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Research Article

Zercon kasensis sp. nov., A New Mite Species (Parasitiformes: Zerconidae) From South-Western Türkiye

Ayşenur Demirdöven[1], Raşit Urhan[2], Mehmet Karaca[3*]

[1]Department of Biology, The Graduate School of Natural and Applied Sciences, Pamukkale University, Denizli, Türkiye
[2]Department of Biology, Faculty of Science, Pamukkale University, Denizli, Türkiye
[3]Denizli Vocational School of Technical Sciences, Pamukkale University, Denizli, Türkiye

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Abstract
Various biological materials were collected from Saklıkent National Park (Antalya province) for investigation species diversity of the family Zerconidae. The collected materials were transferred to the acarology laboratory, mites were sorted with the Berlese-Tullgren funnels, and specimens of the zerconid mites were selected. Based on the materials collected from *Cedrus libani* and *Quercus coccifera* habitats in the research area, *Zercon kasensis* sp. nov. was described as a new species for the science. The female specimens of the new species were described, drawings were given and various body parts were measured. Males and immature stages of the new species were not found. The new species was compared with other species in the same genus, similarities and differences between the closer species were also presented.

Keywords: Acari, Mesostigmata, systematics, Saklıkent National Park, Antalya

Zercon kasensis sp. nov., Güneybatı Türkiye'den Yeni Bir Akar (Acari: Zerconidae) Türü

Öz
Zerconidae familyasına ait tür çeşitliliğinin araştırılması amacıyla Saklıkent Milli Parkı'ndan (Antalya) çeşitli biyolojik materyaller toplandı. Toplanan materyaller akaroloji laboratuvarına transfer edildi, akarlar Berlese-Tullgren hunileri ile ayıklandı ve zerkonid akarlara ait örnekler seçildi. Araştırma alanında *Cedrus libani* ve *Quercus coccifera* habitatlarından toplanan materyallere dayanarak, *Zercon kasensis* sp. nov. bilim dünyası için yeni bir tür olarak tanımlandı. Yeni türün dişi örnekleri tanımlandı, çizimleri verildi ve çeşitli vücut kısımları ölçüldü. Yeni türün erkeklerine ve ergin olmayan evrelerine rastlanmadı. Yeni tür aynı cins içindeki diğer türlerle karşılaştırıldı, daha yakın türler arasındaki benzerlikler ve farklılıklar da ortaya konuldu.

Anahtar Kelimeler: Acari, Mesostigmata, sistematik, Saklıkent Milli Parkı, Antalya

*Corresponding Author: karacamehmet@pau.edu.tr
Ayşenur DEMİRDÖVEN, https://orcid.org/0000-0002-6651-3429
Raşit URHAN, https://orcid.org/0000-0002-6548-7927
Mehmet KARACA, https://orcid.org/0000-0002-3249-4215

1. Introduction

Studies aimed at determining biodiversity in protected areas have received the attention of many scientists, leading to a focus on research in these areas. National parks are among the most prominent protected areas in Türkiye. According to recent data, the country has 49 national parks. One of these is Saklıkent National Park, located on the border of Antalya and Muğla provinces with a surface area is 1.643 hectares. The park features maquis vegetation at lower altitudes and coniferous tree communities including Turkish pine, black pine and cedar, at medium and higher elevations. The diversity of landforms and plant species has provided favourable habitats for various life forms, including mites.

Systematic, faunistic, ecological and molecular studies on soil mites are quite common. Especially systematic studies on zerconid mites (members of the family Zerconidae) has been increasing both in Türkiye and worldwide [1-9]. Comprehensive regional and provincial studies are being carried out to document the Zerconidae fauna of the country [10-18]. So far, 92 species belonging to genus *Zercon* have been identified from Türkiye [19-20].

