

Contributions to the Zerconidae (Acari: Mesostigmata) fauna of Dilek Peninsula-Büyük Menderes Delta National Park, Türkiye

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Received: 30 December 2022

Accepted: 10 January 2023

Available online: 30 January 2023

ABSTRACT: The mite fauna of the genus *Zercon* (Acari: Zerconidae) of Dilek Peninsula-Büyük Menderes Delta National Park, in western Türkiye was investigated and nine species were reported herein. Among them, *Z. dilekensis* **sp. nov.**, was described and illustrated as a new species for science. A key to *Zercon* species found in the study area was provided. Additionally, the altitude and habitat preferences of the specimens were also given.

Keywords: Soil mite, new species, altitude, habitat, preference, key, Kuşadası, Aydın.

Zoobank: <https://zoobank.org/B45EBEAD-6195-46C9-966F-385022A59EFB>

INTRODUCTION

Zerconids (family Zerconidae) is one of Türkiye's systematically well-studied mite groups. Two genera (*Prozercon* and *Zercon*) and 134 species have been reported from the country up to now (Bilki et al., 2022). However, species diversity of zerconid mites is still increasing especially with local faunistic studies both in Türkiye and the other countries of the Holarctic region (Urhan and Karaca, 2020; Urhan et al., 2020a, b; Bulut et al., 2021; Kaczmarek et al., 2020, 2021; Karaca, 2021; Keçeci et al., 2021; Marchenko, 2021, 2022; Moghimi et al., 2021; Bilki et al., 2022).

Dilek Peninsula-Büyük Menderes Delta National Park is located in western Türkiye. Previously, species diversity of zerconid mites in the genus *Prozercon* was presented (Keçeci et al., 2021). In addition, species diversity of the other genus (*Zercon*) was revealed in this study. In this context, a species list of mites of the genus *Zercon* found in the study area was prepared, previous records of the species were noted, altitudinal and habitat preferences of the specimens were investigated, a key to *Zercon* species was presented, and a new species, *Zercon dilekensis* **sp. nov.** was described herein.

MATERIALS AND METHODS

All materials (soil, litter and moss samples) were collected from different habitats (especially from forestland areas) in the Dilek Peninsula-Büyük Menderes Delta National Park, Kuşadası County of Aydın Province, between December 2018 and May 2020. Samples of zerconid mites were carried out after obtaining legal permissions from the "Republic of Türkiye Ministry of Forestry and Water Affairs, General Directorate of Nature Conservation and National Parks (72784983-488.04-51504)". Totally 191 samplings

from 97 different sites were made in the study area (Fig. 1). The GPS data for collecting localities, including coordinates and altitudes, was taken using a Garmin GPSmap 62s.

Collecting, carrying, sorting, measuring and drawing processes as in Keçeci et al. (2021). Lindquist and Evans (1965), Johnston and Moraza (1991), Lindquist and Moraza (1998) terminologies were used for identification processes. Due to the light microscope (Olympus CX41) used to investigate zerconids, it was impossible to discern pores, poroids, lyrifissures or pore-like structures as in a differential interference contrast microscope. Therefore, not all of these structures have been shown in the related figures.

The holotype and paratypes of *Zercon dilekensis* **sp. nov.**, as well as the other specimens examined in this study were deposited in the Acarology Laboratory of the Department of Biology, Faculty of Science and Arts, Pamukkale University, Denizli, Türkiye (PAU).

All measurements and the scale bars in the figures were given in micrometers (μm). Abbreviations of DN and PN were used for deutonymph and protonymph specimens, respectively.

RESULTS

Family **Zerconidae** Canestrini, 1891

Genus **Zercon** C. L. Koch, 1836

Type species: **Zercon triangularis** C. L. Koch, 1836

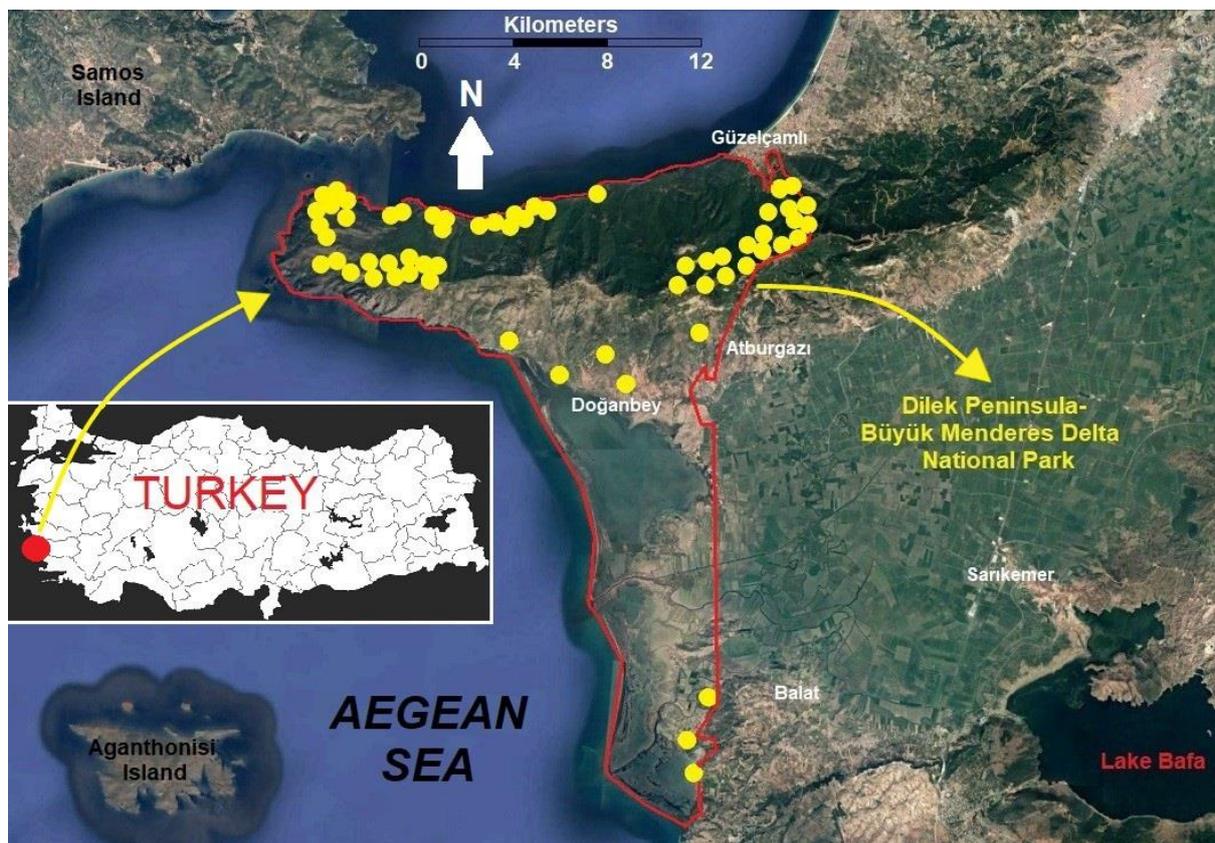


Figure 1. Location of Dilek Peninsula-Büyük Menderes Delta National Park in Türkiye and sampling sites for zirconid mites in the study area (sampling sites were shown with yellow dots).

Peritremal shields terminate in blunt end at the posterior part of coxae IV, with 2 types of setae: *r1* short and smooth, *r3* long and feathered or spiny. There is a distinctive gap between the peritremal shield and the edge of the podonotum with weak sclerotization. Adgenital shields present, with 2–5 opening valves. Opisthonotum with 7 or 8 pairs of marginal setae (*S1 + R1–R6* or *S1 + R1–R7*). Anterior margin of the ventrianal shield with 1 pair (seta *JV1* present, seta *ZV1* absent) or 2 pairs (setae *JV1* and *ZV1* present) of setae (Urhan et al. 2020).

Zercon andrei Sellnick, 1958 (Figure 2)

Materials examined: 10 females, 31 males and 9 DN: soil, litter and moss samples under holly oak (*Quercus ilex*) and sage-leaved rock-rose (*Cistus salviifolius*), 37°43.325' N, 27°18.614' E, 152 m a.s.l., vicinity of Davutlar neighborhood, 9 November 2019. 10 males: soil and litter samples under black pine (*Pinus nigra*), 37°39.378' N, 27°5.134' E, 623 m a.s.l., vicinity of Dipburun Guardhouse, 3 February 2020.

