



Two new records of the genus *Macrocheles* (Acari: Macrochelidae) from Türkiye, with redescription of *M. similis* Krantz and Filipponi

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ABSTRACT: The present work deals with two species of the genus *Macrocheles*, namely *Macrocheles similis* and *Macrocheles mammifer*. These species were found as photretics on a beetle (*Pentadon* sp.) in Antalya and some specimens of *M. similis* were collected freely in Erzincan, Türkiye. *M. similis* was originally described and illustrated from Australian specimens and subsequently reported from several regions, including the USA, Japan and the Hawaiian Islands. Now, unexpectedly, the species has been recorded for the first time in the Western Palearctic. This species is morphologically very similar to *Macrocheles muscaedomesticae*, making it very difficult to distinguish them from each other based on morphological characteristics. Therefore, *M. similis* may have been misidentified as *M. muscaedomesticae* in this region. The make correct identification of *M. similis* is described again in detail here and compared with *M. muscaedomesticae*. In addition, both species investigated in this study are new additions to the Turkish mite fauna.

Keywords: Mesostigmata, mite, phoretic, species diversity, Antalya, Erzincan

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INTRODUCTION

In Türkiye, taxonomic work on the family Macrochelidae is mainly concentrated in the northeastern part of the country, and knowledge of species diversity in other parts of the country is quite limited. So far, a total of 35 species of Macrochelidae mites have been recorded in Türkiye (Özbek, 2017), and most of these species have been found in soil and organic material, with some exceptions. For instance, *M. muscaedomesticae*, found on houseflies and ground squirrels (Göksu and Güler, 1968; Çiçek et al., 2008), while *M. glaber* (Müller, 1860) and *Neopodocinum caputmedusae* (Berlese, 1908) found on dung beetles (Çobanoğlu and Kırgız, 2001). Additionally, *M. similis* and *M. mammifer* are present on a beetle of the genus *Pentodon*, which belongs to the subfamily Dynastinae (Fig. 1). The genus *Macrocheles* is represented by fifteen species in Türkiye (including the present work). One of these species was described from the province of Tokat by Özbek (2017).

The genus *Macrocheles* is one of the largest cosmopolitan genera within the family Macrochelidae, with more than three hundred described valid species in the world (Emberson, 2010). The species of this large genus are morphologically uniform, so it is not easy to distinguish them clearly. The most useful feature is the ornamentation on the ventral shields, especially those on the sternal shield (Hyatt and Emberson, 1988; Halliday, 2000; Mašán, 2003). In recent years, some morphologically similar, litter-dwelling and non-phoretic species have been separated from this genus, such as *Macrholaspis* Oudemans, 1931, *Nothrholaspis* Berlese, 1918 (Mašán, 2003; Emberson, 2010; Krantz, 2018), but there are some species that are close to these separate

genera, such as *Macrocheles niksarensis*, that have some characters that fit the genus *Nothrholaspis* and some that fit the genus *Macrocheles*, making it very difficult to draw a clear boundary between species. With *Macrocheles* and the related genera *Nothrholaspis* and *Macrocholaspis* there are problems and differences of opinion with regard to certain species. These problems arise primarily from the classification of genera on the basis of morphological characteristics. However, with additional knowledge of non-morphological features, this problem could easily be solved. For example, although *M. similis* and *M. muscaedomesticae* have minor morphological differences, there appear to be two significant biological differences between them, such as host specificity and reproductive strategy (Halliday, 1990).

MATERIALS AND METHODS

The mites were collected in Aziz Sancar Park in Antalya and in Ekşisu Marsh in Erzincan, Türkiye. Some specimens were caught by hand and then placed in a small container with 70% ethanol, while others were collected while sieving cattle dung, litter and moss using a modified Berlese funnel. All mites were mounted in Hoyer's medium according to the methods of Walter and Krantz (2009). The mite preparations and host were examined, imaged, photographed, and measured using an Olympus BX63 upright microscope with DP73 camera and a Nikon SMZ25 stereomicroscope with DS-Ri2 camera. All measurements are given in micrometres (µm). The terminology of dorsal setae used in this paper follows that of Lindquist and Evans (1965) as applied to the Macrochelidae by Halliday (1986, 1987). The specimens are kept at EBYU (Acarological Laboratory of Erzincan Binali Yıldırım University, Erzincan, Türkiye).

