

Two new records of the genus *Prozercon* Sellnick, 1943 (Acari: Zerconidae) from Turkey*

Mehmet KARACA**, Raşit URHAN

Biology Department, Faculty of Arts & Sciences, Kinikli Campus, Pamukkale University, Denizli, Turkey

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Abstract: Morphological features of *Prozercon bulbiferus* Ujvari, 2011 and *Prozercon graecus* Ujvari, 2011, which are new records for the Turkish fauna, are given with drawings. Deutonymph members of *P. bulbiferus* are described and illustrated for the first time. Information about habitat and distribution for each species is also provided. Additionally, a key to species of the genus *Prozercon* known from Turkey is given. Both species are found in the Thrace region of Turkey.

Key words: Acari, Zerconidae, *Prozercon*, systematics, new records, Turkey

Zerconid mites are important members of the soil fauna, and they colonize various soil substrates. They are free-living and mostly associated with humus and soil, decomposed litter, leaf mold, plant parts, and mosses (Urhan, 2010). These small, predatory mites feed on the eggs, larvae, and nymphs of other mites and springtails (Shereef et al., 1984). At present, approximately 40 genera composed of more than 400 species are known worldwide. Only two genera, *Prozercon* and *Zercon*, are known from Turkey. Based on the number of species in Turkey and worldwide, the genus *Prozercon* is the second richest genus in the family Zerconidae. Until now, more than 60 species of this genus have been recorded from western Asia, Europe, and North Africa (Ujvári et al., 2013). Twenty-six species of them are known from Turkey (Karaca and Urhan, 2015). The number of recorded *Prozercon* species from Turkey has been raised from 26 to 28 by this study. Previously, *Prozercon bulbiferus* and *P. graecus* were described by Ujvári (2011) on the basis of materials collected from different habitats of Greece.

The aim of this study was to contribute to the knowledge of the Turkish zerconid fauna.

Litter, moss, and soil samples taken from Kırklareli and Tekirdağ provinces were brought to the laboratory in plastic bags. Mites were extracted using a Berlese funnel apparatus. They were then cleared with lactic acid and mounted in glycerin. Measurements and illustrations

were made using a standard light microscope equipped with a drawing attachment (Olympus CX41 and DP25 camera). Finally, mites were fixed and stored in 75% ethanol. The examined materials are deposited at the Acarology Laboratory of Pamukkale University, Denizli (Turkey). The terminology of setae follows that of Mašan and Fend'a (2004). All measurements are given as mean, in micrometers (μm).

Family: Zerconidae Canestrini, 1891

Genus: *Prozercon* Sellnick, 1943

Type species: *Zercon fimbriatus* C.L. Koch, 1839

Prozercon bulbiferus Ujvári, 2011

(Figures 1A, 1B; 2)

Materials: 2 ♀♀, 2 deutonymphs; surroundings of Kıyıköy Dam, Vize District, Kırklareli Province, Turkey, 13 m a.s.l., 23.IX.2013, 41°38'N, 28°04'E. Sample of litter and soil underlying medlar trees (*Mespilus germanica*). 1 ♀ and 1 ♂; inside forest, Vize District, Kırklareli Province, Turkey, 94 m a.s.l., 23.IX.2013, 41°39'N, 28°03'E. Sample of litter and soil underlying oak trees (mostly *Quercus frainetto* and *Q. pubescens*). 1 ♂; inside forest, closer to town of İğneada, Demirköy District, Kırklareli Province, Turkey, 250 m a.s.l., 23.IX.2013, 41°47'N, 27°53'E. Sample of litter and soil underlying beech trees (*Fagus orientalis*). 7 ♀♀, 10 ♂♂, and 1 deutonymph; inside forest, closer to İğneada, Demirköy District, Kırklareli Province, Turkey, 29 m, 23.IX.2013, 41°51'N, 27°56'E. Sample of litter under

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** Correspondence: m.karaca_86@hotmail.com

yellow azalea (*Rhododendron luteum*). 1 ♀; surroundings of Bulgar village, Şarköy District, Tekirdağ Province, Turkey, 21.III.2014, 40°44'N, 27°09'E. Sample of moss pads on the ground in a mixed forest (mostly oak and juniper trees).

