present paper is to make a contribution to oribatid fauna and facilitate the further study.

MATERIAL and METHOD

Samples taken from Soğucak Plateau (1100 msl altitude) in Sakarya province (Fig 1) in May and June 2020 and mites were extracted using a Berlese funnel apparatus.

They were fixed and stored in 70% ethanol. Specimens were cleaned by soaking in Tergazyme® solution for 6–12 h. They were mounted on aluminum stubs with conductive double-sided adhesive carbon tape then critical point dried and gold-coated in a Hummer sputter apparatus before SEM investigation. All measurements are given in micrometers (µm).

Terminology and taxa identification were according to Balogh and Balogh, (1992) and Weigmann, (2006).

Microscopic investigation: Mites were selected under Olympus SZX51 stereomicroscope and investigated under Leica DM1000LED microscope. SEM images were taken by JEOL JSM 6060 LV and Vega Tescan II.

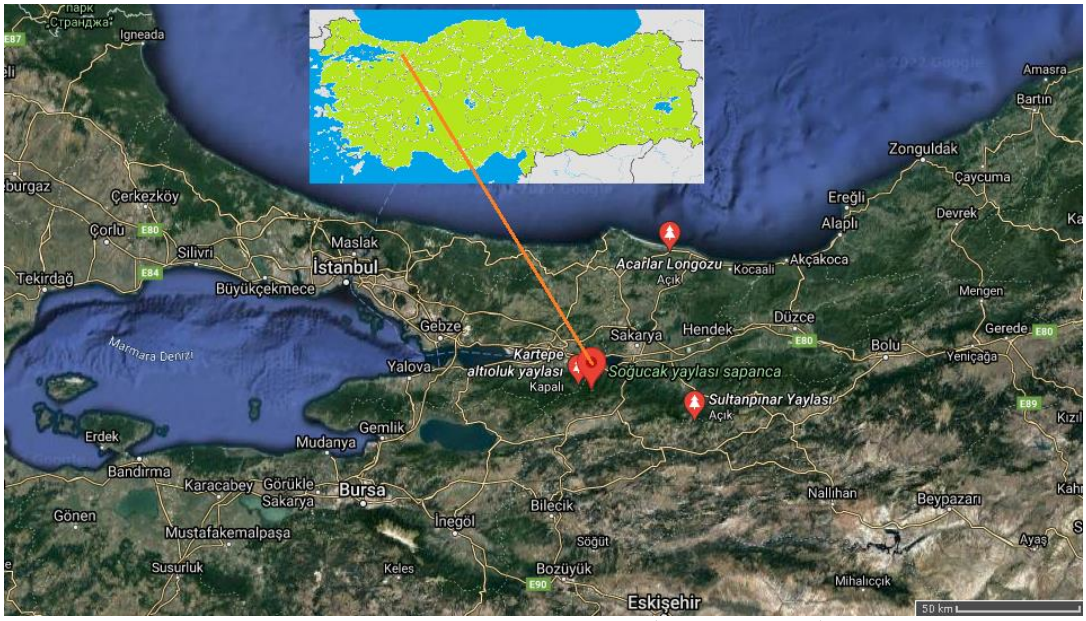

Figure1. Map of the study area (Google Earth)
Şekil 1. Çalışma alanının haritası (Google Earth)

RESULTS

Family: Collohmanniidae

Collohmannia gigantea Sellnick, 1922

Measurements and colour: Body length: 1571, body width: 867 µm (n=1). Colour dark brown.

Diagnosis (Figure 2): Prodorsum subtriangular and rostrum broadly rounded. Sensillus long rod shaped, distally thickened. The notogaster convex dorsally with an imbricate cuticle pattern. Notogaster with three flagellate setae; d_1, h_2 and p_1; seta other notogastral setae relatively short. *gla* present. Eight pairs of genital, two pairs of aggenital, three pairs of anal and three pairs of adanal setae present. Genital plate not divided transversely. Legs are tridactylous.

Material examined: Turkey, Sakarya, Soğucak platue, 40°36´36.6´N, 30°10´32.3´E, 27.05.2020, grassy soil under *Pinus* sp., 1 specimen.

Distribution: Soğucak platue. The second locality record for the species in Turkey (previously recorden from Amasya province Baran and Bezci, 2017). Holoarctic (Weigmann, 2006; Subias, 2004, updated 2021).