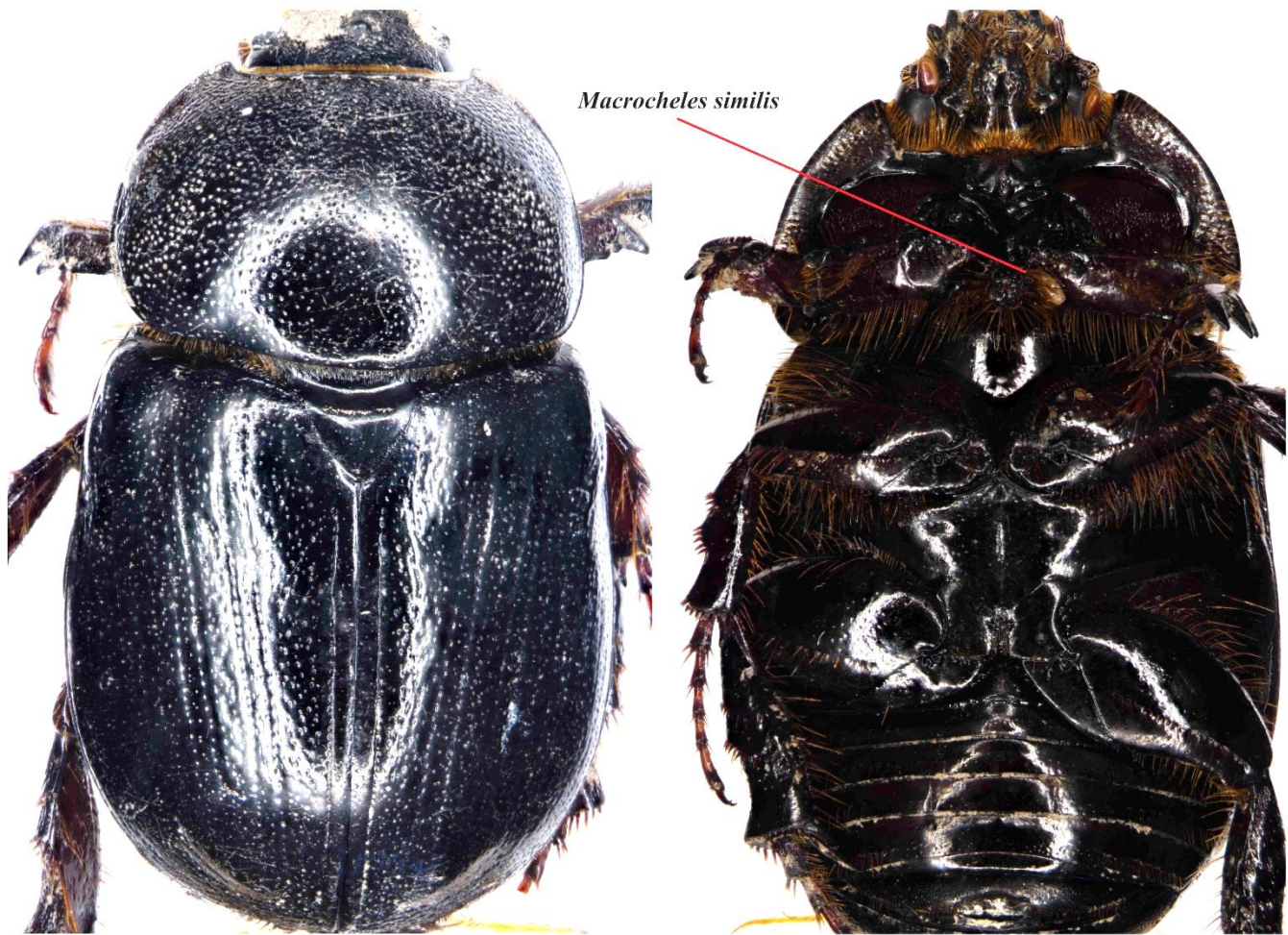


Figure 1. Host of the mites (*Pentadon* sp.). Dorsal view and ventral view with *Macrocheles similis*.

RESULTS

Macrocheles mammifer Berlese, 1938

Macrocheles (Nothropholaspis) mammifer Berlese, 1918: 171.

Macrocheles (Macrocheles) postneri Krauss, 1970: 28.