Female (Figure 1A). Idiosoma (excluding gnathosoma) in the 11 specimens: mean length 325 (317–331) µm, mean width 242 (229–257) µm.

Dorsal side (Figure 1A). Twenty pairs of different setae present on podonotum's dorsal side: j-row with 6 pairs, z-row with 2 pairs, s-row with 5 pairs, r-row with 7 pairs. Two pairs of different setae present on podonotum's ventral side: p-row with 2 pairs (seta p1 presented on dorsal figure, above seta r1; setae p2 and R7 visible on ventral view). On podonotum, all setae densely plumose (except j5). Seta j5 smooth and needle-like. Seta j1 and r-series brush-like, remaining setae pointed. Twenty-two pairs of different setae present on opisthonotum's dorsal side: J-row with 6 pairs, Z-row with 5 pairs, S-row with 4 pairs, R-row with 7 pairs. On opisthonotum, all setae densely pilose (except setae R-series). All marginal R setae short, smooth, and thorn-like. Setae J6, Z5, and S2-4 brush-like; remaining setae pointed. Only seta J4 reaching base of the following seta in the series. Setae S2-4 reaching beyond margin

of opisthonotum. In majority of specimens, setal bases enlarged and bulb-like (especially setae of J-series).

Pores (Figure 1A). Three different pores present on podonotum. Pores po1 under base of s1, po2 on line connecting j4 and s3, closer to s3, po3 located between z1 and s5, closer to s5. Podonotum covered by reticulate pattern. Four different pores present on opisthonotum. Pores Po1 located anterolaterally to bases of Z1, Po2 outside line connecting Z2 and S1, closer to S1, Po3 located between Z3 and S4, Po4 on line connecting Z5 and S4. Opisthonotum covered by extensive irregular pits. Dorsal fossae weakly sclerotized, general size and appearance.

Ventral side. Ventral shields' shape, chaetotaxy, and shapes of peritremes typical for genus *Prozercon*. Setae p1 and p2 smooth, short, and needle-like. Lateral ends of peritremal shield reach R4–5. Adgenital shields absent. Ventroanal shield with 8 pairs of setae. Anterior margin of ventroanal shield with 2 setae; postanal seta is single. All of them smooth, short, and needle-like.

Male (Figure 1B). Idiosoma (excluding gnathosoma) in the 12 specimens: mean length 271 (265–287) µm, mean width 198 (185–213) µm.

