



First faunistic data on soil mites (Acari: Oribatida: Punctoribatidae, Phenelopelidae) from the Acarlar Longoz Forest

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Abstract

In this study, soil mites found in the Acarlar Longoz Forest in Sakarya Province, Türkiye, which is the largest longoz of country, were investigated for the first time. The aim was to better understand the mite fauna of Türkiye by determining the species belonging to the families Punctoribatidae and Phenelopelidae (Acari: Oribatida). Knowledge of the oribatid mite fauna of Türkiye is very limited. The samples were collected in May, 2022. Three species belonging to the families Punctoribatidae and Phenelopelidae were recorded. The species *Punctoribates (Minguezetes) palustris* (Banks, 1895) and *Peloptulus (Sacculoptulus) sacculiferus* (Weigmann, 2008) are first records from Türkiye. SEM images of the species are presented.

Keywords: Acarlar Longoz Forest, First record, Phenelopelidae, Punctoribatidae, Türkiye

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Acarlar Longoz Ormanı'ndan toprak akarları (Acari: Oribatida: Punctoribatidae, Phenelopelidae) hakkında ilk faunistik veriler

Özet

Bu çalışmada Türkiye'nin tek parça halindeki en büyük longoz (subasar) olan Acarlar Longoz ormanında bulunan toprak akarları faunistik açıdan ilk kez incelenmiştir. Punctoribatidae ve Phenelopelidae (Acari: Oribatida) familyalarına ait türlerinin belirlenerek Türkiye akar faunasına katkıda bulunmak amaçlanmıştır. Örnekler Acarlar Longoz Ormanı'ndan 2022 yılı Mayıs ayında toplanmıştır. Türkiye'nin oribatid akar faunası hakkında bilgi çok sınırlıdır. Bu araştırma sırasında Acarlar Longoz Ormanı'ndan Punctoribatidae ve Phenelopelidae familyalarına ait üç tür kaydedilmiştir. *Punctoribates (Minguezetes) palustris* (Banks, 1895) ve *Peloptulus (Sacculoptulus) sacculiferus* (Weigmann, 2008) türleri Türkiye'den ilk kez kaydedilmiştir. Türlerin SEM görüntüleri sunulmuştur.

Anahtar kelimeler: Acarlar Longoz Ormanı, yeni kayıt, Phenelopelidae, Punctoribatidae, Türkiye

1. Introduction

Microhabitats in forest soils provide fairly stable and suitable conditions for their inhabitants, and therefore the species richness of the soil mesofauna (Mesostigmata, Oribatida, Collembola, Nematoda) in the old forest soils is quite high [1].

The oribatida is the most species rich suborder of Acari. There are 162 families and over 11,000 described species belonging to the suborder Oribatida, with nearly 4,000 of these species found in the Palearctic region [2,3].

The family Mycobatidae Grandjean 1954 was considered as a junior synonym of Punctoribatidae Thor, 1937 by different authors [4,5]. The family Punctoribatidae has 101 species in 12 genera [2]. The characteristic features of the family Punctoribatidae are the presence of movable or semimovable slender pteromorphs, tectum on the anterior margin of notogaster, shiny or variously ornamented notogaster, lamella with cuspides and translamella, and 10 pairs of notogastral setae. The family Punctoribatidae has 101 known species in 12 genera [6-8].

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The family Phenopelopidae Petrunkevitch, 1955 has 99 known species in 4 genera [2]. The characteristic features of the family are large body size (400-1000 micrometers), notogaster covered in a thick cerotegumental layer, prodorsal lamella flat and blade like, more or less pointed rostrum, movable or semimovable pteromorphs, presence of area porosae and 8-10 pairs of notogastral setae [9,10].

