



Mites of the family Macrochelidae (Acari: Mesostigmata) in Bayburt province, Türkiye

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ABSTRACT: This paper reports on mites of the family Macrochelidae that were collected between 2013 and 2015 in Bayburt province of Türkiye. A total of 13 species belonging to seven genera—*Glyptholaspis*, *Holostaspella*, *Longicheles*, *Macrholaspis*, *Macrocheles*, *Neopodocinium* and *Nothrholaspis*—were collected. In this study, the spermathecal structures of *Longicheles ozkani* are described for the first time, and the presence of a developing larva in two females of *Macrholaspis recki* indicates larviparity or ovoviviparity. Furthermore, DIC (Differential Interference Contrast) images of all developmental stages of *Neopodocinium meridionalis*, except for the larval stage and eggs, are presented.

Keywords: *Longicheles ozkani*, *Neopodocinium meridionalis*, edaphic mites, species diversity, fauna

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INTRODUCTION

Bayburt province is located in the northeastern Anatolian region of Türkiye and features a rugged, mountainous landscape. The topography includes deep valleys and high hills shaped by the tributaries of the Çoruh River. Due to its elevated inland position, the region has a harsh continental climate, with short, cool summers and long, cold winters. Vegetation is primarily composed of steppes and meadows, with sparse coniferous forests in the mountainous zones. These geographical features strongly influence both the natural environment and economic activities such as agriculture and livestock farming (Tarkan, 1972; Özey, 1994; Hacıhasanzade, 2007).

Previous studies have identified several eviphidoid mite species from this region. For example, *Nothrholaspis bilobatus* was first described by Özbek and Halliday (2015), while *Neopodocinium meridionalis* was found and identified by Geçit and Özbek (2017) as a phoretic associate of an unidentified coprophagous beetle belonging to the family Macrochelidae. Subsequently, Şahin and Özbek reported nine species from the area, including three newly described species within the family Pachylaelapidae. More recently, Özbek (2023) recorded *Eviphis ostrinus* (C.L. Koch, 1839) from the same region, a species assigned to the family Eviphididae. Additionally, several other mite species representing various families have also been documented in this locality (Karakurt, 2023; Erman et al., 2024).

The aim of the present study is to identify members of the family Macrochelidae from Bayburt province and to contribute to the understanding of their distribution and species diversity in Türkiye.

MATERIALS AND METHODS

Mites were collected by sieving decomposing organic matter and moss, and by removing phoretic individuals from a coprophilous beetle. The mites were extracted

using modified Berlese-Tullgren funnels and mounted in Hoyer's medium following to the methods of Walter and Krantz (2009). Some specimens of the species were dissected to allow detailed examination of specific structures for identification purposes. All measurements are in micrometres (µm). Lengths of shields were measured along their midlines from the anterior to the posterior margins, and widths were measured from the dorsal area at the mid-level (at the widest point) for the dorsal shield, between mid-level of coxae II (at the narrowest point) for the sternal shield, and from the widest point for the epigynal and ventrianal shield. The specimens were examined, illustrated, photographed, and measured using an Olympus BX63 upright microscope and an Olympus DP73 camera. The terminology of dorsal and ventral setae used in this paper follows those of Lindquist and Evans (1965), and the classification of the family Macrochelidae is based on the revision by Emberson (2010). The voucher are deposited at EBYU (Acarology Laboratory of Erzincan Binali Yıldırım University, Erzincan, Türkiye). Frequently referenced localities (i.e., those mentioned two or more times) are abbreviated in the text as follows: AL – Aygır Lake, AP – Aydıntepe Plateau, CV – Çayır yolu Village, GV – Gençosman Village, KG – Kop Gate, KV – Kozluk Village, SV – Sarımeşe Village, UL – Uluçayır Village, UP – Üzengili Plateau, UV – Üzengili Village, and YF – Yakup Abdal Forest. These abbreviations are used consistently throughout the text in place of the full locality names.

