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ARAŞTIRMA MAKALESİ **RESEARCH PAPER**

A newly recorded Gymnodamaeid (Acari, Oribatida, Gymnodamaeidae) mite from Turkey

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Abstract: The knowledge of the oribatid mite fauna of Türkiye is very limited. In order to make contribution to the Turkish soil mite fauna, samples were collected from Kocaeli province and the Gymnodamaeid mites systematically evaluated. Gymnodamaeid mites are cosmopolitan except Australia and Antarctica and they tend to live in dry habitats like alpine, tundra and grasslands. Members of this family usually inhabit in soil but some tend to live on moss, algae and lichen and so they supposed as phytophagous. The taxonomy of the Gymnodamaeid mites is difficult because of incomplete descriptions or misinterpretations. This is due to the fact that some authors try to dissolve the cerotegument layer or prefer newly molted samples for study. However thick, ornamented cerotegument provides useful in species recognition in undamaged, mature adults. So the scanning electron microscopic investigation is almost mandatory in the study of Gymnodamaeid mites. The number of Gymnodamaeid species previously recorded from Türkiye is just restricted to five. The samples are collected in May 2019 from pine forest in Sarıcaali town of Kocaeli province of Turkey. The Gymnodamaeid mite species Adrodamaeus striatus (Aoki, 1984) is newly recorded from Türkiye. This species previously known from South Eastern Palearctic and North of Oriental. Scanning electron microscopy images of the species is firstly presented by this study.

Keywords: Acari, gymnodamaeidae, adrodamaeus, oribatida, new record, kocaeli, Türkiye.

Türkiye'den yeni kaydedilen bir Gymnodamaeid akar (Acari, Oribatida, Gymnodamaeidae)

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Öz: Türkiye'nin oribatid akar faunasına ilişkin bilgiler oldukça sınırlıdır. Türkiye toprak akarı faunasına katkı sağlamak amacıyla Kocaeli ilinden örnekler toplanmış ve sistematik olarak değerlendirilmiştir. Gymnodamaeid akarları Avustralya ve Antarktika dışında kozmopolittir ve dağlar, tundra ve çayırlar gibi kuru habitatlarda yaşama eğilimindedirler. Bu ailenin üyeleri genellikle toprakta yaşar, ancak bazıları yosun, alg ve likenlerle beslenmeye eğilimlidir ve bu nedenle fitofag olarak kabul edilirler. Gymnodamaeid akarlarının taksonomisi, eksik tanımlamalar veya yanlış yorumlamalar nedeniyle zordur. Bunun nedeni, bazı yazarların serotegüment katmanını çözmeye çalışması veya çalışma için yeni tüy dökmüş örnekleri tercih etmesidir. Bununla birlikte, kalın, oymalı serotegument, hasarsız, olgun yetişkinlerde türlerin tanınmasında yararlı olur. Bu nedenle Gymnodamaeid akarlarının araştırılmasında taramalı elektron mikroskobu incelemesi neredeyse zorunludur. Türkiye'den daha önce kaydedilen Gymnodamaeid türlerinin sayısı beş ile sınırlıdır. Örnekler Mayıs 2019'da Türkiye'nin Kocaeli ilinin Sarıcaali ilçesindeki çam ormanından toplanmıştır.Bu çalışma ile Gymnodamaeid akar türü Adrodamaeus striatus (Aoki, 1984) Türkiye'den ilk olarak kaydedilmiştir. Bu tür daha önce Güneydoğu Palearktik ve Kuzey Doğu'dan bilinmektedir. Türe ait taramalı elektron mikroskobu görüntüleri ilk kez bu çalışmayla sunulmuştur.

Anahtar kelimeler: Acari, Gymnodamaeidae, *Adrodamaeus*, Oribatida, yeni kayıt, Kocaeli, Türkiye.

INTRODUCTION

In the upper layer of the soil, Oribatid mites are one of the most dominant groups. Oribatid mites are also known as moss mites, as they were first discovered on moss. Oribatid mites are represented by more than 11.000 species in the world. They have many ecological functions such as breaking down organic residues in the soil, being a food source for larger soil predators (Hoy, 2008), controlling and transporting microorganisms in the soil.