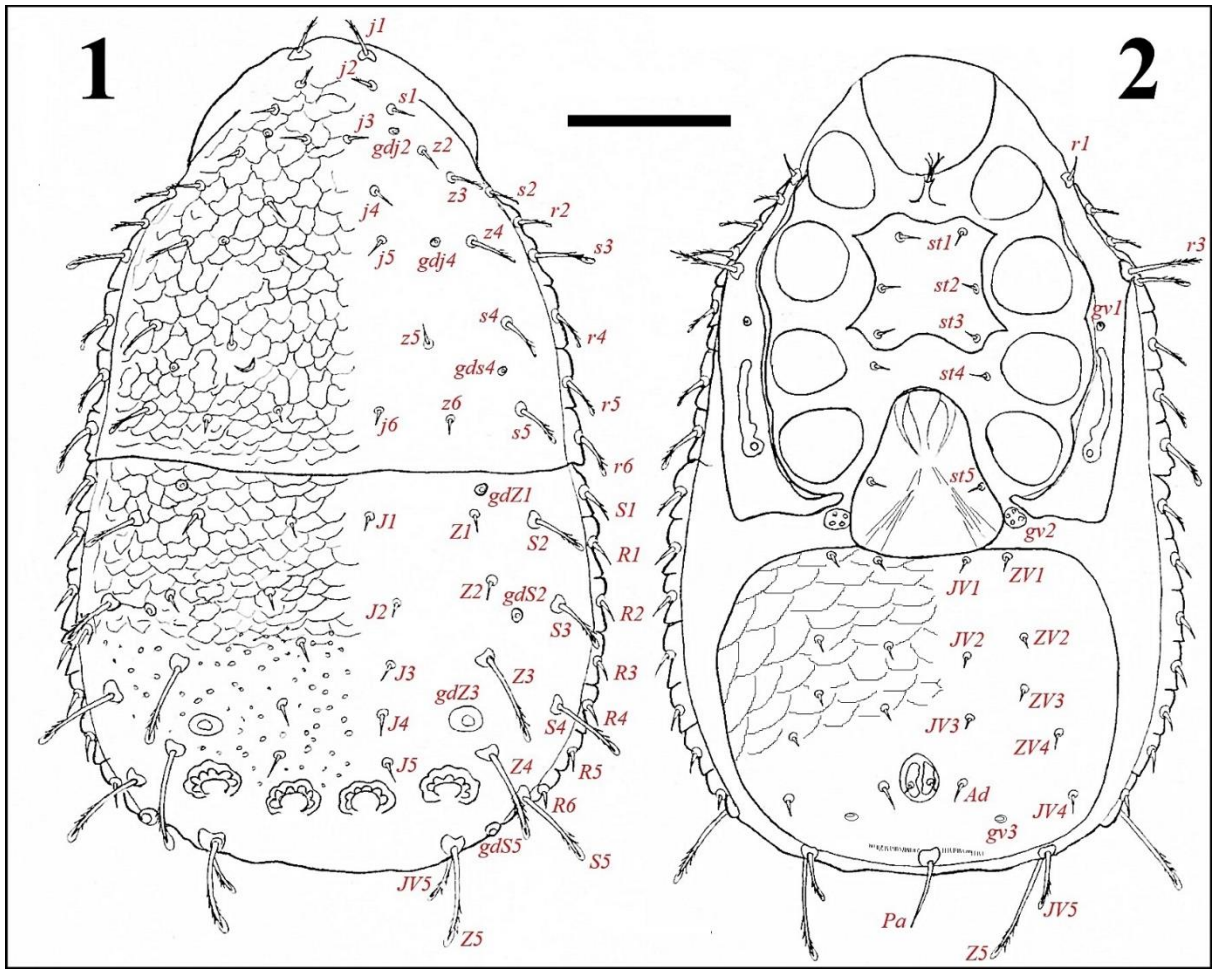
During the examination of zerconid mites specimens collected from Saklıkent National Park, it was observed that two specimens were not resemble any known species of the genus *Zercon*. As a result, they are described here as *Zercon kasensis* sp. nov.