RESULTS

Glyptholaspis saprophila Maşán, 2003

Material examined. 3♀♀ from moss, (AP) 40°25'07"N 40°11'49"E, 2200 m a.s.l., 1 May 2013; 1♀ from moss, (UL) 40°14'57"N 40°17'28"E, 1889 m a.s.l., 2 July 2013; 1♀ and 1♂ from moss, (SV) 40°27'02"N 40°18'47"E, 1655 m a.s.l., 17 June 2014.

Remarks. *Glyphtholaspis saprophila* was firstly described by Mašán (2003) from Slovakia, based on females only. Later, Özbek et al. (2015a) recorded both female and male specimens of this species from the provinces of Gümüşhane and Tokat in Türkiye. In the present study, both female and male specimens of the species were identified from this region. These specimens are morphologically similar to those previously described.

***Holostaspella bidentata* Özbek, 2017**

Material examined. 1♀ from moss, (GV) 40°13'00"N 40°03'01"E, 1659 m a.s.l., 5 April 2014; 2♀♀ from moss, (GV) 40°09'06"N 40°20'44"E, 1745 m a.s.l., 18 April 2014.

Remarks. *Holostaspella bidentata* was first described by Özbek (2017) from the Gümüşhane province of Türkiye, based on both female and male specimens. In the present study, three females have been collected and identified for the first time from the study area. These females are morphologically similar to those of the type materials (Özbek, 2017).

***Longicheles hortorum* (Berlese, 1904)**

Material examined. 3♀♀ from litter of *Populus* sp., (Göz Stream) 40°11'50"N 40°18'35"E, 1596 m a.s.l., 18 April 2014; 2♀♀ from moss, (GV) 40°09'06"N 40°20'44"E, 1745 m a.s.l., 18 April 2014.

Remarks. This species is widespread in European regions (Mašán, 2003). In Türkiye, it was first recorded by Özbek and Bal (2012a) from the provinces of Giresun and Gümüşhane. In this study, five female specimens were collected and examined. These specimens are morphologically match with both the European and the previously identified specimens from Türkiye (Valle 1953; Hyatt and Emberson, 1988; Mašán, 2003; Özbek and Bal, 2012a)

***Longicheles ozkani* Özbek, Bal and Doğan, 2013**

Material examined. 2♀♀ from litter of *Pinus* sp., (YF) 40°03'21"N 39°53'39"E, 1850 m a.s.l., 17 May 2013; 1♀ from litter of *Pinus* sp., (YF) 40°03'21"N 39°53'39"E, 1835 m a.s.l., 17 May 2013; 1♀ from moss, (GV) 40°09'06"N 40°20'44"E, 1745 m a.s.l., 18.04.2014; 1♀ from litter of *Rosa canina*, (YF) 40°03'11"N 39°43'17"E, 1902 m a.s.l., 19 May 2015.

Remarks. This species was first described by Özbek et al. (2013) based on female specimens collected from the provinces of Tokat, Sivas, Giresun, and Gümüşhane in Türkiye. In the present study, four female specimens were collected and identified from the study area for the first time. The newly collected specimens are morphologically similar to the type materials (Özbek et al., 2013). In this genus, spermathecal structures are generally not apparent (Emberson, 2010). However, in one specimen from the study area, the spermathecal structures of *L. ozkani* were clearly visible for the first time. The tubuli annulati were strongly elongated, and the rami were distinctly visible (Fig. 1).

***Macrholaspis evansi* Balogh, 1958**

Material examined. 2♀♀ from litter of *Pinus* sp., (YF) 40°03'21"N 39°53'39"E, 1840 m a.s.l., 17 May 2013; 1♀ from moss, (GV) 40°09'06"N 40°20'44"E, 1745 m a.s.l., 18 April 2014; 1♀ from moss, (SV) 40°27'02"N 40°18'47"E, 1655 m a.s.l., 17 June 2014.

Remarks. *Macrholaspis evansi* was first described by Balogh (1958) from Bulgaria and later reported by Bregetova (1977) from the Crimea. It was later described by Özbek (2013, 2017) from the provinces of Giresun, Gümüşhane and Tokat in Türkiye. This species can be reliably distinguished from other relatives by the presence of smooth and pointed setae (*j*₆, *z*₆, *J*₂, *J*₅) in the middle part of the dorsal shield (Balogh, 1958; Bregetova, 1977; Mašán, 2003). Özbek (2017) observed that the seta *j*₆ is mostly pilose in Turkish specimens, although it can occasionally be smooth and pointed. In all specimens examined in the present study, this seta was clearly pilose.