Gymnodamaeid mites are cosmopolitan except Australia and Antarctica (Woas, 2002, Subias 2004). These mites are tend to live in forest and open habitats (Woas, 2002). Gymnodamaeid mites characterized by sclerotized and cerotegumented flat notogaster, long legs with 3 claws, separate and large genital and anal plates with anogenital bridge (Weigmann, 2006; Walter, 2009; Hugo-Coetzee, 2010).

Genus *Adrodamaeus* characterized by separate genital and anal plates, two pairs of anal and seven pairs of genital setae, posterior edge of notogaster with two to five pairs of setae, prodorsum with pustules and rostral ridges, long and apically barbed sensillus (Walter, 2009; Hugo-Coetzee, 2014).

This family has 6 genus namely, *Adrodamaeus* Paschoal, 1984, *Arthrodamaeus* Grandjean, 1954, *Gymnodamaeus* Kulczynski, 1902, *Jacotella* Banks, 1947, *Joshuella* Wallwork, 1972 and *Plesiodamaeus* Grandjean, 1954. The Gymnodamaeid species previously recorded from Turkiye are *Adrodamaeus starki* (Bulanova-Zachvatkina, 1967): *Gymnodamaeus barbarossa* Weigmann, 2006, *Gymnodamaeus bicostatus* (Koch,1835), *Jacotella frondeus* (Kulijev, 1979) and *Joshuella meyeri* (Bayartogtokh and Schatz, 2009) (Dik et al., 1999; Toluk & Ayyıldız, 2014; Ayyıldız & Toluk, 2016, Baran, 2019).

As a result of this study on Gymnodamaeid mites of Kocaeli province the species *Adrodamaeus striatus* (Aoki, 1984) previously known from South Eastern Palearctic and North of Oriental is firstly recorded from Türkiye.

MATERIAL AND METHOD

Soil samples were taken from Kocaeli province in May 2019. Mites were extracted in Berlese-Tullgren funnel apparatus form the soil samples and sorted by stereo microscope Olympus SZX51. Specimens were examined under light microscope Leica DM 1000 and scanning electron microscope JEOL JSM 6060 LV. Mites were stored in 70% ethanol in SAU Acarology Laboratory.

RESULTS

Genus *Adrodamaeus* Paschoal, 1984**:** Syn: *Heterodamaeus* Woolley, 1957 (Subías, 2004).

***Adrodamaeus striatus* (Aoki, 1984)**

Redescription

Material Examined: Soil samples were gathered from pine forest, Sarıcaali, Kocaeli province, Türkiye, three adult specimens, 17 May 2019. 40°57'06.2"N 30°10'07.5"E, 250 m.

Measurements: Body 680-685 µm in length, 420-430 µm in width, sensillus (*ss*) 236-239 µm, *le* 118-122 µm, *ex* 22 µm, *h1* 40 µm, *h2* 98-102 µm in length (n=3).

Integument: Colour dark brown.

Prodorsum: Rostrum rounded. Rostral and lamellar setae similar, long, arced medially and granulated (Figure 1A). Sensillus with long stalk and barbed head (Figure 1B), interlamellar setae minute, hardly visible and positioned on the interbothridial bulgings. Distance between insertion points of interlamellar setae 100µm. On the prodorsal region a pair of interbothridial bulging, a median spherical pustule and angled rostral ridges present. Exobothridial setae setiform, thin and inserted anteriolaterally to interbothridial bulging (Figure 1A).