2. Material and Methods

Based on the legal permission received from the General Directorate of Nature Conservation and National Parks (Republic of Türkiye, Ministry of Agriculture and Forestry, No: 21264211-288.04-7093271), soil and litter samples were collected from Lebanese cedar and kermes oak habitats in Saklıkent National Park, Kaş county, Antalya province, south-western Türkiye. At each sampling sites, data on coordinates and altitudes were recorded using a GPS device. All collected materials were then transferred to the Acarology Laboratory at Pamukkale University (PAU), Biology Department, Denizli, Türkiye.

Standard methods were used for extraction, measurement and drawing processes [21]. Terminologies of Lindquist & Evans (1965), Johnston & Moraza (1991) and Lindquist & Moraza (1998) were used in identification of the mite specimens [22-24]. Podonotal setae are shown in lower letters, opisthonotal setae are shown in capital letters. Various measurements (e.g. length and width of idiosoma, lengths of dorsal setae and ranges for setal bases, scale bar of the figures) were taken using a Olympus CX41 light microscope for the new specimens and shown as μm (micrometer). The type specimens of *Zercon kasensis* sp. nov. were stored in the PAU.

3. Results and Discussion



Figures 1-2. Dorsal and ventral appearance of *Zercon kasensis* sp. nov. (female) 1. Dorsum, 2. Venter (scale bar equal to 100)

Family **Zerconidae** Canestrini, 1891
Genus ***Zercon*** C. L. Koch, 1836
Type species: ***Zercon triangularis*** C. L. Koch, 1836
For detailed diagnosis, see Urhan and Karaca, 2023 [13].

Zercon kasensis sp. nov. (Figures 1, 2)
Type material. Holotype ♀ from litter and soil under Lebanese cedar: *Cedrus libani* (Pinaceae), 38°28.013' N, 28°28.881' E, 1215 m a.s.l., nearby of Çukur Ardıç plateau, Çamlıköy neighborhood, Kaş, Antalya, TÜRKİYE, 7 March 2023. One paratype ♀ from litter and soil under kermes oak: *Quercus coccifera* (Fagaceae), 36°22.510' N, 29°30.230' E, 885 m a.s.l., nearby of Çamlıova neighborhood, Kaş, Antalya, TÜRKİYE, 15 April 2023. Leg. Ayşenur Demirdöven.

Diagnosis. Two pairs of setae (*JV1* and *ZV1*) in the anterior margin of ventrianal shield. Short and smooth setae on the middle part of podonotum present, finely barbed with hyaline sheaths setae in the lateral part present (except setae *j1–2*, both of them finely barbed without hyaline

sheaths). Short and smooth setae in the middle part of opisthonotum present, partially elongated, finely barbed with hyaline sheaths setae present in the lateral part (except marginal setae). Gland pores *gdS2* situated among setae *Z2* and *S3*, closer to *S3*, *gdZ3* larger and more obviously than the other opisthonotal pores, situated among setae *J3* and *Z4*, closer to *Z4*. Dorsal fossae strongly developed and distinct. Tile-like patterns on podonotum and anterior margin of opisthonotum present, remaining parts of opisthonotum punctated.

Female. Length of idiosoma (excluding gnathosoma) 455 and width 300 in holotype; length of idiosoma 450, width 295 in paratype.