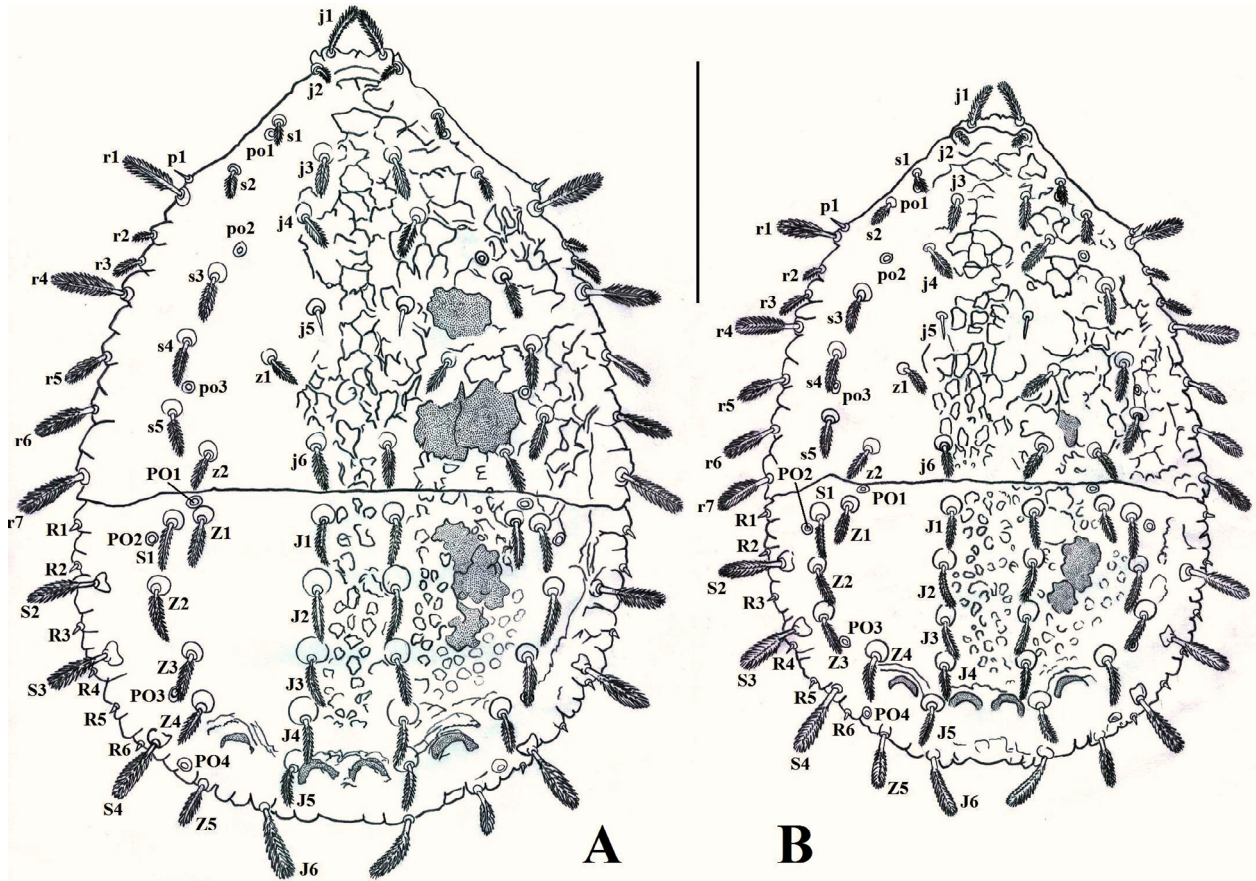


Figure 1. Dorsal views of *Prozercon bulbiferus*: A) female, B) male (scale bar = 100 µm).

Dorsal side, ventral side, shapes of setae on idiosoma, and sculpture of podonotum and opisthonotum basically similar to that of female.

Pores (Figure 1B). On podonotum, pores po1 under base of s1, po2 outside line connecting j4 and s3, po3 located between s4 and s5. On opisthonotum, pores Po1 located anterolaterally to bases of Z1, Po2 on line connecting S1 and S2, closer to S1, Po3 on line connecting Z4 and S3, closer to Z4, Po4 located between Z5 and S4. Dorsal cavities' general size and appearance as in female individuals.

Deutonymph (Figure 2). Idiosoma (excluding gnathosoma) in the 2 specimens: mean length 277 (270–283) µm, mean width 196 (189–202) µm.

Dorsal side, ventral side, shapes of setae on idiosoma, sculpture of podonotum and opisthonotum, size and appearance of dorsal cavities basically similar to those of female and male (except podonotal setae r2 and r3). Although in female and male specimens setae r2–3 densely plumose, these setae smooth and needle-like in deutonymphs.

Pores (Figure 2). On podonotum, pores po1 under base of s1, po2 outside line connecting j4 and s3, closer to s3, po3 inside line connecting s4 and s5, closer to s4. On opisthonotum, pores Po1 located anterolaterally to bases of Z1, Po2 located between Z2 and S1, closer to S1, Po3 outside line connecting Z3 and Z4, Po4 near base of Z5.