Short description: On podonotum, seta *j1* finely barbed, the remaining setae smooth and needle-like. On opisthonotum, setae *J1–5*, *Z1–2*, *S1–2*, *R1–6* smooth and needle-like. Setae *Z3–5* and *S3–5* finely barbed with hyaline endings. Although seta *Z4* extends to the edge of the opisthonotum,

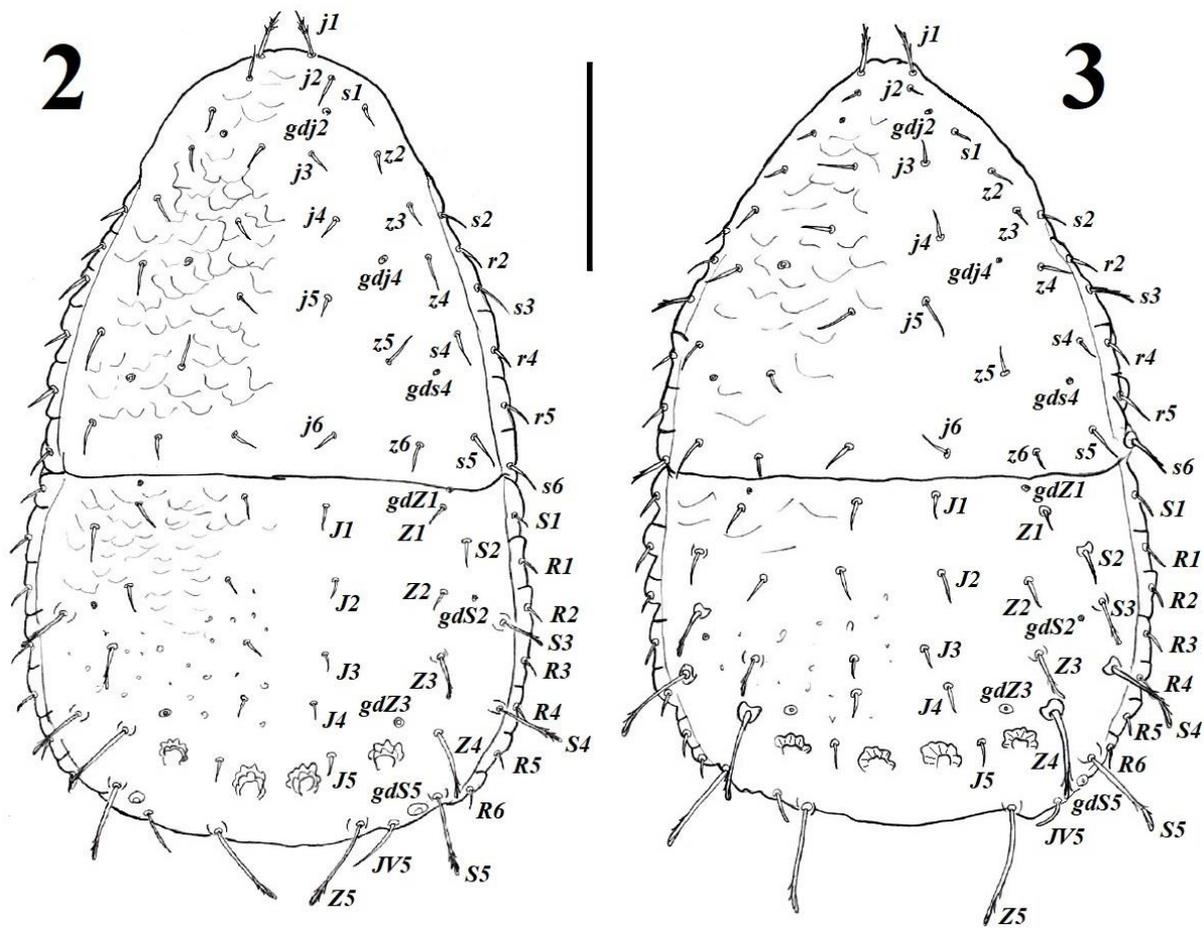
setae *Z5* and *S4–5* extend to beyond the opisthonotum. Pores *gdS2* located between setae *Z3* and *S3*, closer to *S3*, *gdZ3* located between setae *J4* and *Z4*. Dorsal cavities distinct and weakly developed. Anterior margin of ventrianal shield with 2 pairs of setae (*JV1* and *ZV1*), glands *gv2* present. Posterolateral tips of peritrematal shield reach the level of seta *S1* (Gwiazdowicz et al., 2009).

Deutonymph (Fig. 2)

Length × width of idiosoma: 419–450 × 252–265 (n=9).

Generally, idiosomal adenotaxy and poroidotaxy similar to those of females, with a few exceptions. Although seta *Z4* extends to the edge of the opisthonotum in female specimens, this seta extends to beyond the opisthonotum in some deutonymph specimens. Pores *gdS2* located between setae *Z2* and *S3*, closer to *Z2*. Dorsal cavities distinct and weakly developed, outer pair slightly larger than inner pair in some specimens. Anterior margin of ventrianal shield with 2 pairs of setae (*JV1* and *ZV1*), glands *gv2* present. Posterolateral tips of peritrematal shield reach the level of seta *S1–R1*. Distances between setae *Z5–Z5* and *Z5–JV5* 94–99 and 14–21, respectively. Podonotal and opisthonotal shields distinct. Average lengths and ranges of opisthonotal setae are given in Table 1 for the deutonymph specimens.

Distribution in Türkiye: Artvin (Urhan and Karaca, 2013), Aydın (present study).



Figures 2-3. Dorsal views of deutonymph specimens **2.** *Zeron andrei*, **3.** *Zeron plumatopilus*. Scale bar 100.

Table 1. Average lengths of opisthonotal setae and the distances between their bases in J, Z, and S rows of *Zeron andrei* (deutonymphs).

Setae	DN	Setae	DN	Seta	DN
J1	6	Z1	6	S1	11
J1-J2	53	Z1-Z2	54	S1-S2	22
J2	6	Z2	7	S2	13
J2-J3	40	Z2-Z3	50	S2-S3	52
J3	7	Z3	24	S3	22
J3-J4	32	Z3-Z4	48	S3-S4	50
J4	7	Z4	38	S4	34
J4-J5	26	Z4-Z5	41	S4-S5	51
J5	7	Z5	48	S5	41

Known distribution: Bulgaria, France, Hungary, Iran, Norway, and Romania (Karg, 1993; Gwiazdowicz et al., 2009).

Remarks: Deutonymph specimens of *Z. andrei* were recorded for the first time from Türkiye in this study.

***Zeron colligans* Berlese, 1920**

It was the most abundant species in terms of number of specimens in the study area.

Materials examined: 55 females: soil and litter samples under strawberry tree (*Arbutus unedo*), holm oak (*Quercus aucheri*), holly oak (*Q. ilex*) and black pine (*P. nigra*), 37°40.747' N, 27°3.498' E, 50 m a.s.l., vicinity of Dipburun and Kavaklıburun Guardhouses, 10 December 2018. 52 females: soil and litter samples under holly oak (*Q. ilex*) and black pine (*P. nigra*), 37°37.974' N, 27°7.588' E, 20 m a.s.l., vicinity of Doğanbey neighborhood, 10 December 2018. 159 females and 2 DN: soil and litter samples under sage-leaved rock-rose (*C. salviifolius*), thorny burnet (*Sarcopoterium spinosum*), Aleppo oak (*Quercus infectoria*), 37°43.534' N, 27°21.654' E, 482 m a.s.l., vicinity of Aydem wind power plant, 14 May 2019. 31 females, 2 males, 3 DN and 1 PN: soil, litter and moss samples under kermes oak (*Quercus coccifera*), black pine (*P. nigra*) and sage-leaved rock-rose (*C. salviifolius*), 37°42.964' N, 27°20.957' E, 639 m a.s.l., vicinity of Aydem wind power plant, 14 May 2019. 38 females, 11 males, 6 DN and 3 PN: soil, litter and moss samples under kermes oak (*Q. coccifera*), black pine (*P. nigra*), juniper (*Juniperus* sp.) and shrub (*Daphne gnidioides*), 37°41.425' N, 27°18.443' E, 861 m a.s.l., vicinity of Aydem wind power plant, 14 May 2019. 83 females, 21 males and 6 DN: soil, litter and moss samples under mastic tree (*Pistacia lentiscus*), carob tree (*Ceratonia siliqua*), juniper (*Juniperus* sp.), olive (*Olea europaea*), thorny burnet (*S. spinosum*), 37°37.283' N, 27°11.763' E, 12 m a.s.l., vicinity of

Tuzburgazı and Doğanbey neighborhoods, 14 May 2019. 26 females, 19 males, 6 DN and 9 PN: soil, litter and moss samples under oleaster-leaved pear (*Pyrus elaeagrifolia*), Turkish oak (*Quercus cerris*), 37°40.863' N, 27°15.143' E, 900 m a.s.l., Dilek Mountain, 31 August 2019. 53 females and 14 males: soil and litter samples under Turkish oak (*Q. cerris*), kermes oak (*Q. coccifera*), kermes oak (*Q. coccifera*), Aleppo oak (*Q. infectoria*), Turkish pine (*Pinus brutia*) and black pine (*P. nigra*), 37°42.058' N, 27°17.231' E, 657 m a.s.l., vicinity of Kurşunlu monastery, 9 November 2019. 29 females and 14 males: soil, litter and moss samples under holly oak (*Q. ilex*) and Turkish pine (*P. brutia*), 37°41.385' N, 27°8.310' E, 34 m a.s.l., vicinity of Dipburun and Kavaklıburun Guardhouses, 3 February 2020. 73 females, 23 males, 7 DN and 2 PN: soil, litter and moss samples under Greek strawberry tree (*Arbutus andrachne*), 37°29.564' N, 27°15.705' E, 101 m a.s.l., vicinity of Akköy neighborhood, 8 April 2020.