Family: Oribotritiidae

Oribotritia (O.) krivolutskyi Liu, Niedbała and Starý, 2011

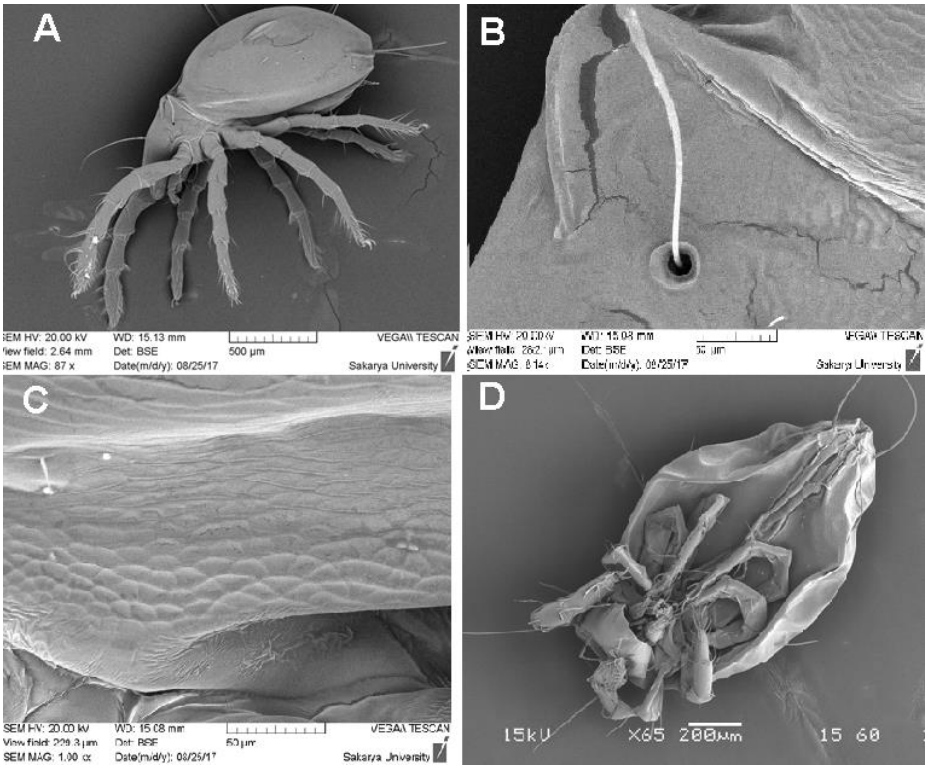

Figure 2. *Collohmannia gigantea* Sellnick, 1922. A - latera view; B - bothridium; C – notogastral cuticle pattern; D- ventral view

Şekil 2. Collohmannia gigantea Sellnick, 1922. A – yandan görünüş; B - bothridium; C – notogaster kütükula deseni; D- karından görünüş

Measurements and colour: Prodorsal length: 558-600 width:474-487 height:170-188 µm. Notogastral length 1210-1403, width 980-1010, height 895-903 µm (n=3). Colour brown.

Diagnosis (Figure 3): Body surface finely punctate. Rostral, interlamellar, lamellar and exobothridial setae smooth, fine and setiform. Sensillus short and robust 120-125 µm in length. One pair of long and strong lateral carina. Notogastral setae thin and setiform except thick and rigid setae ps_2 and ps_3. Eight pairs of genital setae, g_1-g_3 longer than the others. Two pairs of thin and long aggenital setae present. One pair of minute anal setae, three pairs of thin adanal setae present. Genito-aggenital plate 270-300, ano-adanal plate 565-576 µm in length. Mutual distance between ad_1 and ad_2 smaller than that between ad_2 and ad_3; setae ad_3 the shortest, setae ad_1 the longest; lyrifissures *iad* located between setae ad_3 and anal setae. Legs are heterotridactylous.

Material examined: Turkey, Sakarya, Soğucak plateau, 40°36´37.0´N, 30°10´33´E, 27.05.2020, soil and litter from the mixed forest, 3 specimens.

Distribution: Soğucak plateau. The second locality record for the species throughout the world and the first in Turkey (previously only known from Azerbaijan Lui *et al.* 2011). Palearctic.

Family: Neoliodidae

Neoliodes theleproctus (Hermann, 1804)

Measurements and colour: Body length: 1064- 1085, body width: 754-760 µm (n=3). Colour brown.

Diagnosis (Figure 4): Rostrum broadly rounded. Bothridia dorso-laterally opened, Sensillus short-stalked, thick club-shaped. Notogaster oval, with longitudional carina in front of notogaster. Anterior border of notogaster convex. The surface of notogaster with nymphal scalps and with laterally arranged lines. Six pairs of notogastral setae present. Genital and anal plates large and close to each other. Genital plate transversely divided into two parts. Seven pairs of thin genital setae (5+2) present. Adanal plate with three pairs of minute setae.