Five species belonging to family Punctoribatidae have been recorded from Türkiye, namely: *Minunthozetes (M.) pseudofusiger* (Schweizer, 1922), *Minunthozetes (M.) semirufus* (Koch, 1841), *Punctoribates (P.) punctum* (Koch, 1839), *Punctoribates (P.) angulatus* Bayartogtokh, Grobler and Cobanoglu, 2000, and *Punctoribates (Minguezetes) hexagonus* Berlese, 1908 [11-14]. At present, eight species belonging to family Phenopelopidae are known from Türkiye, namely: *Eupelops acromios* (Hermann, 1804), *Eupelops nepotulus* (Berlese, 1916), *Eupelops torulosus* (Koch, 1839), *Eupelops sulcatus* (Oudemans, 1914), *Eupelops occultus* (C.L. Koch, 1835), *Eupelops curtipilus* (Berlese, 1916), *Peloptulus phaeonotus* (Koch, 1844) and *Peloptulus montanus* (Hull, 1914) [14-18].

Acarlar Longoz Forest is bordered by Denizköy, Taşlıgeçit and Camitepe villages in Sakarya Province, northern Türkiye. Its width is 250–1250 m and it is approximately 7.5 km long in the east-west direction. The length of the coast is 12 km. It is a typical coastal set lake in terms of its formation. It is bordered by sand dunes with a height of 20-25 m between the Black Sea and the Longoz and low hills with an average height of 100 m in the south. It is located 6 km west of the Sakarya River, and its waters flow into the Sakarya River via the Okçu Stream. It has been reported that ash (*Fraxinus* sp.), alder (*Alnus* sp.), beech (*Fagus* sp.) and elm (*Ulmus* sp.) species are common in the forest area [19].

In this study, the aim was to contribute to a better understanding of the oribatid fauna of Türkiye by investigating the punctoribatid and phenopelopid mites of Acarlar Longoz Forest, which has unusual and distinctive wetland microhabitats, and has not been studied in terms of oribatid mite fauna before.

2. Materials and methods

The study area was Acarlar Longoz Forest located in the Marmara Region of Türkiye (Figure 1). Acarlar lake is one of the best models of the Longoz forest ecosystem in Türkiye. It is located about 6 km west of the point where the Sakarya River flows in to the Black Sea. The lowest altitude is 2 m and the highest altitude is 50 m. The Longoz forest area, which runs parallel to the coast, is approximately 1.5 km inland from the Black Sea coastline and is 7.5 km long. The area of the lake is about 2,517 hectares. It is covered with an dense vegetation and forest and it has Longoz features due to its wetland characteristics. The Longoz forest shelters rich flora and fauna due to its humid, wetland conditions [20]. The locations where the examined materials were collected are shown in Figure 2.

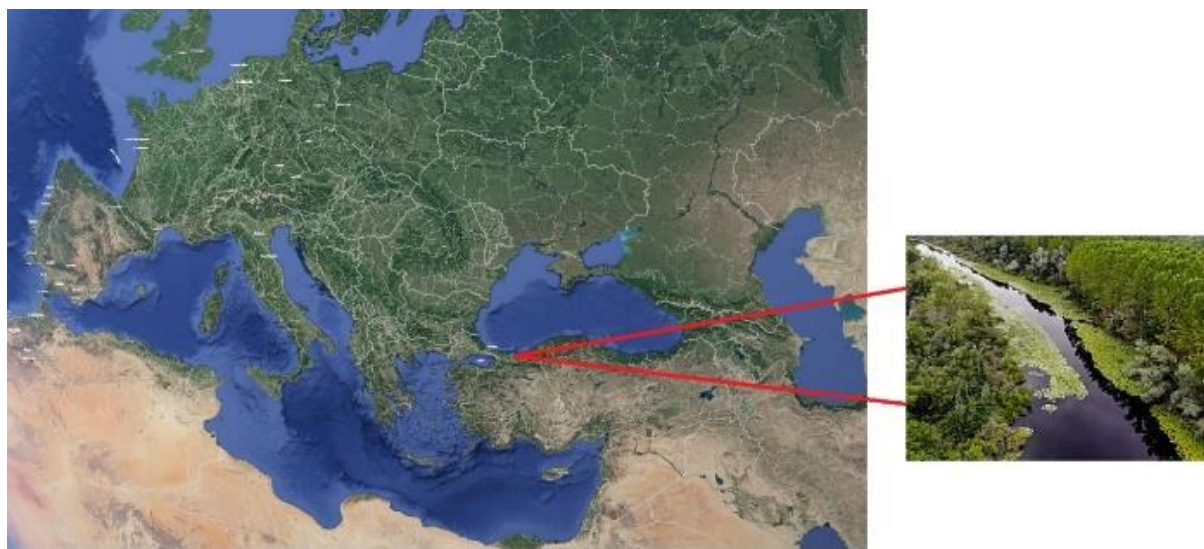


Figure 1. Map and view of the study area (Google Maps)