Short description: On podonotum, seta *j1* and marginal setae (*s2-3*, *s6*, *r2* and *r4-5*) finely barbed, the remaining setae short, smooth and needle-like. On opisthonotum, setae *J1-2*, *Z1-2* and *S2* short, smooth and needle-like. Setae *S3* and marginal setae (*S1* and *R1-6*) finely barbed. The remaining opisthotal setae elongated, finely barbed with hyaline endings. Only setae *Z5* and *S5* extend to beyond the opisthonotum. Pores *gdS2* located between setae *Z2* and *S3*, *gdZ3* located between setae *J4* and *Z4*. Dorsal cavities distinct and strongly developed. Anterior margin of ventrianal shield with 1 pair of setae (*JV1*), glands *gv2* present. Posterolateral tips of peritrematal shield reach the level of setae *S1* (Bilki et al., 2022)

Distribution in Türkiye: Afyonkarahisar, Artvin, Aydın, Balıkesir, Çanakkale, Denizli, Edirne, Erzurum, Giresun, İstanbul, Kırklareli, Kütahya, Muğla, Tekirdağ, Uşak (Bilki et al., 2022).

Known distribution: Austria, France, Iran, Ireland, Italy, Russia, Sweden, and Swiss (Bilki et al., 2022).

Zercon cretensis Ujvári, 2008

Materials examined: 101 females: soil and litter samples under black pine (*P. nigra*), holly oak (*Q. ilex*) and Aleppo oak (*Q. infectoria*), 37°39.585' N, 27°6.728' E, 893 m a.s.l., vicinity of Dipburun and Kavaklıburun Guardhouses, 10 December 2018. 46 females and 1 DN: soil and litter samples under Turkish pine (*P. brutia*), sage-leaved rock-rose (*C. salviifolius*), thorny burnet (*S. spinosum*), sycamore (*Platanus orientalis*) and holy bramble (*Rubus sanctus*), 37°44.420' N, 27°21.429' E, 310 m a.s.l., vicinity of Ağaçalı neighborhood, 14 May 2019. 8 females: soil and litter samples under sage-leaved rock-rose (*C. salviifolius*) and holly oak (*Q. ilex*), 37°43.534' N, 27°21.654' E, 482 m a.s.l., vicinity of Ağaçalı neighborhood, 14 May 2019.

Short description: On podonotum, seta *j1* and marginal setae (*s2-3*, *s6*, *r2* and *r4-5*) finely barbed, the remaining setae short, smooth and needle-like. On opisthonotum, setae *J1-2* and *Z1-2* short, smooth and needle-like. Setae *J3-5*, *Z3-5* and *S2-5* finely barbed with hyaline endings. All marginal setae (*S1* and *R1-6*) finely barbed. Although seta *Z4* extends to the edge of the opisthonotum, setae *Z5* and *S4-5* extend to beyond the opisthonotum. Pores *gdS2* located between setae *Z2* and *S3*, *gdZ3* located between setae *J4* and *Z4*, closer to *Z4*. Dorsal cavities distinct and strongly developed. Anterior margin of ventrianal shield with one 1 of setae (*JV1*), glands *gv2* present. Posterolateral tips of peritrematal shield reach the level of setae *S1-R1* (Ujvári, 2008).

Distribution in Türkiye: Çanakkale, Edirne, Kırklareli, Tekirdağ (Karaca and Urhan, 2016), İstanbul (Duran and Urhan, 2017), Afyonkarahisar, Kütahya, Uşak (Urhan and Duran, 2019), Aydın (present study).

Known distribution: Greece (Ujvári, 2008).

Zercon denizliensis Urhan, 2011

Materials examined: 1 male: soil and litter samples under oleaster-leaved pear (*P. elaeagrifolia*), 37°41.121' N, 27°17.595' E, 892 m a.s.l., Dilek Mountain, 31 August 2019. 2 females, 5 males and 1 DN: soil and litter samples under common hawthorn (*Crataegus monogyna*), 37°41.080' N, 27°15.571' E, 893 m a.s.l., Dilek Mountain, 31 August 2019. One male: soil, litter and moss samples under sage-leaved rock-rose (*C. salviifolius*), 37°42.624' N, 27°18.512' E, 277 m a.s.l., Dilek Mountain, 9 November 2019. 5 females, 25 males and 1 DN: soil and litter samples under black pine (*P. nigra*), 37°39.434' N, 27°4.952' E, 608 m a.s.l., vicinity of Dipburun Guardhouse, 3 February 2020.

Short description: On podonotum, seta *j1* and marginal setae (*s2-3*, *s6*, *r2* and *r4-5*) finely barbed, the remaining setae short, smooth and needle-like. On opisthonotum, setae *J1-2* and *Z1-2* smooth and needle-like. Setae *J3-5*, *Z3-5* and *S4-5* finely barbed with hyaline endings. Setae *S2-3* and marginal setae (*S1* and *R1-6*) finely barbed. Only setae *Z4-5* and *S4-5* extend to beyond the opisthonotum. Pores *gdS2* located between setae *Z2* and *S3*, *gdZ3* located between setae *J4* and *Z4*, closer to *Z4*. Dorsal cavities distinct and strongly developed. Anterior margin of ventrianal shield with 2 pairs of setae (*JV1* and *ZV1*), glands *gv2* present. Posterolateral tips of peritrematal shield reach the level of seta *S1* (Urhan, 2011).

Distribution in Türkiye: Afyonkarahisar, Balıkesir, Denizli, Kütahya, Uşak (Karaca, 2021), Aydın (present study).

Known distribution: This species is only known from Türkiye (Urhan, 2011).

Zercon huseyini Urhan, 2008

Materials examined: 2 females: soil and litter samples under Greek strawberry tree (*A. andrachne*), 37°39.585' N, 27°6.728' E, 891 m a.s.l., vicinity of surveillance radar area of Naval Forces Command, 10 December 2018.

Short description: On podonotum, seta *j1* finely barbed, the remaining setae short, smooth and needle-like. On opisthonotum, setae *J1-3*, *Z1-2*, *S2* and marginal setae (*S1* and *R1-6*) smooth and needle-like. Setae *J4-5*, *Z3-5* and *S3-5* elongated, smooth and hyaline endings. Although seta *Z4* extends to the edge of the opisthonotum, setae *J5* and *S5* extend to beyond the opisthonotum. Pores *gdS2* located between setae *S2* and *R2*, closer to *S2*, *gdZ3* located between setae *Z4* and *S4*. Dorsal cavities large, distinct and strongly developed. Anterior margin of ventrianal shield with 2 pairs of setae (*JV1* and *ZV1*), glands *gv2* present. Posterolateral tips of peritrematal shield reach the level of seta *S1* (Urhan, 2008).

Distribution in Türkiye: Denizli (Urhan, 2008), Afyonkarahisar, Kütahya, Uşak (Urhan and Duran, 2019), Aydın (present study).

Known distribution: This species is only known from Türkiye (Urhan, 2008).

Zercon kallimcii Urhan, 2010

Materials examined: 64 females: soil and litter samples under black pine (*P. nigra*), Aleppo oak (*Q. infectoria*) and olive (*O. europaea*), 37°39.429' N, 27°5.705' E, 669 m a.s.l., vicinity of surveillance radar area of Naval Forces Command, 10 December 2018. 130 females, 4 DN and 2 PN: soil, litter and moss samples under sage-leaved rock-rose (*C. salviifolius*), kermes oak (*Q. coccifera*), holy bramble (*R. sanctus*), Turkish pine (*P. brutia*) and holly oak (*Q. ilex*), 37°44.420' N, 27°21.429' E, 310 m a.s.l., vicinity of Ağaçalı neighborhood, 14 May 2019. 7 females and 1 male: soil, litter and moss samples under Turkish oak (*Q. cerris*), 37°41.448' N, 27°17.376' E, 758 m a.s.l., vicinity of Davutlar neighborhood, 9 November 2019. 20 females and 10 males: soil, litter and moss samples under Turkish pine (*P. brutia*), holly oak (*Q. ilex*) and sage-leaved rock-rose (*C. salviifolius*), 37°42.624' N, 27°18.512' E, 277 m a.s.l., vicinity of Kurşunlu monastery, 9 November 2019. 3 females: soil and litter samples under black pine (*P. nigra*), thorn (*Paliurus spina-christi*) and holly oak (*Q. ilex*), 37°39.411' N, 27°4.963' E, 612 m a.s.l., vicinity of Dipburun Guardhouse, 3 February 2020.