Average lengths of opisthonotal setae and distances between setae within longitudinal rows of female, male, and deutonymph specimens: see Table 1.

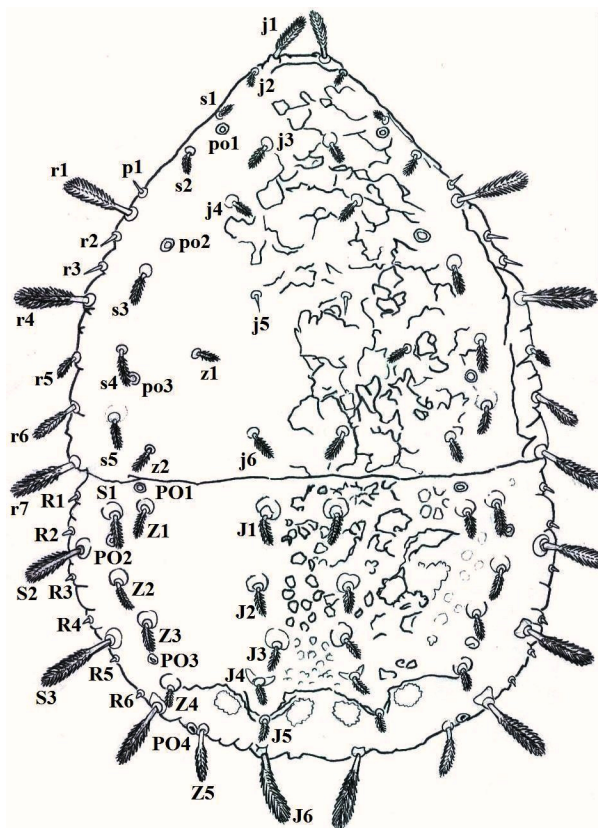


Figure 2. Dorsal view of deutonymph of *Prozercon bulbiferus* (scale bar = 100 µm).

Table 1. Lengths of opisthonotal setae and the distances between their bases in J-, Z-, and S- rows of *Prozercon bulbiferus* (values as mean, in micrometers) (F: female, M: male, DN: deutonymph).

Seta	F	M	DN	Seta	F	M	DN	Seta	F	M	DN
J1	21	17	12	Z1	23	15	12	S1	21	15	14
J1–J2	31	27	28	Z1–Z2	38	31	31	S1–S2	40	26	18
J2	23	18	11	Z2	24	17	12	S2	30	28	24
J2–J3	30	24	33	Z2–Z3	31	22	29	S2–S3	31	27	36
J3	19	17	11	Z3	21	17	12	S3	27	29	32
J3–J4	25	19	16	Z3–Z4	23	28	27	S3–S4	42	30	31
J4	19	15	8	Z4	18	20	7	S4	29	33	27
J4–J5	21	19	15	Z4–Z5	31	33	20				
J5	18	17	9	Z5	20	28	19				
J5–J6	22	21	13								
J6	31	27	27								
J6–J6	60	48	37								

Remarks. In type specimens, number of R setae varies between 7 or 8 pairs, but in Turkish specimens these setae number 7 pairs. In some Turkish specimens, on podonotum seta r2 short and smooth (in type specimens, all setae r2 short, plumose, and brush-like) in female and male. Additionally, lateral ends of peritremal shields reach R7–8 in Greek specimens, but in our specimens these shields' lateral ends reach R4–5.

Prozercon graecus Ujvári, 2011

(Figure 3A–3B)

Materials: 11 ♀♀ and 3 ♂♂; inside forest, closer to İğneada, Demirköy District, Kırklareli Province, Turkey, 29 m a.s.l., 23.IX.2013, 41°51'N, 27°56'E. Sample of litter under yellow azalea (*Rhododendron luteum*).

Female (Figure 3A). Idiosoma (excluding gnathosoma) in the 11 specimens: mean length 317 (308–325) µm, mean width 233 (224–238) µm.