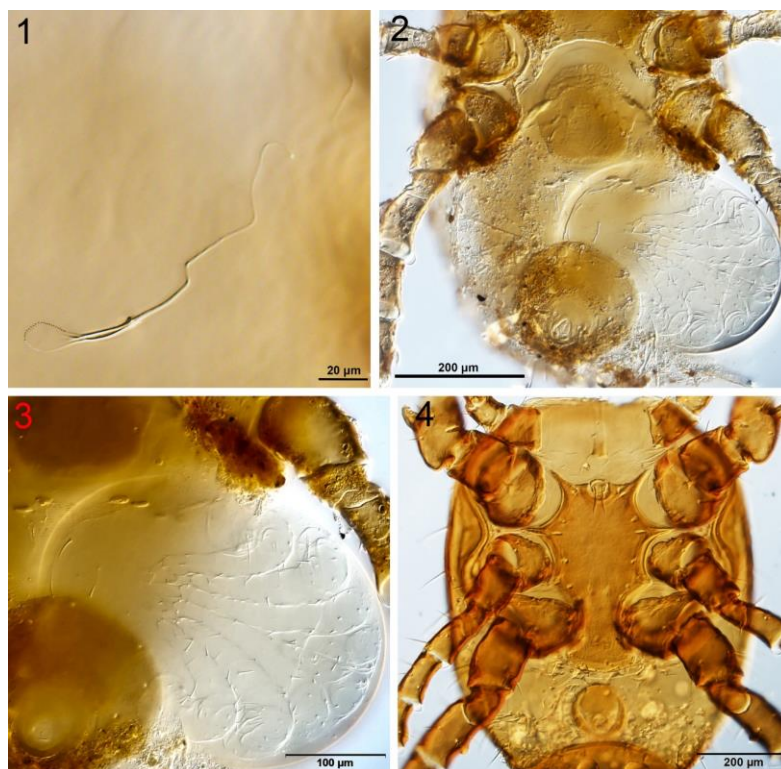
***Macrholaspis recki* (Bregetova and Koroleva, 1960)**

Material examined. 4♀♀ from litter of *Salix* sp., (CV) 40°15'53"N 39°58'30"E, 1618 m a.s.l., 1 May 2013; 1♀ from moss, (AP) 40°25'07"N 40°11'49"E, 2200 m a.s.l., 1 May 2013; 7♀♀ from moss, (AP) 40°26'01"N 40°07'31"E, 2195 m a.s.l., 17 May 2013; 2♀♀ from litter of *Astragalus* sp., (AP) 40°25'57"N 40°07'29"E, 2190 m a.s.l., 17 May 2013; 43♀♀ and 1DN from litter of *Pinus* sp., (YF) 40°03'21"N 39°53'39"E, 1840 m a.s.l., 17 May 2013; 6♀♀ from moss, (YF) 40°03'21"N 39°53'39"E, 1850 m a.s.l., 17 May 2013; 1♀ from moss, (Dağtarla Village) 40°20'30"N 40°25'39"E, 1631 m a.s.l., 2 July 2013; 15♀♀ from moss, (YF) 40°03'23"N 39°43'16"E, 1960 m a.s.l., 5 April 2014; 4♀♀ from moss, (Karşıgeçit Village) 40°21'42"N 40°26'42"E, 1683 m a.s.l., 2 July 2013; 23♀♀ from litter of *Populus* sp., (YF) 40°03'23"N 39°43'16"E, 1964 m a.s.l., 5 April 2014; 2♀♀ from moss, (GV) 40°09'06"N 40°20'44"E, 1754 m a.s.l., 18 April 2014; 2♀♀ from litter of *Platanus* sp., (YF) 40°03'09"N 39°43'15"E, 1900 m a.s.l., 18 April 2014; 2♀♀ from litter of *Astragalus* sp., (AP) 40°24'47"N 40°07'43"E, 1949 m a.s.l., 1 June 2014; 5♀♀ from moss, (SV) 40°27'02"N 40°18'47"E, 1655 m a.s.l., 17 June 2014; 1♀ from litter of *Populus* sp., (SV) 40°27'02"N 40°18'47"E, 1655 m a.s.l., 17 June 2014; 2♀♀ from litter of *Astragalus* sp., (Kılıçkaya Village) 40°28'53"N 40°15'38"E, 1736 m a.s.l., 17 June 2014; 3♀♀ from moss, (YF) 40°02'33"N 39°43'13"E, 2005 m a.s.l., 27 June 2014; 3♀♀ from litter under stone, (KV) 40°27'39"N 40°16'08"E, 1641 m a.s.l., 9 May 2015; 1♀ from litter of *Rosa canina*, (YF) 40°03'11"N 39°43'17"E, 1902 m a.s.l., 19 May 2015.