Short description: On podonotum, setae *j1-2* and marginal setae (*s2-3*, *s6*, *r2* and *r4-5*) finely barbed, the remaining setae short, smooth and needle-like. On opisthonotum, setae *J1* and *Z1* smooth and needle-like. Setae *J2-5*, *Z2-5* and

S2-5 finely barbed with hyaline endings. Marginal setae (*S1* and *R1-6*) finely barbed. Although setae *J5* and *Z4* extend to the edge of the opisthonotum, setae *Z5* and *S4-5* extend to beyond the opisthonotum. Pores *gdS2* located between setae *Z2* and *S3*, closer to *Z2*, *gdZ3* located between setae *J5* and *Z4*, closer to *Z4*. Dorsal cavities distinct and strongly developed. Anterior margin of ventrianal shield with 2 pairs of setae (*JV1* and *ZV1*), glands *gv2* present. Posterolateral tips of peritrematal shield reach the level of seta *S1* (Urhan, 2010).

Distribution in Türkiye: Denizli (Urhan, 2010), Aydın (present study).

Known distribution: This species is only known from Türkiye (Urhan, 2010).

Zercon plumatopilus Athias-Henriot, 1961 (Figure 3)

Materials examined: 14 females, 9 males and 3 DN: soil and litter samples under kermes oak (*Q. coccifera*), Turkish oak (*Q. cerris*) and sage-leaved rock-rose (*C. salviifolius*), 37°42.174' N, 27°17.517' E, 543 m a.s.l., vicinity of Kurşunlu monastery, 9 November 2019. 2 females and 3 males: soil and litter samples under Turkish oak (*Q. cerris*) and Aleppo oak (*Q. infectoria*), 37°42.213' N, 27°17.990' E, 385 m a.s.l., vicinity of Davutlar neighborhood, 9 November 2019.

Short description: On podonotum, setae *j1-2* and marginal setae (*s2-3*, *s6*, *r2* and *r4-5*) finely barbed, the remaining setae short, smooth and needle-like. On opisthonotum, setae *J1* and *Z1* smooth and needle-like. Setae *J2*, *Z2*, *S2* and marginal setae (*S1* and *R1-6*) finely barbed. Setae *J3-5*, *Z3-5* and *S3-5* elongated, finely barbed with hyaline endings. Although setae *Z4* and *S4* extend to the edge of the opisthonotum, setae *Z5* and *S5* extend beyond the opisthonotum. Pores *gdS2* located between setae *Z2* and *S3*, *gdZ3* located between setae *J5* and *Z4*, closer to *Z4*. Dorsal cavities large, distinct and strongly developed. Anterior margin of ventrianal shield with 1 pair of setae (*JV1*), glands *gv2* present. Posterolateral tips of peritrematal shield reach the level of seta *S1* (Ujvári, 2009).

Deutonymph (Fig. 3)

Length × width of idiosoma: 286–377 × 185–233 (n=3).

On podonotum, setae *j1*, *s3* and *s6* finely barbed, the remaining setae short, smooth and needle-like. On opisthonotum, setae *J1-5*, *Z1-2*, *S2* and marginal setae (*S1* and *R1-6*) short, smooth and needle-like. Setae *Z3-5* and *S3-5* elongated, and finely barbed with hyaline endings. However, setae *Z3* and *S3* shorter than other setae with similar morphological features. Although seta *Z4* extends to the edge of the opisthonotum (or slightly extent beyond), setae *Z5* and *S4-5* extend to beyond the opisthonotum demonstrably.

Pores *gdS2* located between setae *Z3* and *S3*, closer to *S3*, *gdZ3* located between setae *J4* and *Z4*, closer to *Z4*. Dorsal cavities distinct and weakly developed. Anterior margin of ventrianal shield with 1 pair of setae (*JV1*), glands *gv2* present. Posterolateral tips of peritrematal shield reach the level of seta *S1*. Distances between setae *Z5–Z5* and *Z5–JV5* 74–96 and 12–20, respectively. Podonotal and opisthonotal shields distinct. Average lengths and ranges of opisthonotal setae are given in Table 2 for the deutonymph specimens.

Table 2. Average lengths of opisthonotal setae and the distances between their bases in *J*, *Z*, and *S* rows of *Zercon plumatopilus* (deutonymphs).

Setae	DN	Setae	DN	Seta	DN
<i>J1</i>	9	<i>Z1</i>	7	<i>S1</i>	13
<i>J1–J2</i>	30	<i>Z1–Z2</i>	32	<i>S1–S2</i>	29
<i>J2</i>	9	<i>Z2</i>	7	<i>S2</i>	17
<i>J2–J3</i>	29	<i>Z2–Z3</i>	21	<i>S2–S3</i>	26
<i>J3</i>	9	<i>Z3</i>	21	<i>S3</i>	23
<i>J3–J4</i>	15	<i>Z3–Z4</i>	27	<i>S3–S4</i>	27
<i>J4</i>	8	<i>Z4</i>	49	<i>S4</i>	39
<i>J4–J5</i>	22	<i>Z4–Z5</i>	42	<i>S4–S5</i>	39
<i>J5</i>	7	<i>Z5</i>	53	<i>S5</i>	45

Distribution in Türkiye: Erzurum (Duran et al., 2017), Kühtaha (Urhan and Duran, 2019), Aydın (present study).

Known distribution: Italia, Slovenia, Cyprus (Ujvári, 2009), and Albania (Ujvári, 2010).

Zercon turcicus Urhan and Ayyıldız, 1994

Materials examined: 1 female: soil and litter samples under holly oak (*Q. ilex*) and thorn (*P. spina-christi*), 37°39.166' N, 27°3.677' E, 426 m a.s.l., vicinity of surveillance radar area of Naval Forces Command, 3 February 2020.

Short description: On podonotum, setae *j1–2* and marginal setae (*s2–3*, *s6*, *r2* and *r4–5*) finely barbed, the remaining setae short, smooth and needle-like. On opisthonotum, setae *J1–2* and *Z1–2* smooth and needle-like. Seta *S2* and marginal setae (*S1* and *R1–6*) finely barbed. Setae *J3–5*, *Z3–5* and *S3–5* elongated, finely barbed with hyaline endings. Although setae *Z4* and *S4* extend to the edge of the opisthonotum, setae *Z5* and *S5* extend to beyond the opisthonotum. Pores *gdS2* located between setae *S3* and *S4*, *gdZ3* located between setae *J4* and *Z4*, closer to *Z4*. Dorsal cavities large, distinct and strongly developed. Anterior margin of ventrianal shield with 2 pairs of setae (*JV1* and *ZV1*), glands *gv2* present. Posterolateral tips of peritrematal shield reach the level of seta *S1* (Urhan and Ayyıldız, 1994).

Distribution in Türkiye: Erzurum (Urhan and Ayyıldız, 1994), Kırklareli (Karaca and Urhan, 2016), Afyonkarahisar (Urhan and Duran, 2019), Aydın (present study).

Known distribution: Iran (Karaca et al., 2017).

Description of the new species

Zercon dilekensis sp. nov. (Figures 4–9)