Macrocheles mammifer – Krantz, 1967: 150; Bregetova, 1977: 365; Halliday, 2000: 301; Mašán, 2003: 93.

Specimens examined. 2 ♀♀, Aziz Sancar Park, Antalya, Türkiye, 18 May 2018, phoretic on *Pentadon* sp. (Dynastinae).

Notes. *Macrocheles mammifer* is easily distinguished from other members of the genus *Macrocheles* by its characteristic dorsal chaetotaxy with the smooth and pointed dorsal setae *j2*, *j5*, *j6*, *z1*, *z5*, *z6*, *s2*, *s6*, *r4*, the others being pilose. The dorsal shield of the Turkish specimens is 880-902 long and 590-600 wide at its widest point. There are no significant morphological differences between the Turkish and the previously known specimens (Krantz, 1967; Bregetova, 1977; Halliday, 2000; Mašán, 2003). The dorsal and ventral views of the species are shown in Figures 2 and 3. This species is distributed worldwide (Mašán, 2003) and is recorded for the first time from Türkiye in this work.

Macrocheles similis Krantz and Filipponi, 1964

Macrocheles similis Krantz and Filipponi, 1964: 37.

Macrocheles similis – Rodriguez and Ibarra, 1967: 809; Tenorio et al., 1985: 301; Halliday, 1990: 422; 2000: 311; Manning and Halliday, 1994: 91; Saito and Takaku, 2013: 37; Ji et al., 2023: 79 (misidentification).

Diagnosis. Dorsal shield less than 1000, with 28 pairs of setae; *z1*, *j5*, *j6*, *z5*, *z6*, and *J2* smooth, other setae more or less pilose, sometimes knife-like; *linea media transversa* distinct, *linea obliquae anterior* connected with *linea arcuate*, distinct *linea angulate*; ventrianal shield broader, length/width = 0.92-0.99, deutosternal furrow with 4-6 rows of denticles; anterior tips of peritremes extend beyond bases of setae *z1*; thelytokous parthenogenesis; phoretic in beetles.

Description.

Dorsum (Fig. 4). Dorsal shield elongate, 800-900 long, 490-580 wide at widest point (n=9), reticulate with polygonal punctation pattern (Fig. 12), with 28 pairs of setae; setae *j5*, *j6*, *z1*, *z5*, *z6*, and *J2* smooth and pointed, *j1* and *Z4* distinctly pilose and brush-like, other dorsal setae mostly distally on slightly pilose or knife-like, especially marginally situated setae pilosity more distinct and



Figures 2-3. *Macrocheles mammifer* (female). 1. Dorsal view, 2. Ventral view.

reduced pilosity toward paraxial position, distally a few denticles or entirely knife-like (Figs 5, 18, 19); setae *j1* 42–46, *z1* 20–25, *j6* 35–42, *J5* 25–30, other setae length 40–65.