Remarks. This species is widespread in the Palaearctic region (Mašán, 2003; Plumari, 2010) and is the most collected species, particularly from litter, soil, and moss in the Kelkit Valley (Özbek and Bal, 2012b; Özbek, 2017). In accordance with these findings, numerous specimens were collected from soil, various types of litter, and moss in the present study. The species is distributed across the

provinces of Bayburt, Erzincan, Erzurum, Gümüşhane, Sivas, and Tokat in Türkiye. Furthermore, no morphological differences were observed between the newly collected specimens and those previously reported. (Bregetova and Koroleva, 1960; Bregetova, 1977;

Karg, 1993; Maşán, 2003; Plumari, 2010; Özbek and Bal, 2012b) Additionally, this study provides the first evidence that the species may lay eggs containing fully developed larvae (ovoviviparity) or give birth to fully developed larvae (larviparity) (Walter and Proctor, 2013).



Figures 1-4. Macrochelid mites. 1. *Longicheles ozkani*, spermathecal apparatus of female, 2. *Macrocholaspis recki*, ventral view of female with a developing larva in the egg, 3. Larva of *M. recki* inside the egg, 4. *Neopodocinium meridionalis*, ventral idiosoma of male.

***Macrocheles glaber* (Müller, 1860)**

Material examined. 3♀♀ from moss, (AP) 40°25'07"N 40°11'49"E, 2200 m a.s.l., 1 May 2013.

Remarks. This species is distributed in Europe, Asia, North America and Australia (Maşán, 2003). In Türkiye, it has been recorded in the provinces of Adana, Erzincan, Giresun, Gümüşhane, Sivas and Tokat (Çobanoğlu and Kırgız, 2001; Doğan et al., 2015; Özbek et al., 2015b). The newly collected specimens are morphologically similar to the previously known European specimens (Bregetova and Koroleva, 1960; Filipponi and Pegazzano, 1962; Krauss, 1970; Maşán, 2003; Özbek et al., 2015b).

***Neopodocinium meridionalis* (Sellnick, 1931)**

Material examined. 2♀♀, 2♂♂, 3 deutonymphs and 2 protonymphs, phoretic on a coprophilous beetle, (AL) 40°31'57"N 40°23'23"E, 2845 m a.s.l., 1 June 2014.

Remarks. Geçit and Özbek (2017) identified both sexes and all developmental stages (except the larval stage and egg) of this species, which was found as a phoretic associate on an unidentified coprophagous beetle and gave a summary. In the present study, DIC images of all developmental stages of *N. meridionalis*, except the larval stage and egg, together with the body measurements of the Turkish

specimens are presented in Figures 2-8 as follows: Dorsal shield length 980-1070 and width 600-650 at the widest point in females; idiosoma length 915-965 and width 645-700 at the widest point in males; dorsal shield length 740-760 and width 520-550 in deutonymphs. In protonymphs, the podonotal plate is almost equal in length and width (360), while the opisthosomal shield is 150 long and 290 wide at its widest point. The chelicerae of both sexes are presented in Figures 9–10. According to Maşán (2003), the European female specimens have an idiosoma length of 820-835 µm; however, the Turkish specimens are significantly larger (dorsal shield length 980-1070 µm), although other morphological features are similar. This species is known from certain regions of Europe (Maşán, 2003) and has so far only been recorded from the Bayburt province in Türkiye.