Dorsal side (Figure 3A). Twenty pairs of different setae present on podonotum's dorsal side: j-row with 6 pairs, z-row with 2 pairs, s-row with 5 pairs, r-row with 7 pairs. Two pairs of different setae present on podonotum's ventral side: p-row with 2 pairs (seta p1 presented on dorsal figure, above seta r1, seta p2 visible on ventral view). On podonotum, all setae densely plumose. Seta j1 and r-series

brush-like, remaining setae pointed. Twenty-three pairs of different setae present on opisthonorium's dorsal side: J-row with 6 pairs, Z-row with 5 pairs, S-row with 4 pairs, R-row with 8 pairs. On opisthonorium, all setae densely pilose (except setae R-series). All marginal R setae short, smooth, and thorn-like. Setae J6, Z5, and S2-4 brush-like, remaining setae pointed. Setae J3–5 reaching base of the following seta in the series. Setae S2–4 reaching beyond margin of opisthonorium.

Pores (Figure 3A). Three different pores present on podonotum. Pores po1 under base of s1, po2 on line connecting j4 and s3, closer to s3, po3 inside line connecting s4 and s5. Podonotum covered by reticulate pattern. Four different pores present on opisthonorium. Pores Po1 located anterolaterally to bases of Z1, Po2 outside line connecting Z2 and S1, Po3 on line connecting Z4 and S3, closer to Z4, Po4 located between Z5 and S4. Opisthonorium covered by extensive irregular pits. Dorsal fossae well sclerotized, general size and appearance.

Ventral side. All features are similar to *P. bulbiferus*'s ventral side.

Male (Figure 3B). Idiosoma (excluding gnathosoma) in the 3 specimens: mean length 263 (256–268) µm, mean width 187 (184–190) µm.