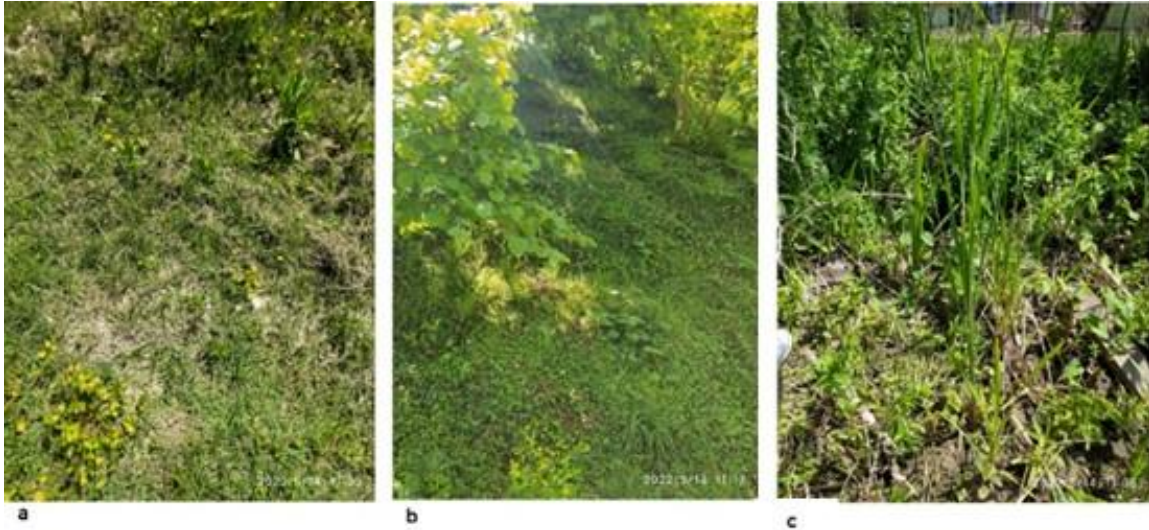


Figure 2. Localities A2, A3, A5.

Soil samples were collected from the Acarlar Longoz Forest located in Sakarya Province, Türkiye in May, 2022. The specimens were extracted using a Berlese funnel apparatus and sorted under an Olympus SZX51 stereomicroscope. The specimens were then examined under light (Leica DM 1000) and scanning electron (JEOL JSM 6060 LV, FEI Quanta FEG 450) microscopes. All measurements are given in micrometers (μm). Balogh and Balogh 1992, and Weigmann 2006 [6,8] were used for terminology and identification. The examined materials are stored at the Acarology Laboratory of the Science Faculty, Sakarya University, in Sakarya, Türkiye

3. Results

Minunthozetes (M.) semirufus (Koch, 1841) (Zetes) (Figure. 3)

Family: Punctoribatidae

Genus: *Minunthozetes*

Subgenus: *Minunthozetes (Minunthozetes)*

Syn: *Punctoribates bicornis* Berlese, 1908, *Oribata fusigera* Michael, 1884, *Minunthozetes major* Mihelčič, 1957

Description.

Material Examined: A3, 41°11'86.8" N 30°54'80.8" E, 14 May 2022, soil where ivy was growing under an alder tree (*Alnus* sp.), Acarlar Longoz forest Turkey.

Measurements: Average body length 256 μm , average body width 163 μm (n=5).

Integument: Colour reddish brown. Prodorsum: Rostrum rounded. Sensillus fusiform with sharply pointed head, interlamellar and lamellar setae thin and smooth, rostral setae invisible. Lamellar cups and translamella present.

Notogaster: Notogaster oval with smooth surface. Notogastral setae short. Pteromorphae curled down. Areae porosae circular.

Ventral region: Apodems well developed, anal and genital plates medium not clear and distance between each other as long as the length of anal plate. Two pairs of anal, three pairs of adanal, one pair of aggenital and six pairs of genital setae present. Epimeral setation 3-1-3-3.