***Nothrholaspis anatolicus* Özbek and Bal, 2013**

Material examined. 3♀♀ from litter of *Salix* sp., (CV) 40°15'53"N 39°58'30"E, 1618 m a.s.l., 1 May 2013; 1♀ from litter of *Astragalus* sp., (AP) 40°26'01"N 40°07'39"E, 2220 m a.s.l., 1 May 2013; 18♀♀ from litter of *Astragalus* sp., (AP) 40°26'06"N 40°07'41"E, 2230 m a.s.l., 17 May 2013; 6♀♀ from litter of *Astragalus* sp., (AP) 40°25'57"N 40°07'29"E, 2190 m a.s.l., 17 May 2013; 4♀♀ from litter of *Astragalus* sp. and moss, (YF) 40°03'21"N 39°53'39"E, 1850 m a.s.l., 17

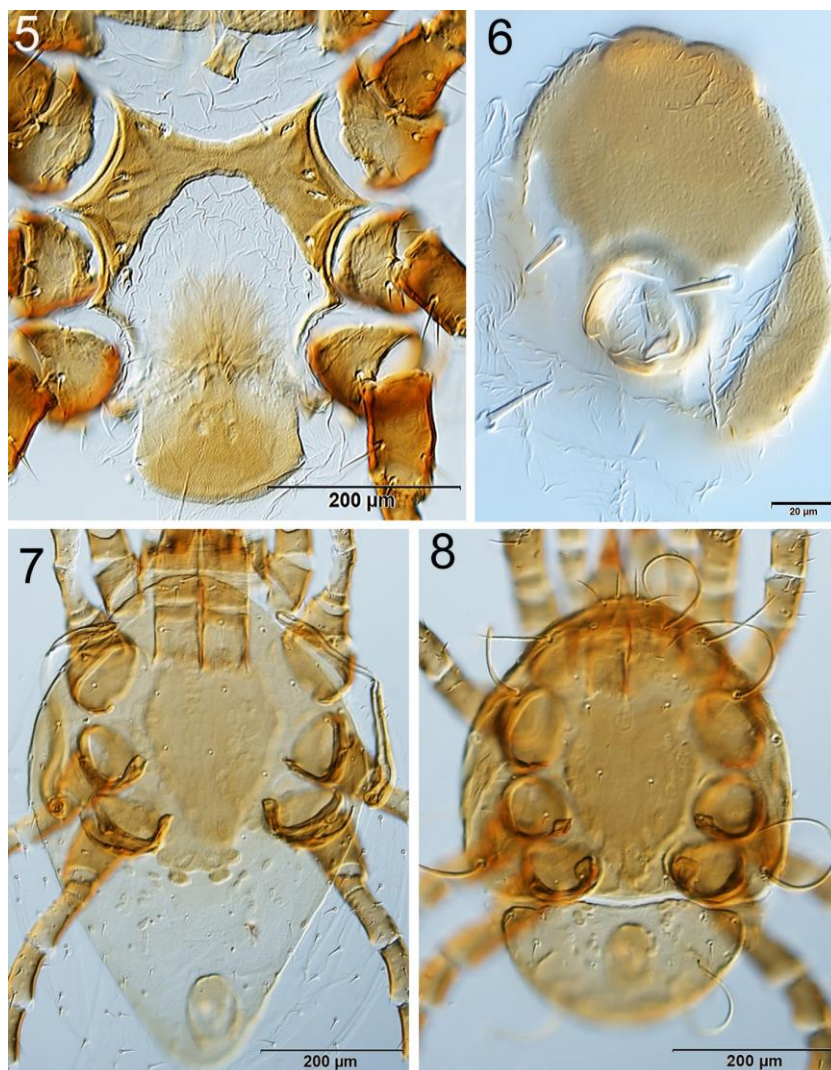
May 2013; 1♀ from litter of *Platanus* sp. (Kop Stream) 40°06'58"N 40°25'19"E, 1906 m a.s.l., 30 May 2013; 2♀♀ from litter moss, (UL) 40°14'57"N 40°17'28"E, 1889 m a.s.l., 2 July 2013; 4♀♀ from litter moss, (Yanıkçam Village) 40°21'16"N 40°28'06"E, 1755 m a.s.l., 2 July 2013; 3♀♀ from moss, (YF) 40°03'23"N 39°43'16"E, 1960 m a.s.l., 5 April 2014; 6♀♀ from litter of *Populus* sp., (Gez Stream) 40°11'50"N 40°18'35"E, 1596 m a.s.l., 5 April 2014; 3♀♀ from litter of *Populus* sp., (KG) 40°02'12"N 40°28'50"E, 2160 m a.s.l., 1 May 2014; 1♀ from moss, (KG) 40°03'20"N 40°27'56"E, 1990 m a.s.l., 1 May 2014; 2♀♀ from moss, (SV) 40°27'02"N 40°18'47"E, 1655 m a.s.l., 17 June 2014; 6♀♀ from litter of *Populus* sp., (KV) 40°27'39"N 40°16'08"E, 1641 m a.s.l., 9 May 2014; 9♀♀ from moss, (YF) 40°03'11"N 39°43'17"E, 1902 m a.s.l., 19 May 2015.