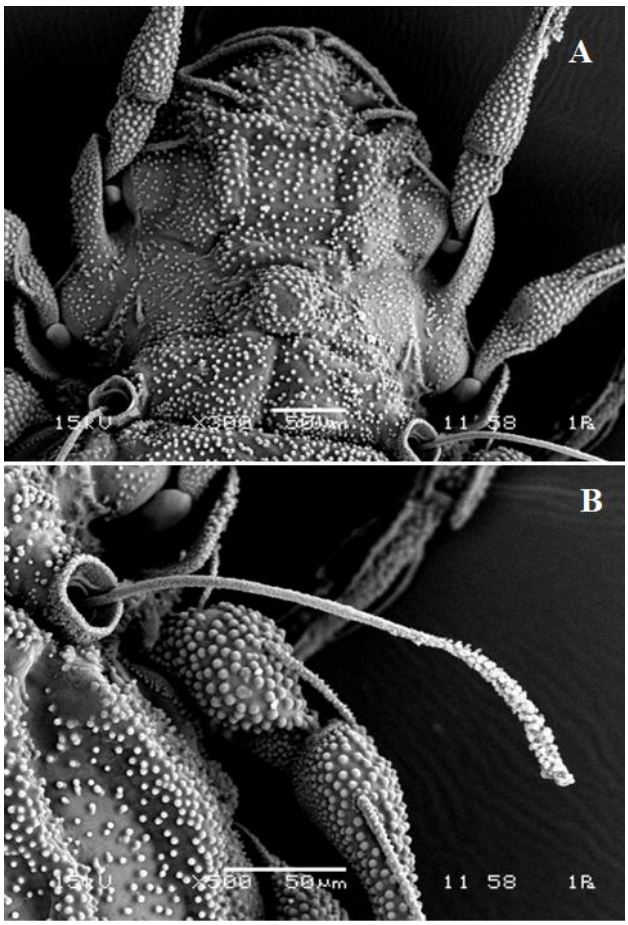

Figure 1. *Adrodamaeus striatus* SEM image, A- Prodorsum. B- Sensillus.

Notogaster: Anterior margin of notogaster without thickening. Notogaster with two paralel ridge posteriorly connected to each other with protrusions. Notogaster surface with granulated cerotegument (Figure 2A). Three pairs of notogastral setae (*h1*, *h2*, *p1*) covered with cerotegumet, observable from dorsal aspect. Setae *h1* and *h2* are originating on the posterior sides of outer ridge, *h2* longer and directed to sides (Figure 2B).

Ventral region: Genital and anal plates are separated. Anal plate bigger than genital one. Two pairs of anal, three pairs of adanal, one pair of aggenital and six

pairs of genital setae present. Aggenital setae inserted laterally to genital plate at the level of *g2*. Epimeral setal formula as 3-1-3-3 (Figure 3-4).

Distributed in South Eastern Palearctic and North of Oriental (Subías, 2004), firstly recorded in Türkiye.

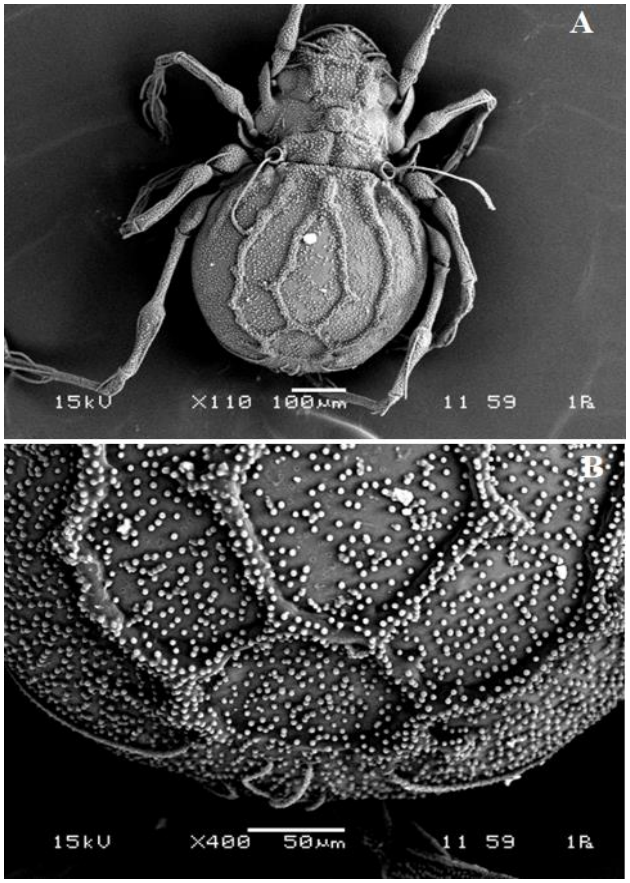

Figure 2. *Adrodamaeus striatus* SEM image, A- Dorsal view, B- Notogastral setae *h1, h2, p1*.