Distribution: Palearctic region and Canada [2]. Reports from Turkiye: Giresun and Samsun Provinces [11].

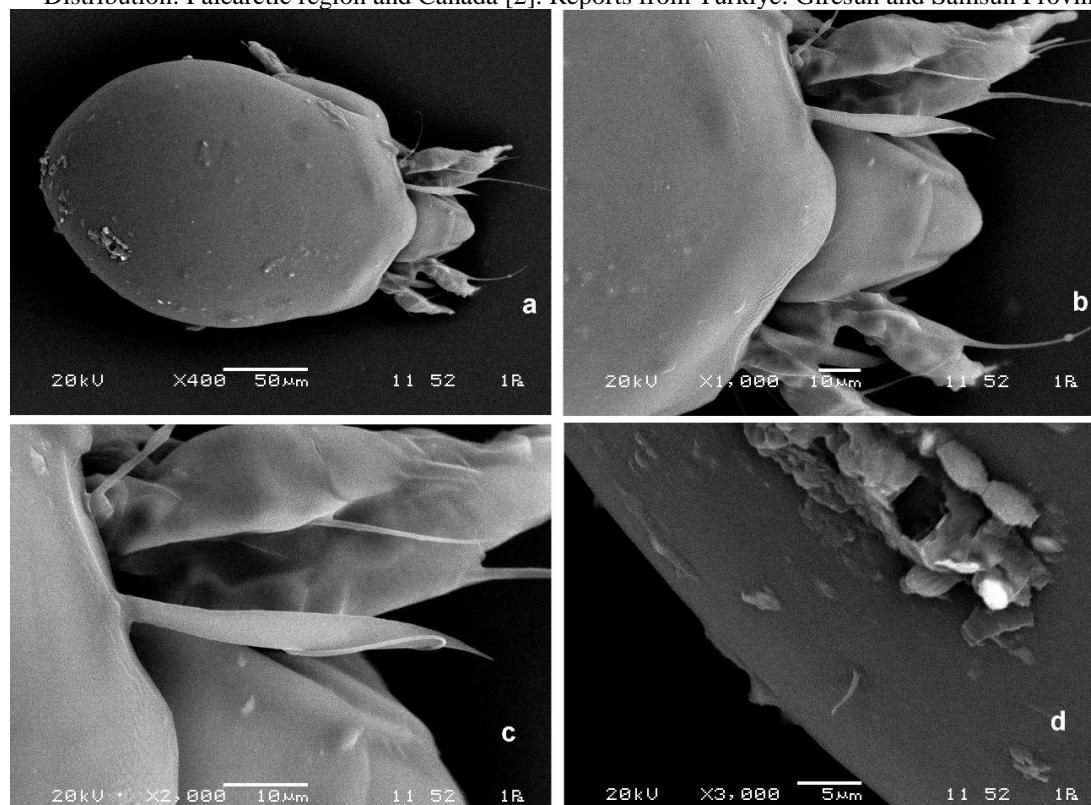


Figure 3. SEM image of *Minunthozetes (M.) semirufus*, a-Dorsal view, b-Prodorsum, c-Sensillus, d-Notogastral setae

***Punctoribates (Minguezetes) palustris* (Banks, 1895) (Figure. 4)**

***Punctoribates (Minguezetes) palustris* (Banks, 1895) (Figure. 4)**

Family: Punctoribatidae

Genus: *Punctoribates*

Subgenus: *Punctoribates (Minguezetes)*

Syn: *Galumna armipes*

Description.

Material Examined: A5, 41°11'87.5" N 30°55'36.0" E, 14 May 2022, soil from shrubland, Acarlar Longoz Forest, Turkiye.

Measurements: Average body length 433 µm, average body width 344 µm (n=3).

Integument: Colour dark brown.

Prodorsum: Rostrum rounded, rostral tetae thin. Anterior notogastral tectum relatively large, almost covering the prodorsum. Sensillus with short stalk and long fusiform head.

Notogaster: Anterior margin with strong u shaped tectum medially. Notogastral setae invisible, only represented by alveoli.