Remarks. This species was first described by Özbek and Bal (2013) from the provinces of Giresun and Gümüşhane in Türkiye. In the present study, numerous female specimens were collected and identified for the first time in the study area. The newly collected specimens are morphologically similar to the type specimens (Özbek and Bal, 2013).

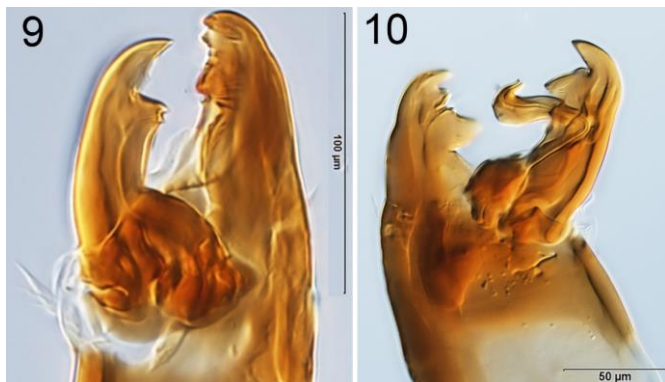
Nothrholaspis bilobatus Özbek and Halliday, 2015

Material examined. 8♀♀, 3♂♂ from moss and litter, (AL) 40°31'57"N 40°23'23"E, 2850 m a.s.l., 17 June 2014; 2♀♀ from moss, (UV) 40°29'57"N 40°24'53"E, 2830 m a.s.l., 17 June 2014; 10♀♀ from moss, (UP) 40°29'48"N 40°25'12"E, 2480 m a.s.l., 13 September 2014; 1♀ from moss, (UP) 40°30'36"N 40°23'41"E, 2832 m a.s.l., 13 September 2014.

Remarks. This species was originally described by Özbek and Halliday (2015) from the study area, based on female and male specimens. According to their findings, the male of this species exhibits a previously undescribed form of sexual dimorphism characterised by a pair of sclerotised lobes in the anal region — an unusual feature within this family. In the present study, numerous additional specimens were collected from the same area. The newly collected females and males are similar to the original type specimens in terms of morphological features (Özbek and Halliday, 2015).



Figures 5-8. *Neopodocinium meridionalis*. 5. Sternal and epigynal shields of female, 6. Anal shield of female, 7. Idiosoma of deutonymph, 8. Idiosoma of protonymph.



Figures 9-10. *Neopodocinium meridionalis*. 9. Chelicera of female, 10. Chelicera of male.

***Nothrholaspis dogani* Özbek and Bal, 2013**

Material examined. 2♀♀ from litter of *Populus* sp., (KG) 40°02'12"N 40°28'50"E, 2160 m a.s.l., 1 May 2014; 14♀♀ from moss, (YF) 40°03'17"N 39°43'17"E, 1900 m a.s.l., 30 May 2013; 4♀♀ from moss, (KG) 40°02'16"N 40°28'24"E, 2072 m a.s.l., 30 May 2013; 2♀♀ from moss, (KG) 40°02'16"N 40°30'48"E, 2417 m a.s.l., 18 May 2014; 1♀ from moss, (YF) 40°02'52"N 39°43'10"E, 1944 m a.s.l., 27 June 2014.