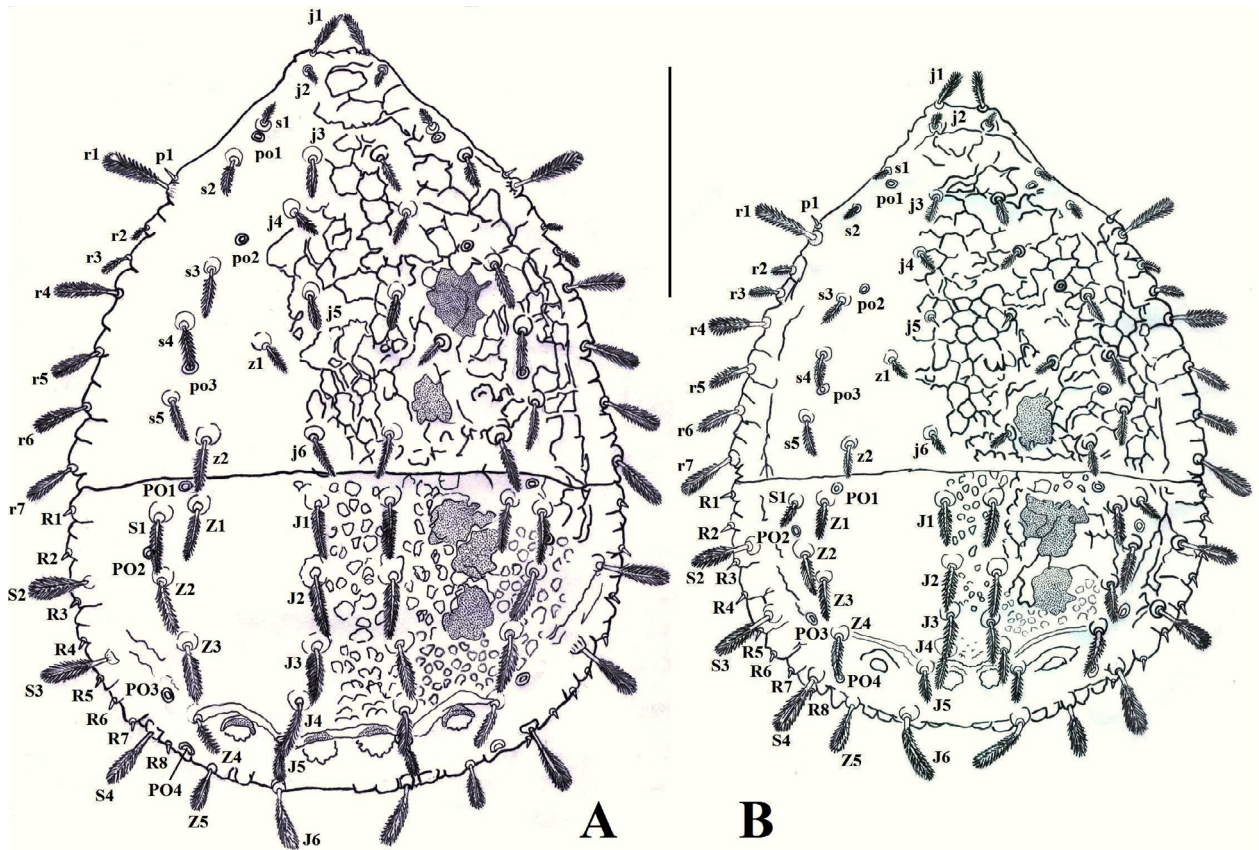


Figure 3. Dorsal views of *Prozercon graecus*: A) female, B) male (scale bar = 100 µm).

Dorsal side, ventral side, shapes of setae on idiosoma (except seta j5), sculpture of podonotum and opisthonotum, size and appearance of dorsal cavities basically similar to those of female. Although in female specimens setae j5 densely plumose, these setae smooth and needle-like in males.

Pores (Figure 3B). On podonotum, pores po1 under base of s1, po2 on line connecting j4 and s3, closer to s3, po3 inside line connecting s4 and s5. On opisthonotum, pores Po1 located anterolaterally to bases of Z1, Po2 located between Z2 and S1, Po3 inside line connecting Z4 and S3, closer to Z4, Po4 outside line connecting Z4 and Z5.

Average lengths of opisthotal setae and distances between setae within longitudinal rows of female and male specimens: see Table 2.

Remarks. In type specimens, number of R setae varies between 6 or 7 pairs, but in Turkish specimens these setae number 8 pairs. In Turkish male specimens, seta S1 shorter than type specimens and seta J5 does not reach base of seta J6. In addition, lateral ends of peritremal shields reach R3–6 in Greece specimens, but in our specimens these shields' lateral ends reach R2–3.

Most Turkish specimens' setal and morphological characters very similar to those of both type specimens. The length and width were compared on the basis of the available literature (Table 3). According to Table 3, our specimens of *P. bulbiferus* and *P. graecus* are approximately the same size as type specimens. Furthermore, the different positions of pores may be a result of geographical variation in Zerconidae members.

Table 2. Lengths of opisthotal setae and the distances between their bases in J-, Z-, and S- rows of *Prozercon graecus* (values as mean, in micrometers) (F: female, M: male).

Seta	F	M	Seta	F	M	Seta	F	M
J1	24	20	Z1	24	18	S1	23	13
J1–J2	23	30	Z1–Z2	36	25	S1–S2	41	28
J2	28	21	Z2	25	24	S2	25	27
J2–J3	33	23	Z2–Z3	30	15	S2–S3	35	32
J3	26	21	Z3	27	19	S3	31	29
J3–J4	35	18	Z3–Z4	33	25	S3–S4	38	33
J4	27	17	Z4	18	20	S4	29	28
J4–J5	20	13	Z4–Z5	23	31			
J5	18	16	Z5	19	23			
J5–J6	21	23						
J6	27	31						
J6–J6	56	50						

Table 3. Length and width intervals of idiosoma of *Prozercon bulbiferus* and *Prozercon graecus* (values in micrometers) (F: female, M: male, DN: deutonymph, PN: protonymph).