Zoobank: <http://zoobank.org/8E8BE2EF-8210-4C6B-ADCB-88A052C335AC>

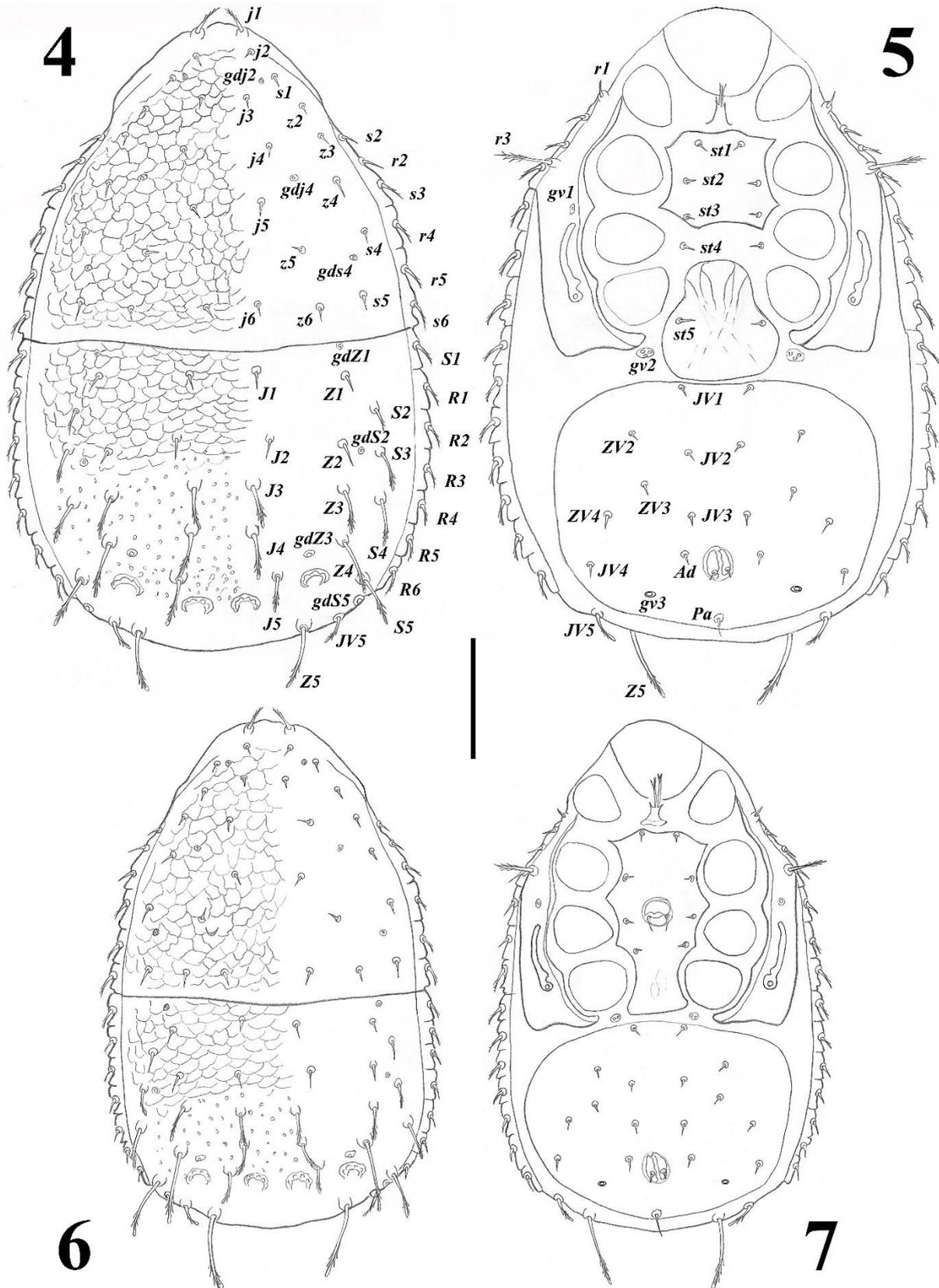
Type material. Holotype (female), soil and litter samples under oleaster-leaved pear (*P. elaeagrifolia*), 37°41.088' N, 27°16.594' E, 935 m a.s.l., Dilek Mountain, Kuşadası County, Aydın Province, 31 August 2019. Paratypes: 6 females, 3 DN and 1 PN, same data as holotype. 9 females and 5 males, soil and litter samples under Turkish oak (*Q. cerris*), 37°41.080' N, 27°15.571' E, 893 m a.s.l., Dilek Mountain, Kuşadası County, Aydın Province, 31 August 2019.

Diagnosis. Anterior margin of ventrianal shield with 2 setae (seta *JV1* present, seta *ZV1* absent). Great majority of podonotal setae short, smooth and needle-like (except seta *j1*, marginal setae *s3*, *s6* and *r4–5*). Setae *j1*, *s3*, *s6* and *r4–5* finely barbed. Great majority of opisthonotal setae elongated, finely barbed with hyaline endings. Setae *Z4–5* and *S5* longer than other opisthonotal setae. Pores *gdS2* located between setae *Z2* and *S3*, *gdZ3* located between setae *J5* and *Z4*.

Dorsal cavities distinct and strongly developed. Podonotum and anterior margin of opisthonotum covered with tile-like pattern, mid-area to posterior margin of opisthonotum covered by an irregular punctate patterns.

Female (Figs 4–5). Length (without gnathosoma) and width in holotype 465 and 320, respectively. Measurements of 15 paratypes: length 440–470, width 305–323.

Dorsal side (Fig. 4). 20 pairs of setae present on podonotum: setae in *j* series with 6 pairs, *z* series with 5 pairs, *s* series with 6 pairs and *r* series with 3 pairs. Setae *j1*, *s3*, *s6* and *r4–5* finely barbed. The remaining podonotal setae short, equal in size, smooth and needle-like. 21 pairs of setae present on opisthonotum: setae in *J* series with 5 pairs, *Z* series with 5 pairs, *S* series with 5 pairs and *R* series with 6 pairs.



Figures 4-7. *Zercon dilekensis* sp. nov. 4. Dorsal view of female, 5. Ventral view of female, 6. Dorsal view of male, 7. Ventral view of male. Scale bar 100.

Most of opisthonotal setae elongated, finely barbed with hyaline endings (except setae *J1-2*, *Z1-2*, *S1* and marginal setae). Setae *J1-2* and *Z1-2* short, smooth and needle-like. Setae *S2* and all marginal setae (*S1 + R1-6*) finely barbed

without hyaline endings. Setae *J3-5*, *Z2-5* and *S3-5* elongated, finely barbed (2 or 3 barbs apically) with hyaline endings. Setae *Z5* and *S5* longer than others, and extend to beyond the opisthonotum. Setae *Z4* extends to the edge of the opisthonotum in many specimens. Setae *J3-4* and *Z3*

reaching the bases of the following setae. Seta *JV5* similar in length to marginal *R* setae, but unlike them, with hyaline ending. The intervals between setae *Z5* and *Z5* 104–123, setae *Z5* and *JV5* 16–18, respectively. Average lengths of the opisthonotal setae and distances between setal bases

Table 3. Average lengths of opisthonotal setae and the distances between their insertions in *J*, *Z*, and *S* rows of *Zercon dilekensis* sp. nov.

Setae	♀	♂	DN	PN	Setae	♀	♂	DN	PN	Setae	♀	♂	DN	PN
<i>J1</i>	16	12	11	7	<i>Z1</i>	20	13	13	8	<i>S1</i>	22	15	8	-
<i>J1-J2</i>	51	33	35	28	<i>Z1-Z2</i>	54	30	39	28	<i>S1-S2</i>	57	48	39	-
<i>J2</i>	21	12	10	7	<i>Z2</i>	22	12	10	8	<i>S2</i>	24	16	18	18
<i>J2-J3</i>	39	28	27	22	<i>Z2-Z3</i>	35	16	26	21	<i>S2-S3</i>	36	29	28	24
<i>J3</i>	34	19	9	6	<i>Z3</i>	35	23	32	22	<i>S3</i>	31	19	22	19
<i>J3-J4</i>	34	21	22	19	<i>Z3-Z4</i>	38	27	30	20	<i>S3-S4</i>	41	32	36	25
<i>J4</i>	36	22	11	6	<i>Z4</i>	45	48	53	55	<i>S4</i>	37	35	48	27
<i>J4-J5</i>	35	22	21	19	<i>Z4-Z5</i>	54	49	48	28	<i>S4-S5</i>	56	38	40	27
<i>J5</i>	36	20	9	6	<i>Z5</i>	46	53	72	72	<i>S5</i>	45	49	57	48

Pores (Fig. 4). On podonotum, pores *gdj2* located on the line connecting setae *j3-s1*, closer to *s1*. Pores *gdj4* located on the line connecting setae *j5-z3*. Pores *gds4* located on the line connecting setae *s4-s5*, closer to *s4*. On opisthonotum, pores *gdZ1* located above the insertions of setae *Z1*. Pores *gdS2* located on the line connecting setae *Z2-S3*. Pores *gdZ3* located on the line connecting setae *J5-Z4*, closer to *Z4*. Pores *gdS5* located below the insertions of setae *S5*.

Ventral side (Fig. 5). Chaetotaxy and shape of the peritrematal shields characteristic of the genus *Zercon*. Posterolateral tips of peritrematal shield reaching the level of setae *S1*. Peritrematal shield with two pairs of setae (*r1* and *r3*), seta *r1* short, smooth and needle-like, seta *r3* elongated and finely barbed apically. Peritremes similar to reverse comma. Sternal shield with three pairs of setae (*st1-st3*), epigynal shield with one pair of setae (*st5*), and one seta (*st4*) located between sternal and epigynal shields; all of them (*st1-st5*) short, smooth and needle-like. Glands *gv2* present between posterior section of epigynal shield and anterior section of ventrianal shield. Anterior margin of ventrianal shield with 1 pair of setae (seta *JV1* present, seta *ZV1* absent). Ventrianal shield with 9 pairs of setae (*JV1-JV5*, *ZV2-ZV4* and *Ad*) and 1 single postanal seta (*Pa*); all of them short, smooth and needle-like (except seta *JV5*). Seta *JV5* slightly elongated, finely barbed with hyaline ending, and extends to beyond the opisthonotum.