Remarks. This species was first described by Özbek and Bal (2013) from the provinces of Giresun and Gümüşhane in Türkiye. In the present study, numerous female specimens were collected and identified for the first time in this region. The newly collected specimens are morphologically like the type specimens (Özbek and Bal, 2013).

***Nothrholaspis turcicus* Özbek and Bal, 2013**

Material examined. 4♀♀ from litter of *Salix* sp., (CV) 40°15'53"N 39°58'30"E, 1618 m a.s.l., 1 May 2013; 32♀♀ from litter of *Astragalus* sp. and moss, (AP) 40°26'06"N 40°07'41"E, 2230 m a.s.l., 17 May 2013; 3♀♀ from litter, (AP) 40°26'03"N 40°07'39"E, 2240 m a.s.l., 17 May 2013; 11♀♀ from litter of *Pinus* sp., (YF) 40°03'21"N 39°53'39"E, 1850 m a.s.l., 17 May 2013; 2♀♀ from litter of *Astragalus* sp., (AP) 40°24'58"N 40°07'27"E, 2014 m a.s.l., 5 April 2014; 1♀ from litter of *Populus* sp., (KG) 40°02'12"N 40°28'50"E, 2160 m a.s.l., 1 May 2014; 2♀♀ from litter of *Populus* sp., (SV) 40°27'02"N 40°18'47"E, 1655 m a.s.l., 17 June 2014; 6♀♀ from litter, (Sırakaya Waterfall) 40°06'11"N 40°14'12"E, 1845 m a.s.l., 25 April 2014; 5♀♀ from litter, (KV) 40°27'39"N 40°16'08"E, 1641 m a.s.l., 9 May 2014.

Remarks. This species was firstly described by Özbek and Bal (2013) from the Gümüşhane province in Türkiye. In the present study, numerous female specimens were collected and identified for the first time in the study area. The newly collected specimens are morphologically similar to the type specimens (Özbek and Bal, 2013).

***Nothrholaspis scutivagus* Özbek, 2017**

Material examined. 5♀♀ from moss, (KG) 40°02'12"N 40°28'52"E, 2165 m a.s.l., 14 September 2013; 1♀ from moss, (AP) 40°29'40"N 40°06'02"E, 2518 m a.s.l., 1 June 2014; 10♀♀ from moss, (SV) 40°27'02"N 40°18'47"E, 1655 m a.s.l., 17 June 2014; 1♀ from litter of *Populus* sp., (YF) 40°03'20"N 39°43'18"E, 1888 m a.s.l., 27 June 2014.

Remarks. Özbek (2013) initially misidentified the type specimens of *Nothrholaspis scutivagus* as *Macrocheles lagodekhensis* Bregetova and Koroleva, 1960, as he had overlooked the platelets present on the soft integument between the epigynal and ventrianal shields. Subsequently, Özbek (2017) re-examined the type materials and described it as a new species within the genus *Nothrholaspis*. This species was previously recorded from the provinces of Giresun and Gümüşhane in Türkiye (Özbek, 2017) and is now reported for the first time from Bayburt province. The newly collected specimens are morphologically similar to the type materials (Özbek, 2017).

DISCUSSION

In Türkiye, studies on macrochelid mites have steadily increased in recent years, leading to the identification of a growing number of species in manure, decaying organic material, and in association with various insects (Özbek, 2017; Özbek and Durucan, 2024). Taxonomic research on the family Macrochelidae has mainly focused on the northeastern part of the country, while knowledge of species diversity in other regions remains limited. To date, a total of 36 macrochelid species have been recorded in Türkiye (Özbek, 2017; Erman et al., 2024). However, the macrochelid fauna of Türkiye is still not fully documented, and many areas remain insufficiently explored. Further fieldwork and detailed taxonomic studies are needed to better understand the diversity, distribution and interactions of these mites.

Statement of ethics approval

Not applicable.

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Conflict of interest

There is no potential conflict of interest.

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