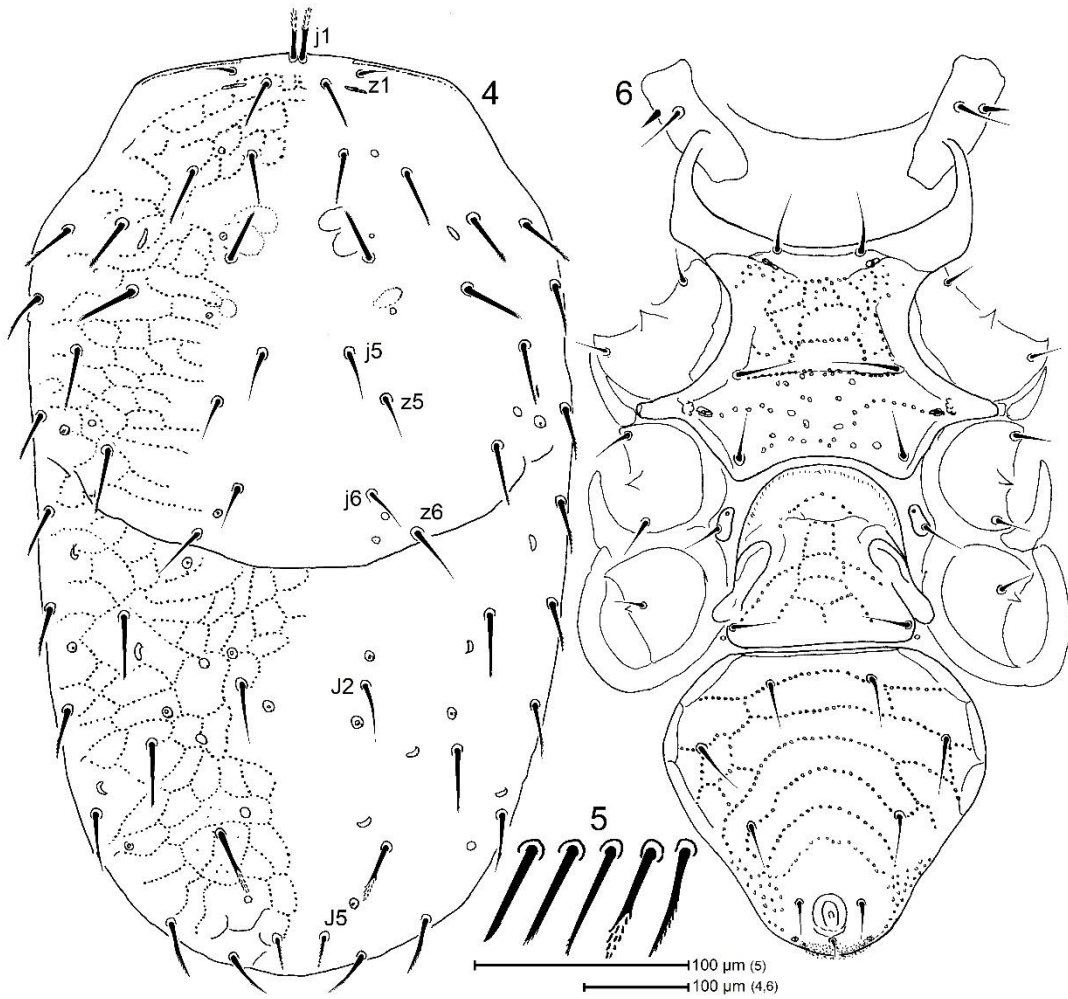
Venter (Figs 6, 13). Sternal shield 180–210 long, 150–190 wide in middle of coxae II; surface sculptured with reticulate pattern and punctation and provided with three pairs of needle-like setae and two pairs of pores; *st1* and *st2* almost equal in length (54–58), *st3* 40–46 long; its surface with distinct *linea media transversa*, *linea obliquae anterior* connected with *linea arcuate*, distinct *linea angulate*; area between *st2* and *st3* ornamented with well-sculpted large oval patterns. Metasternal shields free, elliptical, each with a pore and a smooth seta *st4* (34–40). Epigynal shield 160–180 long, 165–195 wide, helmet-shaped, ornamented with punctate reticulation, with a pair of smooth setae *st5* (42–48). Ventrianal shield wider than long, 260–310 long, 280–325 greatest width (L/W = 0.92–0.99), ornamented with polygonal punctate pattern, with three pairs of smooth pre-anal setae (40–48), one pair of long para-anal setae, and one postanal seta. Anterolateral extensions of cribrum not reaching bases of para-anal setae. Anterior tips of peritremes reaching beyond bases of setae *z1*.

Spermathecal structure. As in Figure 7.