Male (Figs 6-7). Lengths (without gnathosoma) 335–357 and widths 214–230 (n=5). Chaetotaxy of idiosoma, location of pores on idiosoma and ornamentation of dorsal shields similar to the females, with a few exceptions. On opisthonotum, seta *S2* and marginal setae *R3-6* are finely barbed in female specimens, they are smooth and needle-like

within longitudinal *J*, *Z* and *S* rows are given in Table 3 for female, male, DN and PN specimens of *Z. dilekensis* sp. nov.

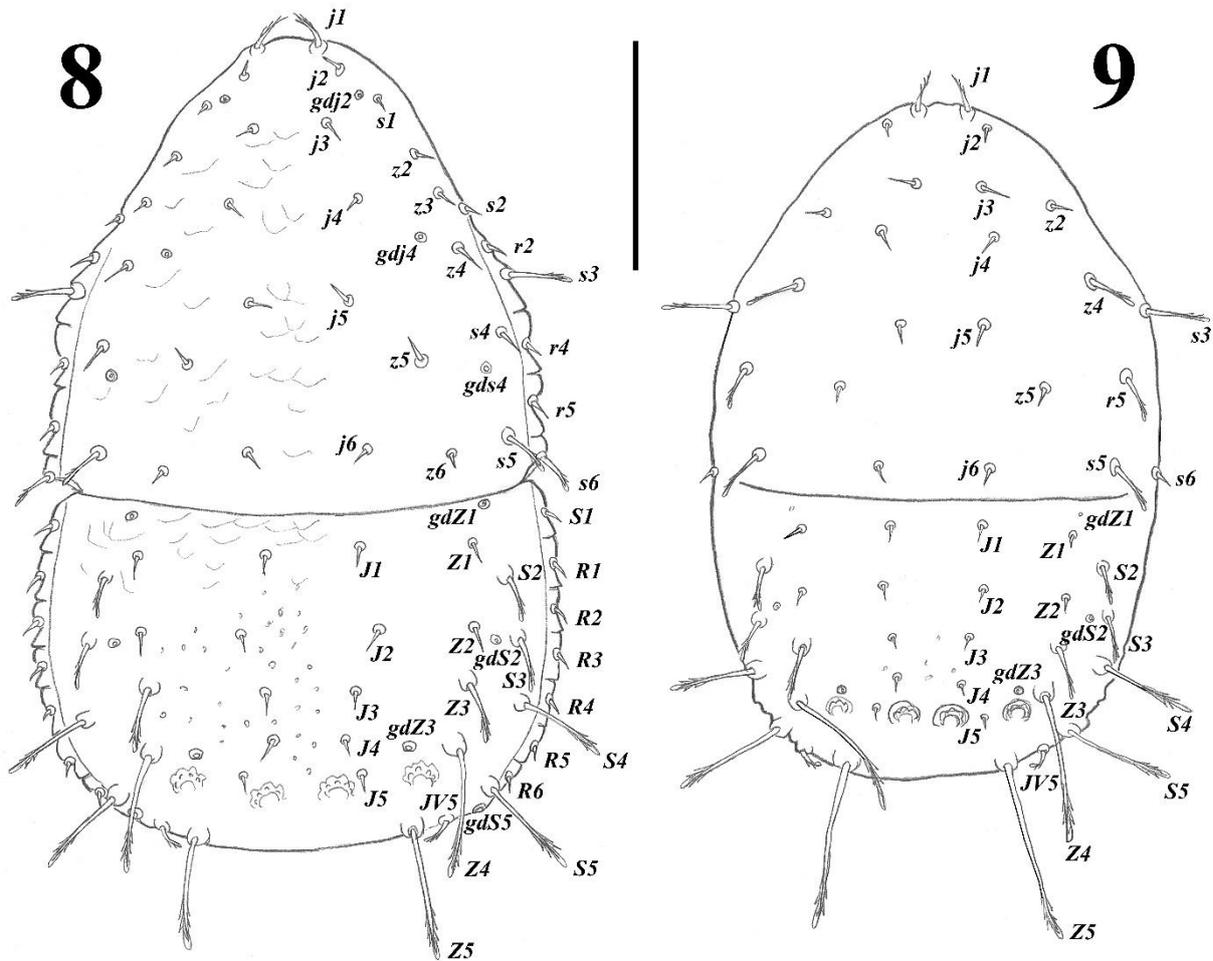
in male specimens. In addition, in comparison with female specimens, seta *Z4* extends to beyond the opisthonotum and seta *S4* extends to the edge of the opisthonotum in male specimens. The intervals between setae *Z5* and *Z5* 91–97, setae *Z5* and *JV5* 18–22, respectively.

Deutonymph (Fig. 8). Lengths 345–363, widths 228–242 (n=3). On podonotum, setae *j1*, *s3* and *s5-6* slightly elongated and finely barbed. Among them, setae *s3* and *s5-6* with hyaline endings. The remaining podonotal setae short, smooth and needle-like. On opisthonotum, setae *J1-5*, *Z1-2*, *S1* and *R1-6* short, smooth and needle-like. Setae *Z3-5* and *S2-5* finely barbed with hyaline ending. Setae *Z4-5* and *S4-5* extend to beyond the opisthonotum. Location of idiosomal pores as in adults. The intervals between setae *Z5* and *Z5* 93–98, setae *Z5* and *JV5* 19–23, respectively.

Protonymph (Fig. 9). Length 263, width 179 (n=1). On podonotum, setae *j1*, *z4*, *s3*, *s5* and *r5* slightly elongated and finely barbed. Among them, setae *z4*, *s3*, *s5* and *r5* with hyaline endings. The remaining podonotal setae short, smooth and needle-like. On opisthonotum, setae *J1-5* and *Z1-2* short, smooth and needle-like. Setae *Z3-5* and *S2-5* finely barbed with hyaline ending. Although seta *S3* extends to the edge of the opisthonotum, setae *Z4-5* and *S4-5* extend to beyond the opisthonotum.

All podonotal pores are invisible. On opisthonotum, pores *gdZ1*, *gdS2* and *gdZ3* are visible. The intervals between setae *Z5* and *Z5* 66, setae *Z5* and *JV5* 17, respectively.

Etymology. The specific epithet '*dilekensis*' refers to the Dilek Peninsula (Kuşadası County, Aydın Province) where the new species was collected.



Figures 8-9. Dorsal views of immature stages of *Zercon dilekensis* sp. nov. **8.** Deutonymph, **9.** Protonymph. Scale bar 100.

Remarks. *Zercon dilekensis* sp. nov. is quite similar to *Z. cretensis* Ujvári, 2008, *Z. plumatopilus* Athias-Henriot,

1961 and *Z. turcicus* Urhan and Ayyıldız, 1994. The morphological distinguishing characters of these four species were given in Table 4.

Table 4. Morphological distinguishing characters between *Z. dilekensis* sp. nov. and closer species within the same genus.

Characters	<i>Z. dilekensis</i> sp. nov.	<i>Z. cretensis</i> Ujvári, 2008	<i>Z. plumatopilus</i> Athias-Henriot, 1961	<i>Z. turcicus</i> Urhan and Ayyıldız, 1994
Podonotal seta <i>j2</i>	smooth	smooth	finely barbed	finely barbed
Opisthonotal seta <i>J5</i>	not reaching to margin of opisthonotum	reaching to margin of opisthonotum	reaching to beyond of opisthonotum	reaching to beyond of opisthonotum
Opisthonotal seta <i>S4</i>	not reaching to beyond of opisthonotum	reaching to beyond of opisthonotum	reaching to beyond of opisthonotum	reaching to beyond of opisthonotum
Marginal setae of opisthonotum (<i>S1 + R1-R6</i>)	finely barbed without hyaline endings	finely barbed with hyaline endings	finely barbed without hyaline endings	finely barbed without hyaline endings
Opisthonotal pore <i>gdZ3</i>	located between setae <i>J5</i> and <i>Z4</i>	located between setae <i>J5</i> and <i>Z4</i>	located between setae <i>J5</i> and <i>Z4</i>	located between setae <i>J4</i> and <i>Z4</i>
Anterior margin of ventrianal shield	with 2 setae	with 2 setae	with 2 setae	with 4 setae
Seta <i>JV5</i>	finely barbed with hyaline endings	elongated and smooth	finely barbed without hyaline endings	finely barbed without hyaline endings

Key to *Zercon* species in the Dilek Peninsula-Büyük Menderes Delta National Park