Figure 3. *Adrodamaeus striatus* SEM image ventral view.

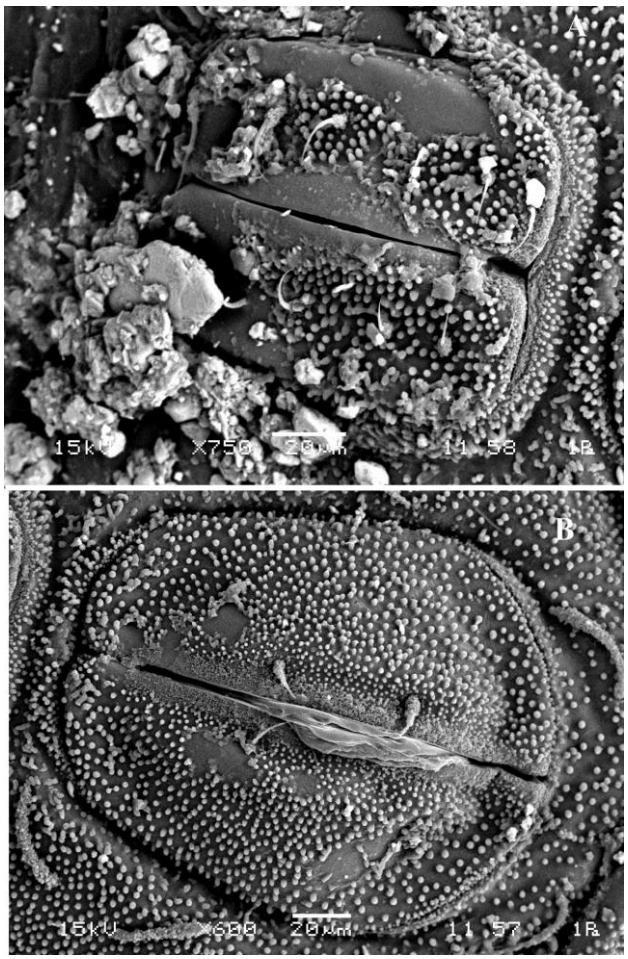

Figure 4. *Adrodamaeus striatus* SEM image, A- Genital plate. B- Anal plate.

DISCUSSION

In this study, redescription of the species *Adrodamaeus striatus* is done, the SEM images of the species is firstly presented by this study.

This species distributed in in South Eastern Palearctic and North of Oriental (Subías, 2004), and newly recorded in Türkiye.

In the original description of the species by Aoki, (1984), the number of genital setae was given as five in the text while shown as six in the figure. The number of setae on the genital plate is six in our specimens as seen in the SEM image (Figure 4a). Other morphological features of ventral plate of our specimens resemble those of previously described.

Although three dorsal setae (*p1, h1* and *h2*) appear in the dorsal view of the species, two other posterior setae (*p2* and *p3*) are also visible in the ventral view (Figure 3).

Walter, (2016) stated that some studies on the Gymnodamaeid mites could have incomplete descriptions or misinterpretations because of trying to dissolve the cerotegument layer or preferring newly molted samples for study. However thick, ornamented cerotegument provides useful in species recognition in undamaged, mature adults.

It has been reported that a combined study of both cleared and intact samples would be more reliable by Walter, (2006). To avoid such misinterpretations the scanning electron microscopic investigation is almost mandatory in the study of Gymnodamaeid mites.

Other morphological features of Turkish specimens are in accordance with previously described.

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