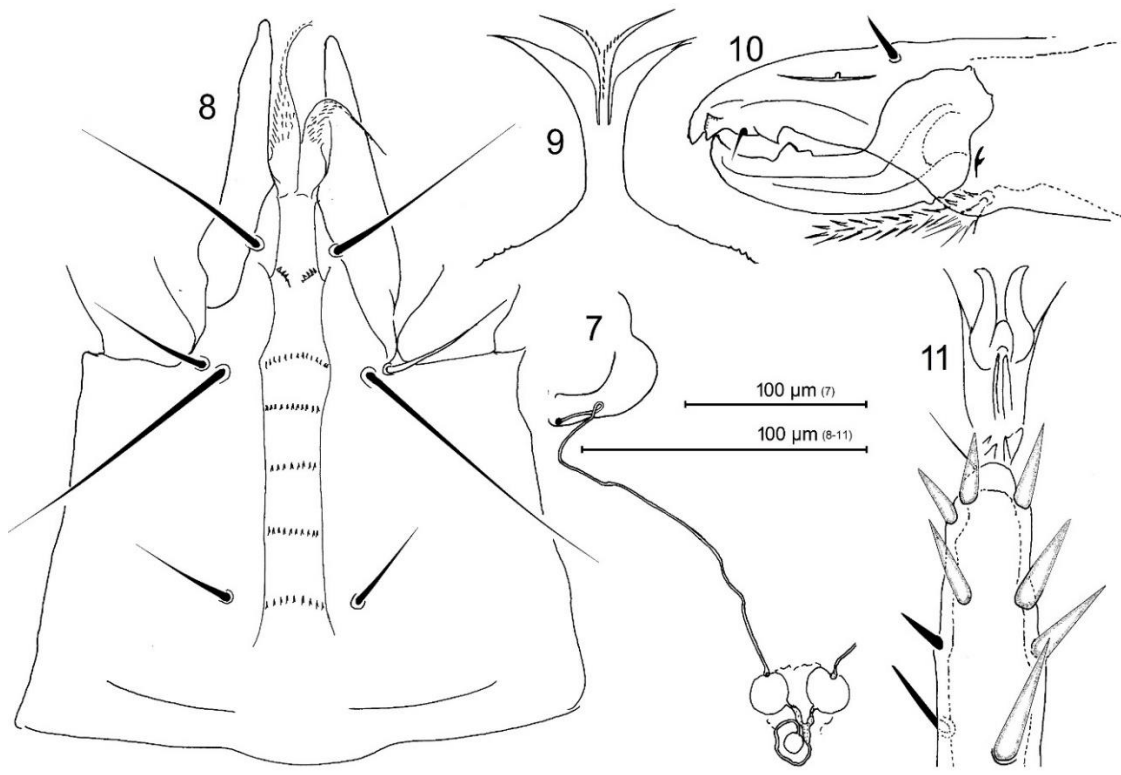
Gnathosoma. Setae *h3* longest, *h2* almost subequal in length to *pc*, *h1* longer than *h2*. Corniculi long and horn-like. Deutosternal furrow with six rows of denticles, row between setae *h1* separated into two parts (Fig. 8). Epistome with a pair of lateral processes distally, a median process deeply bifurcated distally, with long spines on its stem (Fig. 9). Chelicerae well developed, movable digit about 97 long, with two median teeth and unidentate terminal hook, fixed digit about 75 long to level of base of dorsal seta, with one distinct median tooth, one distal tooth near unidentate terminal hook, distinct pilus dentilis and a smooth dorsal seta. Two arthrodial brushes are present, one very short and another more than half as long as movable digit (Figs 10, 16, 17).

Legs. Chaetotaxy typical for the genus and family (Evans, 1963). All coxae with smooth and pointed setae. Tarsus II as in Figure 11.

Specimens examined. 21 ♀♀, Aziz Sancar Park, Antalya, Türkiye, 18 May 2018, phoretic on a dung beetle. Following specimens from Erzincan Ekşisu Marsh, Türkiye 1150 m a.s.l.: one ♀, 39°43'31.91"N 39°37'20.64"E, 13 April 2013, in moss; 4 ♀♀, 39°42'38.65"N 39°36'5.18"E, 13 May 2013, dung and



Figures 4-6. *Macrocheles similis* (female). 4. Dorsal shield, 5. Variations of dorsal setae, 6. Ventral shields.



Figures 7-11. *Macrocheles similis* (female). 7. Spermathecal structure, 8. Gnathosoma, 9. Epistome, 10. Chelicera, 11. Tarsus II.