Ventral region: Anal plate bigger than genital plate and distance between each other shorter than the length of anal plate. Genital plates with longitudinal striations. Two pairs of anal, three pairs of adanal, one pair of aggenital and six or seven pairs of genital setae present. Epimeral setation 3-1-3-3.

Distribution: Holarctic region: Nearctic (frequent) and Western Palearctic (Italy and Caucasus) [2]. New record for the Turkish fauna.

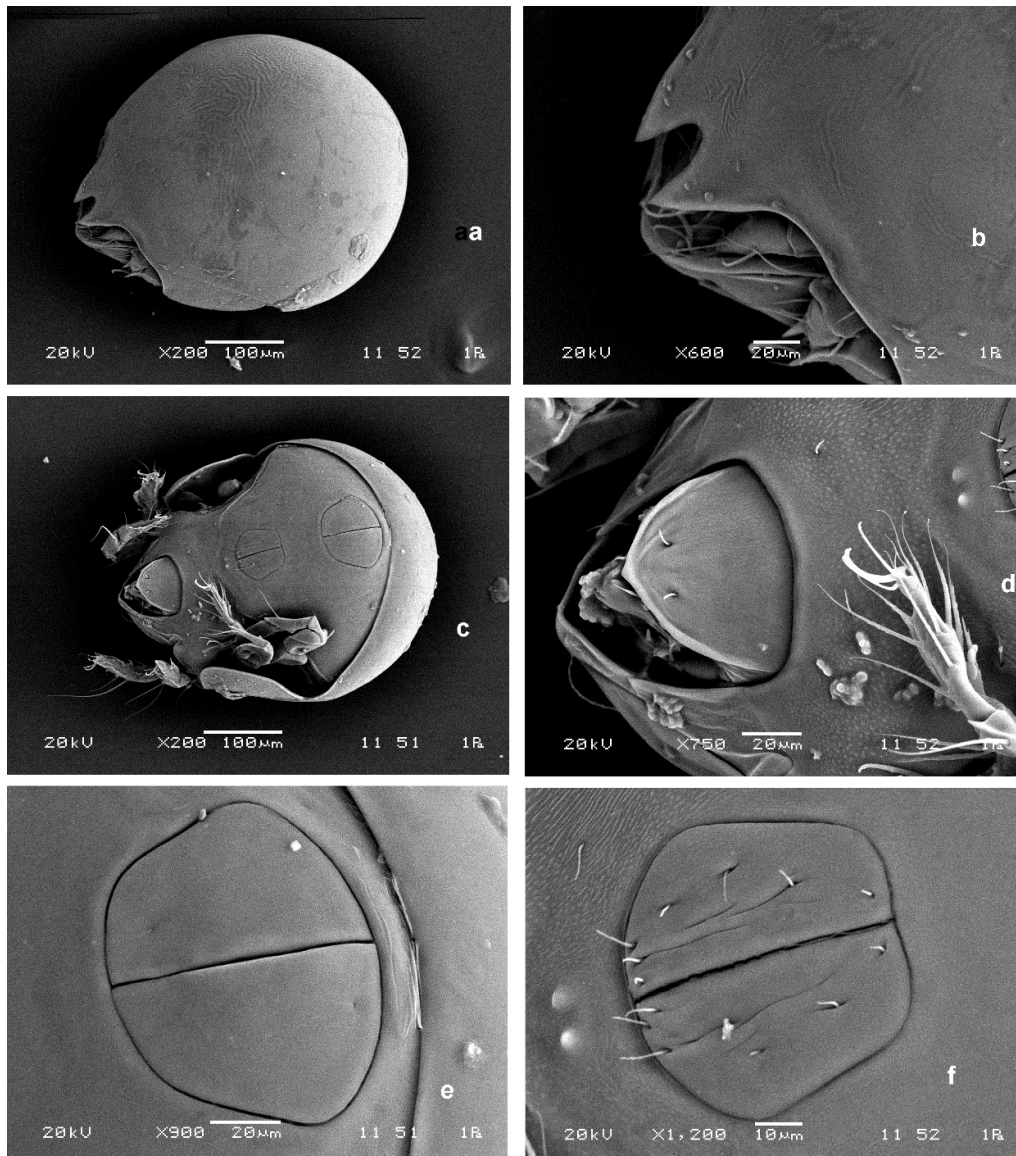


Figure 4. SEM image of *Punctoribates (Minguezetes) palustris*, a-Dorsal view, b-Prodorsum, c-Ventral view, d-Gnathosoma, e-Anal plate, f-Genital plate

***Peloptulus (Sacculoptulus) sacculiferus* (Figure. 5)**

Family: Phenelopidae

Genus: *Peloptulus*

Subgenus: *Peloptulus (Sacculoptulus)*

Description.