Material examined: Turkey, Sakarya, Soğucak plateau, 40° 36'37.6'' N, 30° 10'32.3'' E, 27.05.2020, soil and litter under *Pinus* sp., 3 specimens.

Distribution: Soğucak plateau. The second locality record for the species in Turkey (previously recorded from Yozgat province Per *et al.*, 2015). Semicosmopolitan (Subias, 2004, updated 2021; Weigmann, 2006).

DISCUSSION

Oribotritia (O.) krivolutskyi, has been recorded only from the Caucasus (Azerbaijan) in 2011 by Liu et al. and secondly recorded throughout the world from

Turkey by this study. This species can be distinguished from congeners by the presence of thick and rigid notogastral setae *ps2* and *ps3*, one pair long and strong prodorsal lateral carina, shape of sensillus, number and position of adanal setae (Liu *et al.* 2011). The notogastral length and width of the Turkish specimens (1210-1403x 980-1010µm) are in accordance with the Azerbaijan nominal species. Length of strong notogastral setae *ps2* and *ps3* in the Turkish specimens are shorter than the length of the type specimens. The other morphological feature of the Turkish specimens are appropriate with the original description (Liu *et al.* 2011).

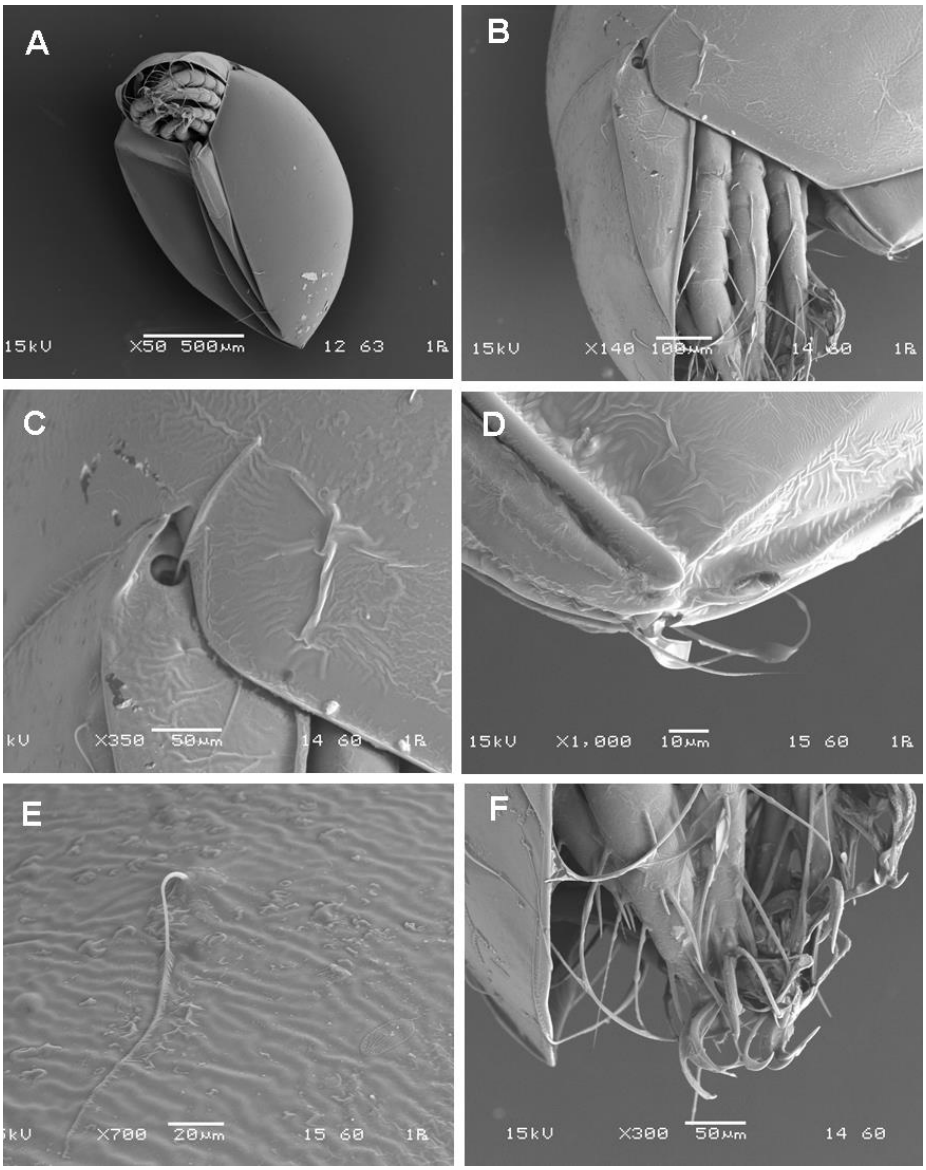

Figure 3. *Oribotritia (O.) krivolutskyi* Liu, Niedbała *and* Starý, 2011. A - ventral view; B - prodorsum; C - sensillus; D - genital setae (g_1-g_3); E - notogastral setae; F – legs