	<i>Prozercon bulbiferus</i>				<i>Prozercon graecus</i>			
	F	M	DN	PN	F	M	DN	PN
Ujvári (2011)	326–350 × 241–252	280–287 × 200–205	-	-	303–340 × 215–234	245–252 × 188–193	-	237 × 158
Turkish specimens	317–331 × 229–247	265–287 × 185–213	270–283 × 189–202	-	308–325 × 224–238	256–268 × 184–190	-	-

On the other hand, 9 zerconid mite species of the genus *Prozercon* were recorded from different habitats (especially in the northern and northeastern regions of the country) of Greece by Ujvári in 2011. Six species of them, namely *P. achaeanus*, *P. bulbiferus*, *P. dramaensis*, *P. graecus*, *P. morazae*, and *P. norae*, were proved to be new to science. A further 3 species (*P. carpathofimbriatus*, *P. carsticus*, and *P. yavuzi*) were recorded for the first time from Greece. Of them, only *P. yavuzi* (Urhan, 1998) has been recorded from Turkey until now. In addition to this species, 2 new records (*P. bulbiferus* and *P. graecus*) are reported from Turkey herein. The other 6 species known from Greece are expected to be found in the Thrace region of Turkey in subsequent investigations.

Key to the adults of the genus *Prozercon* known from Turkey (Females ♀♀)