Dorsum (Fig. 1). Twenty pairs of setae on podonotal shield present, including *j1–6*, *z2–6*, *s1–6*, *r2* and *r4–5*. Bases of setae *r1* and r3 on peritrematal shields, both of them inserted ventrally. Setae *j1–2* finely barbed but not having hyaline sheaths, *j3–6*, *z2*, *z5–6*, *s1* short and smooth, remaining podonotal setae (*z3–4*, *s2–5*, *r2* and *r4–6*) finely barbed and having hyaline sheaths. Setae *s3* obviously and more elongated than other podonotal setae. None of setae *j6*, *z6* and *s5* extend the margin of posterior part of podonotum. Tile-like patterns on podonotal shield present. Twenty-one pairs of setae on opisthonotal shield present, including *J1–5*, *Z1–5*, *S1–5* and *R1–6*. Setae *J1–5*, *Z1–2* and *R1–6* short and smooth, all of them resembling in shape (needle-like) and length. Although *S1* finely barbed but not having hyaline sheath, *Z3–5* and *S2–5* elongated, finely barbed and having hyaline sheaths. In the setal rows of opisthonotum (*J*, *Z* and *S*), none of the setae extend the next base of the setae in the related rows. Although setae *S2–3* extend lateral margin of opisthonotum, *Z4–5* and *S4–5* extend beyond margin of opisthonotum. The intervals between *Z5–Z5* 132–135. There is no intervals for setae *Z5–JV5*, their bases are very closer to each other. Tile-like patterns on anterior margin of opisthonotum present, remaining parts of opisthonotum with punctations.

Gland pores *gdj2* situated among setae *z2* and *s1*, closer to *s1*, *gdj4* situated among setae *j5* and *z4*, *gds4* situated among setae *z5* and *s5* or *z6* and *s4*, *gdZ1* situated above the base of seta *Z1*, *gdS2* situated among setae *Z3* and *S3*, closer to *S3*, *gdZ3* larger and more obviously than the other opisthonotal pores, situated among setae *J3* and *Z4*, closer to *Z4*, *gdS5* situated below the base of seta *S5* (Fig. 1).

Venter (Fig. 2). All morphological characters (ornamentation, poroidotaxy, chaetotaxy etc.) of ventral side of the new species are characteristic just as in all species within the genus. On the peritrematal shield, the posterolateral parts extend the level of seta *S1*. Two setae on peritrematal shield present, the first of them *r1* short and smooth, the second *r3* elongated and finely barbed but not having hyaline sheath. Peritreme shaped like inverted comma. Gland pore *gv1* situated above the anterior part of peritreme, at the level of between *coxae II–III*. Three pairs of setae (*st1–3*) on sternal shield present. Only one pair of setae (*st5*) on epigynal shield present. Seta *st4* situated among sternal and epigynal shields, at the level of *coxa III*. All the above-mentioned setae (*st1–5*) short and smooth. Gland pore *gv2* situated among between posterolateral parts of peritrematal shield and anterior part of ventrianal shield, with four opening valves. Because of the presence of setae *JV1* and *ZV1*, four setae on the anterior margin of ventrianal shield. All of the setae (*JV1–4*, *ZV1–4* and *Ad*) on ventrianal shield short and

smooth. Gland pore *gv3* situated closer to the base of adanal setae. Postanal seta (*Pa*) single. Seta *JV5* finely barbed and having hyaline sheaths, resembling to opisthonotal setae *Z5* and *S5*, but shorter them. Anterior part of ventrianal shield with squamous patterns and these extend the level of setae *JV3* and *ZV4*, remaining parts of ventrianal shield smooth.

Various measurements for opisthonotal setae in female specimens of *Z. kasensis* sp. nov., were presented in Table 1.

Table 1. Lengths of setae on opisthonotal shield and distances of the setal bases from each other in the same rows (mean values were given).

Setae	♀	**Setae**	♀	**Setae**	♀
J1	10	*Z1*	10	*S1*	15
J1–J2	48	*Z1–Z2*	50	*S1–S2*	23
J2	10	*Z2*	10	*S2*	38
J2–J3	35	*Z2–Z3*	38	*S2–S3*	50
J3	13	*Z3*	45	*S3*	43
J3–J4	38	*Z3–Z4*	50	*S3–S4*	50
J4	18	*Z4*	58	*S4*	50
J4–J5	30	*Z4–Z5*	62	*S4–S5*	50
J5	18	*Z5*	75	*S5*	60

Male and immature stages (deutonymph, protonymph and larva). Not found.