Şekil 3. Oribotritia (O.) krivolutskyi Liu, Niedbała ve Starý, 2011. A – karından görünüş; B - prodorsum; C - sensillus; D - genital kıllar (g1-g3); E - notogaster kılı; F – bacaklar

Phthiracaroid genera are especially diverse in areas with well developed organic debries layer (Woas, 2002). *Oribotritia (O.) krivolutskyi* was found in moss and litter sample under beech forest in the Talysh Mountains of Azerbaijan (Liu *et al.* 2011). We found in litter and soil under mixed forest in Soğucak plateau. Beech (*Fagus* sp.) is the most common and widely distributed tree among the moist forests in the Soğucak plateau. According to available data it can be considered as a typical inhabitant of litter and soil under beech forests in mountains.

Neoliodes theleproctus has a semicosmopolitan distribution (Palearctic, Oriental, Australia and Neotropic) (Subias, 2004, updated 2021). In Turkey previously recorded from Yozgat province by Per *et al.* (2015). The body length of *Neoliodes theleproctus* was

previously given between 1100–1375 µm (Weigmann, 2006; Per *et al.*, 2015). Body lengths of the specimens (1064- 1085µm) are smaller than the previously given. The other morphological features are in agreement with the features given by Weigmann (2006) and Per *et al.* (2015) for this species.

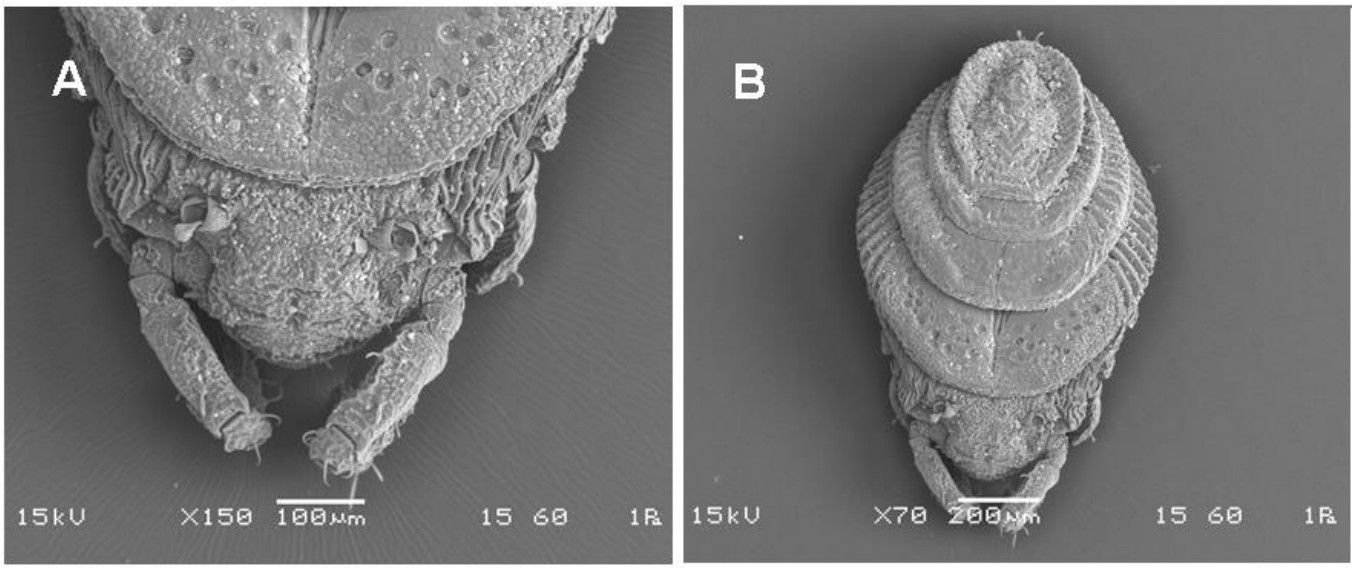

Figure 4. *Neoliodes theleproctus* (Hermann, 1804). A - prodorsum; B - dorsal view
Şekil 4. Neoliodes theleproctus (Hermann, 1804). A - prodorsum; B – sırttan görünüş

In temperate regions mites of Liodidae family tend to prefer warmer and dryer places and their distribution restricted to woodlands (Woas, 2002). This species was detected in bark, rotten wood (Weigmann, 2006), tree debris, moss and lichen (Per et al. 2015). We found in litter and soil under *Pinus* sp..