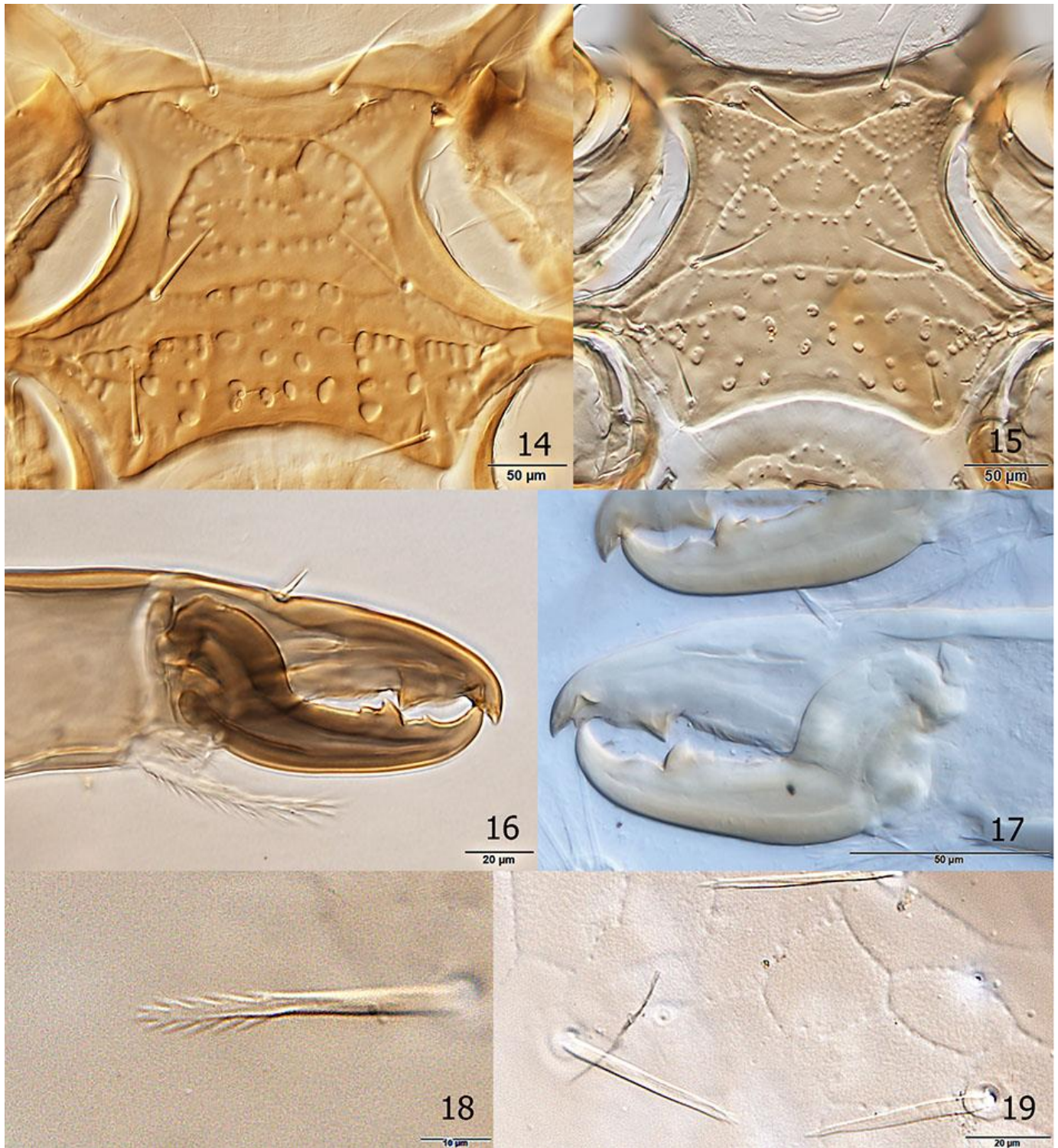


Figures 12-13. *Macrochles similis* (female). **12.** Dorsal view, **13.** Ventral view.

moss in *Juncus heldreichianus*; 4 ♀♀, 39°43'53.4"N 39°37'02.8"E, 16 June 2013, soil and moss; one ♀, 39°43'41.1"N 39°37'30.2"E, 04 July 2013, dung and moss; 7 ♀♀, 39°43'53.4"N 39°37'03.0"E, 02 August 2013, dung and moss; one ♀, 39°43'59.7"N 39°37'15.3"E, 25 October 2013, in dung; 4 ♀♀, 39°43'34"N 39°37'24"E, 11 November 2013, in moss.

Notes. *Macrochles similis* was first described by Krantz and Filipponi (1964) and illustrated by a single female specimen in the Australian region. Later, Rodriguez and Ibarra (1967) mentioned the species in an ecological study of mites on sheep and cattle pastures in Kentucky, USA, and Tenorio et al. (1985) reported the occurrence of this species in the Hawaiian Islands, and Halliday (1990) redescribed the mature and immature stages of numerous Australian specimens and provided further details on morphology and biology. Saito and Takaku (2013) investigated the degree of predatory ability of this species on *Tyrophagus similis* Volgin in Japan. Finally, Ji et al. (2023) reported this species from Korea, but it is not a specimen of *M. similis* as it is shown in the photo of the ventral side.