Etymology. Because the female specimens of the new species were collected from the Kaş county of Antalya province (south-western Türkiye), the specific epithet "*kasensis*" was assigned to the new species.

Remarks. General morphological characters of *Zercon kasensis* sp. nov. is considerably like to *Z. albanicus* Ujvári, 2010 [25], *Z. elongatus* Ujvári, 2010 [25], *Z. emirdagicus* Urhan et al., 2016 [26] and *Z. tefenniensis* Urhan, 2010 [27]. The distinctive morphological characters of these related species as in Table 2.

Table 2. Distinguishing features between *Zercon kasensis* sp. nov. and related species within the genus.

Characters	***Z. kasensis*** sp. nov.	***Z. albanicus*** Ujvári, 2010	***Z. elongatus*** Ujvári, 2010	***Z. emirdagicus*** Urhan et al., 2016	***Z. tefenniensis*** Urhan, 2010
Marginal setae on podonotum	having hyaline sheath	not having hyaline sheath	having hyaline sheath	*s3* having hyaline sheath, others not having hyaline sheath	*s3* having hyaline sheath, others not having hyaline sheath
Podonotal setae *z3-4* and *s4-5*	finely barbed and having hyaline sheaths	s5 finely barbed but not having hyaline sheath, others smooth	short and smooth	short and smooth	short and smooth
Opisthonotal seta *S2*	having hyaline sheath	short and smooth	short and smooth	having hyaline sheath	having hyaline sheath
Opisthonotal seta *S4*	having hyaline sheath	having hyaline sheath	having hyaline sheath	having hyaline sheath	absent
Marginal setae on opisthonotum	*S1* finely barbed but not having hyaline sheath, others short and smooth	*S1* and *R1* finely barbed but not having hyaline sheaths, others short and smooth	short and smooth	short and smooth	short and smooth
Opisthonotal pore *gdZ3*	larger than the others, situated among setae *J4-Z4* or *J4-S4*	about same size with the others, situated among setae *J5-Z4*, closer to *Z4*	about same size with the others, situated among setae *Z3-4*	about same size with the others, situated among setae *Z3-4*	larger than the others, situated among setae *J5-Z4*, closer to *Z4*
Pattern of central surface on opisthonotum	irregular punctated	smooth	smooth	smooth	irregular punctated
Seta *JV5* on ventrianal shield	having hyaline sheath	finely barbed but not having hyaline sheath	short and smooth	having hyaline sheath	having hyaline sheath

According to Table 2, all zerconid mites including the new species have four setae on the anterior margin of ventrianal shield. Also, idiosomal setae of *Zercon kasensis* sp. nov. have the full complementary, there is no absence of seta on podonotum or opisthonotum in the related rows.

4. Conclusion

Recently, various studies were carried out on zerconid mites in national park areas in Türkiye and some new species were identified [28-33]. It is expected that studies on various mite groups will be continued in national parks of the country, which are among the most protected areas. Number of known species of the genus *Zercon* increased to 93 with *Z. kasensis* sp. nov. in Türkiye. Species diversity of Zerconidae fauna in the country will increase with new studies to be carried out locally or regionally.

Ethics in Publishing

There are no ethical issues regarding the publication of this study.

Author Contributions

Ayşenur Demirdöven: Collection of specimens (lead), data acquisition (equal), data analysis/interpretation (equal), preservation (lead). Raşit Urhan: Methodology (lead), project administration, supervision (lead), identification, illustration, data acquisition (equal), data analysis/interpretation (equal), critical revision of manuscript (equal), final approval and accountability (equal). Mehmet Karaca: Conception/design of study, collection of specimens (supporting), data analysis/interpretation (equal), drafting manuscript, critical revision of manuscript (equal), final approval and accountability (equal). This paper was prepared based on first author's M.Sc. thesis.

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