Material Examined: A2, 41°11'87.7" N 30°54'54.0" E, 14 May 2022, Grassy soil, Acarlar Longoz Forest, Türkiye.

Measurements: Average body length 492 µm, average body width 330 µm (n=2).

Integument: Colour brown.

Prodorsum: Rostrum narrow and slightly rounded. Lamellae wide, lamellar setae barbed and originating on anterior edge of cusps; between cusps V-shaped narrow interspace present. Sensillus with long stalk and flattened claviform granulated head, interlamellar setae short.

Notogaster: with large movable pteromorphs connected to each other medially with broad bridge. Pteromorphs and bridge with granulated cerotegument on surface. Notogastral setae c2, lm, la, lp, h2 and h3 spicular and finely granulated. Notogastral setae h1 and p1 bacilliform.

Ventral region: Genital plate bigger than anal plate and distance between each other longer than the length of genital plate. Two pairs of anal, one pair of aggenital and six pairs of genital setae present, adanal setae invisible. Epimeral seta formula: 3-1-3-3.

Distribution: Portugal [2, 21]. New record for the Turkish fauna.

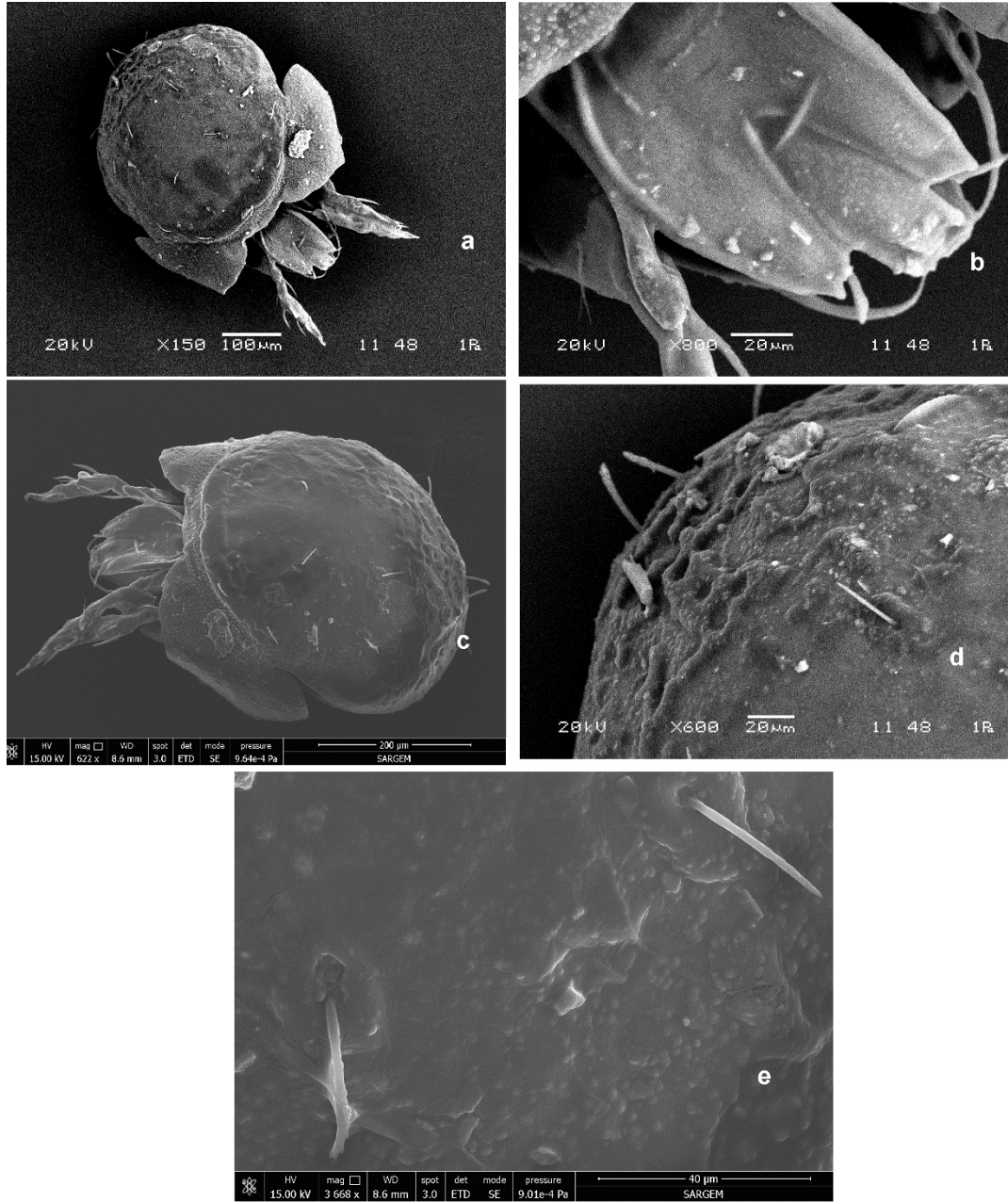


Figure 5. *Peloptulus (Sacculoptulus) sacculiferus* a- SEM image of dorsal view, b- Prodorsum, c- FESEM image of dorsal view, d- SEM image of setae *lp* and *h1*, e- FESEM image of setae *lp* and *h3*

4. Conclusions and discussion

5. Discussion and conclusions

In this study, soil mites of the Acarlar Longoz Forest, which is the largest longoz in Türkiye were investigated faunistically for the first time. Species belonging to the families Puncatoribatidae and Phenopelopidae (Acari: Oribatida) were evaluated in the present study. *Minunthozetes (M.) semirufus* and *Puncatoribates (Minguezetes) palustris* (Puncatoribatidae) and *Peloptulus (Sacculoptulus) sacculiferus* (Phenopelopidae) were recorded.