Macrochles similis morphologically most resembles *M. muscaedomesticae*, Krantz and Filipponi (1964) distinguished it based on some characters such as the pilosity of the dorsal setae, the dimension of the body shields, and the number of rows on the deutosternal furrow of the gnathosoma, but their study revealed only single specimens, later Halliday (1990) updated all characters based on the many specimens. Halliday (1990) shows that these separating characters are unreliable, except for the dimensions of the body part. We here confirmed the statement made by Halliday (1990) based on the Turkish specimens. Krantz and Filloponi (1964) state that setae *j2*, *j3*, *z2*, *z4*, *r3*, *s4*, *r4*, *s2*, *s5*, *s6*, *S1*, *S2*, *Z1* are simple, but Halliday (1990) reported that most of them may have pilosity, especially *r3*, *S1*, *S2* and *Z1* may be more pronounced. Specimens in Türkiye, setae *j5*, *j6*, *z1*, *z5*, *z6*, and *J2* smooth, *j1* and *Z4* strongly pilose and brushy (Fig. 18), other dorsal setae mostly distal on slightly pilose or knife-like, especially marginally situated setae more distinctly pilose. Krantz and Filloponi (1964) state that the deutosternal furrow has four rows of denticles, Halliday (1990) states that it has five rows of denticles, except for one specimen which has four, a female specimen which has six rows of denticles.



Figures 14-19. *Macrocheles* spp. (females). **14.** Surface of sternal shield of *M. muscaedomesticae*. **15-19.** *M. similis*. **15.** Surface of sternal shield, **16-17.** Chelicera, **18.** Seta Z4, **19.** Some setae on dorsal shield.

All specimens examined in the current study have are six rows of denticles, the row between setae *h1* is divided into two parts. The body size and the ornamentation on the sternal shield (surface of the sternal shield in *M. muscaedomesticae* as in Figure 14 and in *M. similis* as in Figure 15) are the most reliable differences between *M. muscaedomesticae* and *M. similis*. The length of dorsal shield of *M. similis* is 750-881 in Australian specimens (Krantz and Fillipponi, 1964; Halliday, 1990), 800-900 in Turkish specimens. Özbek et al. (2015) also report a

length of more than 1000 for *M. muscaedomesticae*, which was found in the dung of one specimen.

In addition, Halliday (1990) notes that non-morphological differences between *M. similis* and *M. muscaedomesticae*, such as the fact that *M. muscaedomesticae* is almost associated with flies as phoretic, are not observed in *M. similis*. In addition, *M. muscaedomesticae* reproduces by arrhenotokous parthenogenesis, whereas *M. similis* appears to be thelytokous. Furthermore, despite many specimens collected in Türkiye, no males of *M. similis*

were found. Therefore, Turkish specimens of *M. similis* are also thelythokous as reported by Halliday (1990).

DISCUSSION

The family Macrochelidae is quite well-known in the western Palaearctic, especially in Europe, compared to the other mesostigmatic mite families. There are many comprehensive papers on the systematics and species diversity of Macrochelidae species in this region (Evans and Browning, 1956; Krauss, 1970; Karg, 1971; Bregetova, 1977; Hyatt and Emberson, 1988; Mašan, 2003), but *M. similis* has not yet been described in this region. We collected 21 female specimens on the ventral side of a beetle (*Pentadon* sp.) in Antalya province in the Mediterranean region of Türkiye and many females freely in dung, soil and moss in Ekşisu Marsh in Erzincan province in eastern Türkiye. In conclusion, *M. muscaedomesticae* and *M. similis* are very similar based on their morphological features, so some researchers may not have been able to correctly identify the species; therefore, it would be appropriate to re-examine some specimens identified as *M. muscaedomesticae* in the Palaearctic.

Authors' contributions

Hasan Hüseyin Özbek: Methodology, identification, illustration, conservation, data collection, draft manuscript. **Furkan Durucan:** Collection of specimens, data collection, draft manuscript.

Statement of ethics approval

Not applicable.

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Conflict of interest

There is no potential conflict of interest.

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