- 1 Anterior margin of ventrianal shield with 2 setae (setae *JV1* present, setae *ZV1* absent)2
- 1' Anterior margin of ventrianal shield with 4 setae (setae *JV1* and *ZV1* present)5
- 2 Opisthonotal seta *S4* reaching to margin or beyond of opisthonotum3
- 2' Opisthonotal seta *S4* not reaching to margin of opisthonotum***Z. colligans*** Berlese, 1920
- 3 All marginal setae on opisthonotum (*S1* and *R* setae) finely barbed with hyaline endings4
- 3' All marginal setae on opisthonotum (*S1* and *R* setae) short, smooth and needle-like ***Z. huseyini*** Urhan, 2008
- 4 Opisthonotal setae *J5*, *Z4* and *S4* not reaching to margin of opisthonotum ***Z. plumatopilus*** Athias-Henriot, 1961
- 4' Opisthonotal setae *J5*, *Z4* and *S4* reaching to margin or beyond of opisthonotum***Z. cretensis*** Ujvári, 2008
- 5 Opisthonotal seta *J2* short, smooth and needle-like6
- 5' Opisthonotal seta *J2* finely barbed with hyaline ending ***Z. kallimci*** Urhan, 2010
- 6 Opisthonotal seta *S4* reaching to beyond of opisthonotum7
- 6' Opisthonotal seta *S4* not reaching to margin of opisthonotum***Z. dilekensis*** sp. nov.
- 7 Opisthonotal seta *S3* with hyaline ending8
- 7' Opisthonotal seta *S3* without hyaline ending
..... ***Z. denizliensis*** Urhan, 2011
- 8 Opisthonotal setae *J3-5* not reaching the bases of the following setae ***Z. andrei*** Sellnick, 1958
- 8' Opisthonotal setae *J3-5* reaching the bases of the following setae ***Z. turcicus*** Urhan and Ayyıldız, 1994

Altitude preferences of *Zercon* species in the study area

All materials for the *Zercon* species were collected from suitable forestland areas at the altitude from 0 to 1000 m a.s.l. All sampling areas were divided according to 50 meters elevation ranges. After identification processes in the laboratory, the altitudinal distribution results of the *Zercon* species were marked in Table 5.

According to Table 5, *Z. plumatopilus* and *Z. turcicus* occur only at middle altitudes (350–550 m a.s.l.), *Z. dilekensis* sp. nov. and *Z. huseyini* occur only at higher altitudes (850–950 m a.s.l.). On the other hand, since *Z. colligans* (0–950 m a.s.l.) and *Z. kallimcii* (150–900 m a.s.l.) showed a wide range of occurrences. The remaining species have no clear preference in terms of altitudinal ranges.

Habitat preferences of *Zercon* species in the study area

Samplings for *Zercon* species were carried out in 97 different localities and the following 22 habitat types, mostly tree species, were noted: carob tree (*Ceratonia siliqua*), common hawthorn (*Crataegus monogyna*), juniper (*Juniperus* sp.), mastic tree (*Pistacia lentiscus*), moss (unspecified), oaks (*Quercus* spp.), oleaster-leafed pear (*Pyrus elaeagrifolia*), olive (*Olea europaea*), pines (*Pinus* spp.), holy bramble (*Rubus sanctus*), sage-leaved rock-rose (*Cistus salvifolius*), shrub (*Daphne gnidioides*), strawberry trees (*Arbutus* spp.), sycamore (*Platanus orientalis*), thorn (*Paliurus spina-christi*) and thorny burnet (*Sarcopoterium spinosum*). Habitat preferences of *Zercon* species were marked in Table 6.

Table 8 show that *Z. colligans* and *Z. kallimcii* were found in samples from 18 and 11 different habitat types, respectively. On the other hand, *Z. huseyini* was found only in the habitat of Greek strawberry tree (*Arbutus andrachne*), *Z. dilekensis* sp. nov. was found only in the habitats of oleaster-leafed pear (*Pyrus elaeagrifolia*) and Turkish oak (*Quercus cerris*), *Z. turcicus* was found only in the habitats of thorn (*Paliurus spina-christi*) and holly oak (*Quercus ilex*). The most species-rich habitats are: Sage-leaved rock-rose (6 spp.), black pine (5 spp.) and holly oak (5 spp.). In contrast to these rich habitats, specimens of single *Zercon* species were found in the following habitats: Strawberry tree, carob tree, common hawthorn, shrub, juniper, mastic tree, sycamore, and holm oak.

Authors' contributions

Raşit Urhan: Funding acquisition, methodology (equal), project administration, supervision (lead), collection of specimens (supporting), identification, illustration, preservation. **Mehmet Karaca:** Investigation, collection of specimens (lead), data curation, formal analysis, methodology (equal), supervision (supporting), writing - original draft, writing - review and editing.

Funding

This work was supported by the Scientific and Technological Research Council of Türkiye (TÜBİTAK), under project 118Z101. The authors thank to anonymous reviewers for the valuable advices. We also thank Büşra Keçeci (M.Sc.) for her assistance in the laboratory and the field.

Table 5. Altitude preferences of *Zercon* species in the study area.

Altitudinal ranges (meters above sea level)	<i>Z. andrei</i> Sellnick, 1958	<i>Z. colligans</i> Berlese, 1920	<i>Z. cretensis</i> Ujvári, 2008	<i>Z. denizliensis</i> Urhan, 2011	<i>Z. ditekensis</i> sp. nov.	<i>Z. huseyini</i> Urhan, 2008	<i>Z. kallimcii</i> Urhan, 2010	<i>Z. plumatopilus</i> Athias-Henriot, 1961	<i>Z. turcicus</i> Urhan and Ayıldız, 1994
0-50		+							
50-100		+							
100-150		+							
150-200	+						+		
200-250			+				+		
250-300			+	+			+		
300-350			+				+		
350-400		+						+	
400-450							+		+
450-500		+	+				+		
500-550		+						+	
550-600									
600-650	+	+		+			+		
650-700		+	+				+		
700-750		+							
750-800							+		
800-850			+				+		
850-900		+	+	+	+	+	+		
900-950		+			+				
950-1000									

Table 6. Habitat preferences of *Zercon* species in the study area.

Habitat types	<i>Z. andrei</i> Sellnick, 1958	<i>Z. colligans</i> Berlese, 1920	<i>Z. cretensis</i> Ujvári, 2008	<i>Z. denizliensis</i> Urhan, 2011	<i>Z. ditekensis</i> sp. nov.	<i>Z. huseyini</i> Urhan, 2008	<i>Z. kallimcii</i> Urhan, 2010	<i>Z. plumatopilus</i> Athias-Henriot, 1961	<i>Z. turcicus</i> Urhan and Ayıldız, 1994
<i>Arbutus unedo</i>		+							
<i>Arbutus andrachne</i>		+				+			
<i>Ceratonia siliqua</i>		+							
<i>Cistus salviifolius</i>	+	+	+	+			+	+	
<i>Crataegus monogyna</i>				+					
<i>Daphne gnidioides</i>		+							
<i>Juniperus</i> sp.		+							
Moss (unspecified)	+	+		+			+		
<i>Olea europaea</i>		+					+		
<i>Paliurus spina-christi</i>							+		+
<i>Pinus brutia</i>		+	+				+		
<i>Pinus nigra</i>	+	+	+	+			+		
<i>Pistacia lentiscus</i>		+							
<i>Platanus orientalis</i>			+						
<i>Pyrus elaeagrifolia</i>		+		+	+				
<i>Quercus aucheri</i>		+							
<i>Quercus cerris</i>		+			+		+	+	
<i>Quercus coccifera</i>		+					+	+	
<i>Quercus ilex</i>	+	+	+				+		+
<i>Quercus infectoria</i>		+	+				+	+	
<i>Rubus sanctus</i>			+				+		
<i>Sarcopoterium spinosum</i>		+	+						

Conflict of interest

No potential conflict of interest was reported by the authors.

Acknowledgements

We would like to express our sincere gratitude to TÜBİTAK for their financial support to this study. Also, we are grateful to the “Republic of Türkiye Ministry of Agriculture and Forestry General Directorate of Nature Conservation and National Parks” that provided the necessary permissions for field surveys. Summary of this study was presented as oral presentation and published as an abstract at the 2nd International Eurasian Conference on Science, Engineering and Technology (EurasianSciEnTech 2020), which was held at the Gaziantep University (Türkiye), between 7-9 October 2020.