Minunthozetes (M.) semirufus is known from the Palearctic Region and Canada, and has been reported from Giresun and Samsun Provinces, Türkiye [11]. This species is abundant in meadows, pastures, grasslands and soil surface moss [23]. We found it in grassy soil under an alder tree. In this study, the average body size of *M. (M.) semirufus* specimens was 256/163 µm. These measurements are in agreement with Bayartogtokh et al. (2002) but are smaller than the European specimens reported by Bayartogtokh et al. [11].

The second species, *Punctoribates (Minguezetes) palustris*, has frequently been reported from the Nearctic Region and also the Western Palearctic (Italy and Caucasus) [2]. This study reports it for the first time from Türkiye. *Punctoribates (Minguezetes) palustris* has been reported from bogs and flooded forests [24]. We also found it in flooded forests. The body length was 437–470 µm [25] and the body lengths of the our specimens were similar. This is the first record of the species from Turkey.

Peloptulus (Sacculoptulus) sacculiferus has previously only been recorded from the type locality; Portugal - coastal region, habitats adjacent to the sea, lagoon and river bank with meadow and shrub vegetation [2, 21]. Our specimens were also recorded from a longoz in a coastal area. Average body length and body width were 485/315 µm; the body dimensions of our specimens (492/330 µm) closely resemble provided earlier [21].

The sensillus in our specimens extends beyond the translamellar ridge, being longer than in the original description of the species in which it only comes up to the level of the translamella [21]. The other morphological features of our specimens are in agreement with the features given by Weigmann [21]. This is only the second record of *Peloptulus (Sacculoptulus) sacculiferus* worldwide, having previously only been recorded from Portugal [2,21]. Thus, it can be said that to date it is known to have a Mediterranean distribution.

The Acarlar Floodplain Forest in Sakarya Province, Türkiye is a vital protected wetland area that represents an ecosystem type that continues to be lost in many areas of the world. This area is likely to have many other unreported invertebrates, including mites, and possibly undescribed species.

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