- 1 (14) Number of S setae 2 or 3 pairs.
- 2 (3) Setae S2–S3 absent *kurui* Urhan, 1998
- 3 (2) Setae S2 or S3 present.
- 4 (5) Seta S2 absent, seta S3 present ...*bircanae* Urhan, 1998
- 5 (4) Seta S2 present, seta S3 absent.
- 6 (9) Setae j3–j4 and j6 short and smooth.
- 7 (8) Number of R setae 7 pairs, setae R1 and Z5 plumose*balikesirensis* Urhan, 2008
- 8 (7) Number of R setae 8 pairs, setae R1 and Z5 short and smooth.....*celali* Urhan, 2010
- 9 (6) Setae j3–j4 and j6 plumose.
- 10 (11) Great majority of marginal R setae plumose*erdogani* Urhan, 2010
- 11 (10) Great majority of marginal R setae smooth.
- 12 (13) Seta R1 plumose *yavuzi* Urhan, 1998
- 13 (12) Seta R1 short and smooth....*denizliensis* Urhan, 2002
- 14 (1) Number of S setae 4 pairs.
- 15 (28) Seta S1 short and smooth.
- 16 (23) Seta S2 plumose.
- 17 (20) Marginal R setae short and smooth.
- 18 (19) Setae S2–S3 elongated and reach beyond opisthonotum.....*fimbriatus* (C. L. Koch, 1839)
- 19 (18) Setae S2–S3 short and do not reach beyond opisthonotum.....*buraki* Urhan, 2008
- 20 (17) Marginal R setae plumose.
- 21 (22) Setae j2–j4 and j6 short and smooth*mersinensis* Urhan, 1998
- 22 (21) Setae j2–j4 and j6 plumose*marati* Urhan, 2013
- 24 (25) Seta S3 short and smooth, do not reach beyond opisthonotum.....*boyacii* Urhan & Ayyildiz, 1996
- 25 (24) Seta S3 elongated and plumose, reach beyond opisthonotum.
- 26 (27) Pores Po2 below the base of seta S1.....*turcicus* Urhan & Ayyildiz, 1996
- 27 (26) Pores Po2 above the base of seta S1.....*luxtoni* Urhan & Ayyildiz, 1996
- 28 (15) Seta S1 plumose.
- 29 (30) Seta j5 elongated and plumose*graecus* Ujvári, 2011
- 30 (29) Seta j5 short and smooth.
- 31 (36) Seta j6 short and smooth.
- 32 (33) Setae j2 and R1 plumose*giresunensis* Urhan, 2013
- 33 (32) Setae j2 and R1 short and smooth.
- 34 (35) Seta s5 short and smooth, seta J4 does not reach base of seta J5, seta J5 does not reach beyond opisthonotum.....*rafalskii* Blaszkak, 1971
- 35 (34) Seta s5 plumose, seta J4 reaches base of seta J5, seta J5 reaches beyond opisthonotum.....*artvinensis* Urhan & Ayyildiz, 1996
- 36 (31) Seta j6 elongated and plumose.
- 37 (42) Seta j3 short and smooth.
- 38 (39) Seta r2 short and smooth.....*demirsoyi* Urhan & Ayyildiz, 1996
- 39 (38) Seta r2 plumose.
- 40 (41) Seta s3 elongated and plumose, seta j6 reaches beyond podonotum.....*martae* Ujvári, 2010
- 41 (40) Seta s3 short and smooth, seta j6 does not reach beyond podonotum.....*kafkasoricus* Urhan, 1998
- 42 (37) Seta j3 plumose.
- 43 (44) Seta r2 short and smooth, sternal shield divided into 2 parts.....*blaszaki* (Urhan & Ayyildiz, 1996)
- 44 (43) Seta r2 plumose, sternal shield not divided into 2 parts.
- 45 (50) Marginal R setae short and smooth.
- 46 (47) Pores Po2 located to left side of seta S1*satapliae* Petrova, 1977
- 47 (46) Pores Po2 located to right side of seta S1.
- 48 (49) Bases of setae J- and Z- series large and bulb-like, setae J2–J4 do not reach the base of following seta.....*bulbiferus* Ujvári, 2011
- 49 (48) Bases of setae J- and Z- series normal size, setae J2–J4 reach the base of following seta.....*traegardhi* (Halbert, 1923)
- 50 (45) Marginal R setae plumose.
- 51 (52) Pores Po2 above the base of seta S1.....*orhani* Urhan & Ayyildiz, 1996
- 52 (51) Pores Po2 below the base of seta S1.
- 53 (54) None of setae in J-series reach the base of following seta (except J5), seta S2 does not reach beyond opisthonotum *umidicola* Urhan, 2002
- 54 (53) All of setae in J-series reach the base of following seta, seta S2 reaches beyond opisthonotum*kamili* Urhan & Ayyildiz, 1996

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References

- Karaca M, Urhan R (2015). A new record of zerconid mites (Acari, Mesostigmata, Zerconidae) from the Thrace region of Turkey. *Turk J Zool* 39: 188-190.
- Mašán P, Fenda P (2004). Zerconid Mites of Slovakia (Acari, Mesostigmata, Zerconidae). Bratislava, Slovakia: Institute of Zoology, Slovak Academy of Sciences.
- Shereef GM, Afifi MA, El Bishlawy SHO (1984). Description, life cycle and feeding habitats of *Zercon adalicus* n. sp. (Acari, Gamasida, Zerconidae). *Bulletin of Faculty of Agriculture, Cairo University* 35: 1765-1774.
- Ujvári Z (2011). Six new species of *Prozercon* Sellnick, 1943 (Acari, Mesostigmata, Zerconidae) from Greece, with remarks on the genus. *Zootaxa* 2785: 1-31.
- Ujvári Z, Moradian H, Ostovan H (2013). *Prozercon iranensis* sp. n., a new species of Zerconidae (Acari: Mesostigmata) from Iran. *Zool Middle East* 59: 353-357.
- Urhan R (1998). Some new species of the family Zerconidae (Acari: Mesostigmata) from Turkey. *J Nat Hist* 32: 533-543.
- Urhan R (2010). *Prozercon celali* sp. nov. of soil mites (Acari: Zerconidae) from Turkey. *Ann Zool* 60: 133-137.