The species *Collohmannia gigantea* is show distribution in the Holarctic region. In Turkey it was recorded from Amasya province (Baran and Bezci, 2017). *Collohmannia gigantea* is similar to *C. chusteri* and *C. asiatica* but differs from it by bigger body dimensions and the length of setae *d2*, *p1* and *h2*. The body length of the species was previously given between 1450-2025 µm (Weigmann, 2006) and the body length of the specimen shows conformity with this. The other morphological features of the specimens closely resemble given by Weigmann (2006) for this species. This is the second record of species from Turkey.

Family Collohmanniidae shows Holoactic distribution (Woas 2002; Weigmann, 2006; Subias, 2004, updated 2021). The species *Collohmannia gigantea* has been reported from deciduous and mixed forests such as sweet chestnut forests and thermophilic (Woas 2002). We also found it in grassy soil from mixed forest under *Pinus* sp..

This study presents newly recorded and known species to the oribatid fauna of Turkey. For *Oribotritia (O.) krivolutskyi* Turkey is the first locality record outside its type locality Azerbaijan. The species *N. theleproctus* has a semicosmopolitan and *C. gigantea* has a Southern Palearctic distribution and they are previously recorded in Tukey from Yozgat and Amasya provinces respectively.

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Researchers Contribution Rate Declaration Summary

The authors declare that they have contributed equally to the article.

Conflicts of Interest Statement

None of the authors had any financial or personal relationships with other individuals or organizations that might inappropriately influence their work during the submission process.

REFERENCES

Baran Ş, Bezci T 2017. First Occurence of the Genus Collohmannia Sellnick, 1922 (Acari: Oribatida) in Turkey. ISEEP-2017 VIII. International Symposium on Ecology and Environmental Problems4-7 October 2017, Çanakkale.

Baran Ş, Bezci T, Ayyıldız N 2018. Supplementary Checklist of Oribatid Mites (Acari) from Turkey. Munis Entomology and Zoology, 13(1): 91-97.

Gümüş N 2020. Bazı Oribatid Akar Türlerinin Kromozom Sayılarının Belirlenmesi. Yozgat Bozok

Üniversitesi Fen Bilimleri Enstitüsü Biyoloji Ana Bilim Dalı, Yüksek Lisans Tezi, 43 sy.

Liu D, Niedbała, W Starý J 2011. Description of Two New Species of the Family Oribotritiidae (Acari: Oribatida: Euphthiracaroidea). Annales Zoologici, 61(4): 811–816. http://dx.doi.org/10.3161/000345411X622624

Niedbała W 2006. Ptyctimous Mites (Acari: Oribatida) of South Africa. Annales Zoologici, 56 (Supplement 1): 1–97.

Niedbała W 2008. Ptyctimous Mites (Acari: Oribatida) of Poland. Fauna Poloniae, Natura optima dux Foundation, 3: 1-242.

Norton RA 1990. Acarina: Oribatida. (Soil Biology Guide. John Wiley and Sons, New York: Ed. Dindal DL) 779-803.

Per S, Taşdemir A, Ayyıldız N 2015. Türkiye Faunası İçin Yeni Oribatid Akarlar (Acari, Oribatida). Türkiye Entomoloji Bülteni 5(1): 29-34. DOI: 10.16969/teb.31351

Scheu S, Ruess L, Bonkowski M 2005. Interactions Between Microorganisms and Soil Micro- and Meso-Fauna (Soil Biology– Microorganisms in Soils: Roles in Genesis and Functions Vol. 3, Springer, New York: Ed. Buscot F, Varma A) 253–275.

Sevimli A, Baran Ş 2016. Neoliodid (Acari: Oribatida) Species of Şamlar Forest, İstanbul. Acta Turcica Biologica, 29 (3): 78-82.

Subías LS 2004. Listado Sistemático, Sinonímico y Biogeográfico de Los Ácaros Oribátidos (Acariformes: Oribatida) Del Mundo (excepto fósiles), 16ª Actualización. 532 pp. Available from http://bba.bioucm.es/cont/docs/RO_1.pdf (accessed March 2021).

Weigmann G 2006. Hornmilben (Oribatida). Goecke & Evers Keltern, Deutschlands, 550 p.

Woas S 2002. Acari: Oribatida. (Amazonian Arachnida and Myriapoda. Pensoft Publishers, Sofia, Moscow: Ed. Adis J) 21–291.