REFERENCES

- Bilki, K., Urhan, R. and Karaca, M. 2022. Mites of the family Zerconidae (Acari: Mesostigmata) from Southwestern Turkey, with description of three new species. *Acarological Studies*, 4 (2): 89-103.
[doi: 10.47121/acarolstud.1129248](https://doi.org/10.47121/acarolstud.1129248)
- Bulut, D.R., Urhan, R. and Karaca, M. 2021. Zerconid mites (Acari, Zerconidae) from eastern parts of Aydın Province (Turkey), with description of *Zercon karacasuensis* sp. nov. *Acarological Studies*, 3 (2): 73-81.
[doi: 10.47121/acarolstud.911415](https://doi.org/10.47121/acarolstud.911415)
- Duran, E.H. and Urhan, R. 2017. Zerconid mites (Acari, Zerconidae) in İstanbul, with four new records for the Turkish fauna. *Turkish Journal of Zoology*, 41 (5): 931-939.
[doi: 10.3906/zoo-1601-27](https://doi.org/10.3906/zoo-1601-27)
- Duran, E.H., Karaca, M. and Urhan, R. 2017. First records of females of *Zercon plumatopilus* (Acari: Zerconidae) from Turkey. *Research Journal of Biology Sciences*, 10 (1): 33-36. [In Turkish]
- Gwiazdowicz, D.J., Coulson, S.J. and Ávila-Jiménez, M.L. 2009. First records of *Zercon andrei* Sellnick, 1958 and *Zerconopsis mustairi* Schweizer, 1949 (Acari, Mesostigmata) from Bjørnøya, Svalbard. *Norwegian Journal of Entomology*, 56, 117-119.
- Johnston, D.E. and Moraza, M.L. 1991. The idiosomal adenotaxy and poroidotaxy of Zerconidae (Mesostigmata: Zerconina). In: *Modern Acarology*. Vol. 2. Dusbábek, F. and Bukva, V. (Ed.). Academia, Prague, Czech Republic, 346-356.
- Kaczmarek, S., Marquardt, T. and Jangazieva, B. 2020. *Zercon utemisovi* sp. n. – a new species of Zerconidae (Parasitiformes, Mesostigmata) from Kazakhstan with notes on *Zercon karadaghiensis* Balan, 1992. *International Journal of Acarology*, 46 (1): 52-59.
[doi: 10.1080/01647954.2019.1704867](https://doi.org/10.1080/01647954.2019.1704867)
- Kaczmarek, S., Marquardt, T. and Seniczak, A. 2021. A new species of *Zercon* (Parasitiformes: Mesostigmata) from Norway, with notes on sexual dimorphism in Zerconidae. *Systematic and Applied Acarology*, 26 (9): 1676-1702.
[doi: 10.11158/saa.26.9.5](https://doi.org/10.11158/saa.26.9.5)
- Karaca, M. 2021. Zerconid mites (Acari: Mesostigmata: Zerconidae) of the Kazdağı National Park, Turkey, with altitude and habitat preferences of the species. *Biharean Biologist*, 15 (1): 6-13.
- Karaca, M. and Urhan, R. 2016. Five new species of *Zercon* C. L. Koch, 1836 (Acari: Zerconidae) from Northwestern Turkey. *Zootaxa*, 4127 (1): 31-59.
[doi: 10.11646/zootaxa.4127.1.2](https://doi.org/10.11646/zootaxa.4127.1.2)
- Karaca, M., Ordoukhanian, C., Ahadiyat, A. and Urhan, R. 2017. New occurrences of zerconid mites (Acari: Zerconidae) from Iran, with checklist and a key to the Iranian species. *International Journal of Acarology*, 43 (8): 603-611.
[doi: 10.1080/01647954.2017.1373857](https://doi.org/10.1080/01647954.2017.1373857)
- Karg, W. 1993. Acari (Acarina), Milben Parasitiformes (Anactinochaeta), Cohors Gamasina Leach. Raubmilben. *Die Tierwelt Deutschlands*, 59 Teil. Gustav Fischer Verlag, Jena, Germany, 523 pp.
- Keçeci, B., Urhan, R. and Karaca, M. 2021. Mites of the genus *Prozercon* (Acari, Zerconidae) in Dilek Peninsula-Büyük Menderes Delta National Park (Turkey), with description of a new species. *Acarological Studies*, 3 (1): 37-42.
[doi: 10.47121/acarolstud.837286](https://doi.org/10.47121/acarolstud.837286)
- Lindquist, E.E. and Evans, G.O. 1965. Taxonomic concepts in the Ascidae, with a modified setal nomenclature for the idiosoma of the Gamasina (Acarina: Mesostigmata). *Memoirs of the Entomological Society of Canada*, 47: 1-64.
- Lindquist, E.E. and Moraza, M.L. 1998. Observations on homologies of idiosomal setae in Zerconidae (Acari: Mesostigmata), with modified notation for some posterior body setae. *Acarologia*, 39: 203-226.
- Marchenko, I.I. 2021. Four new species of *Halozercon* (Acari: Mesostigmata: Zerconidae) from South Siberia Mountains (Russia) with a key to all known species. *Zootaxa*, 4941 (2): 151-185.
[doi: 10.11646/zootaxa.4941.2.1](https://doi.org/10.11646/zootaxa.4941.2.1)
- Marchenko, I.I. 2022. Description of new genus *Baikalozercon* (Acari: Mesostigmata: Zerconidae) with two new species from South Siberia Mountains (Russia). *Zootaxa*, 5120 (3): 301-333.
[doi: 10.11646/zootaxa.5120.3.1](https://doi.org/10.11646/zootaxa.5120.3.1)
- Moghimi, F., Ahadiyat, A., Karaca, M., Kiadaliri, H. and Urhan, R. 2021. Description of *Prozercon caspiansis* sp. nov. (Acari: Mesostigmata: Zerconidae) from Iran, with descriptions of male and larva of *P. dominiaki* Błazszak, 1979. *Systematic and Applied Acarology*, 26 (9): 1703-1720.
[doi: 10.11158/saa.26.9.6](https://doi.org/10.11158/saa.26.9.6)

- Ujvári, Z. 2008. Zerconid mites (Acari: Mesostigmata: Zerconidae) from Crete, Greece, with description of two new species. *Opuscula Zoologica Budapest*, 39: 99-108.
- Ujvári, Z. 2009. First records of zerconid mites (Acari: Mesostigmata, Zerconidae) from Cyprus with description of *Prozercon semiseparatus* sp. nov. *Opuscula Zoologica Budapest*, 40 (1): 63-71.
- Ujvári, Z. 2010. First records of zerconid mites (Acari: Mesostigmata: Zerconidae) from Albania, with description of three new species. *Opuscula Zoologica Budapest*, 41 (1): 57-75.
- Urhan, R. 2008. Two new species of *Zercon* (Acari: Zerconidae) from Turkey. *Biologia*, 63(3): 395-401.
doi: [10.2478/s11756-008-0057-4](https://doi.org/10.2478/s11756-008-0057-4)
- Urhan, R. 2011. Two new species of zerconid mites (Acari, Mesostigmata) from Honaz Mountain National Park (Turkey). *Turkish Journal of Zoology*, 35 (2): 163-174.
doi: [10.3906/zoo-0911-120](https://doi.org/10.3906/zoo-0911-120)
- Urhan, R. and Ayyıldız, N. 1994. Two new species of the genus *Zercon* Koch (Acari, Zerconidae) from Turkey. *International Journal of Acarology*, 19 (4): 335-339.
doi: [10.1080/01647959308683988](https://doi.org/10.1080/01647959308683988)
- Urhan, R. and Duran, E.H. 2019. Zerconid mites (Acari, Zerconidae) in Inner Aegean Region, with a new record for the Turkish fauna. *Zootaxa*, 4568 (2): 323-336.
doi: [10.11646/zootaxa.4568.2.7](https://doi.org/10.11646/zootaxa.4568.2.7)
- Urhan, R. and Karaca, M. 2013. Zerconid mites (Acari, Zerconidae) in forestland of Artvin Province (Turkey). *International Caucasian Forestry Symposium*, 24-26 October, 2013, Artvin, Turkey, *Proceedings Book*, 687-699.
- Urhan, R. and Karaca, M. 2020. First finding of *Prozercon bulgariensis* Ujvári, 2013 (Acari, Zerconidae) from Turkey. *International Journal of Scientific and Technological Research*, 6 (7): 91-97.
doi: [10.7176/IJSTR/6-07-10](https://doi.org/10.7176/IJSTR/6-07-10)
- Urhan, R., Duran, E.H. and Karaca, M. 2020a. Three new species of *Zercon* C. L. Koch, 1836 (Acari: Zerconidae) from Coastal Aegean Section of Turkey. *Journal of Natural History*, 54 (35-36): 2323-2341.
doi: [10.1080/00222933.2020.1844328](https://doi.org/10.1080/00222933.2020.1844328)
- Urhan, R., Karaca, M. and Duran, E.H. 2020b. Description of *Prozercon miraci* sp. nov. (Acari: Mesostigmata: Zerconidae) from Coastal Aegean Section in Turkey, with a key to the Turkish species. *Acarological Studies*, 2 (1): 18-23.

Edited by: Salih Doğan

Reviewed by: Three anonymous referees

Citation: Urhan, R. and Karaca, M. 2023. Contributions to the Zerconidae (Acari: Mesostigmata) fauna of Dilek Peninsula-Büyük Menderes Delta National Park, Türkiye. *Acarological Studies*, 5 (1): 21-33.