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Prozercon banazensis sp. nov. (Acari: Mesostigmata: Zerconidae), a new species of zerconid mite from Turkey, with a new record

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Abstract: In this study, *Prozercon banazensis* sp. nov. is described and illustrated from female and deutonymph specimens collected in Kütahya and Uşak provinces (Turkey). Morphological features of *P. morazae* Ujvári, 2011, which is a new record for the Turkish fauna, are also given with drawings. Information on habitat and distribution for each species is also provided.

Key words: Systematics, *Prozercon*, new species, new record, Turkey

1. Introduction

Zerconid mites are important members of the soil fauna and they colonize various soil substrates (Karaca and Urhan, 2015a). They are free-living and mostly associated with humus, soil, decomposed litter, leaf mold, plant parts, and mosses (Urhan, 2010a). 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 comprising more than 400 species are known worldwide. Only two genera, *Prozercon* and *Zercon*, have been recorded from Turkey. The genus *Prozercon*, based on the number of species in Turkey and worldwide, is the second richest genus in the family Zerconidae. To date, more than 60 species of this genus have been recorded from the West Palearctic. Of these, 29 species were known from Turkey (Karaca and Urhan, 2015b). With the new species and new record of zerconid mites, the number of recorded *Prozercon* species from Turkey has risen from 29 to 31. Previously, *P. morazae* was described by Ujvári (2011) on the basis of materials collected from Arkadia, Greece. The aim of this study is to contribute to the knowledge of the Turkish zerconid fauna.

2. Materials and methods

Litter, moss, and soil samples taken from Kütahya and Uşak 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). Morphological terminology, idiosomal chaetotaxy, and poroidotaxy used in the descriptions follow those of Mašán and Fend'a (2004). All measurements are given as means, in micrometers.

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3. Results

Family: Zerconidae Canestrini, 1891
Genus: *Prozercon* Sellnick, 1943
Type species: *Zercon fimbriatus* C.L. Koch, 1839
Prozercon banazensis sp. nov.
(Figures 1A–1C)

Type materials: Holotype ♀. Mixed forest, Banaz district, Uşak Province, Turkey, 38°44.419′N, 29°45.443′E, 917 m, 17 August 2014. Samples from litter and soil under *Juniperus* sp. Paratypes: 16 ♀♀; same data as holotype. 2 ♀♀; Mixed forest, Center, Uşak Province, Turkey, 38°46.314′N, 29°12.579′E, 590 m, 2 March 2014, Samples from moss pads. 9 ♀♀; Mixed forest, Domaniç district, Kütahya Province, Turkey, 39°51.685′N, 29°27.972′E, 1460 m, 11 October 2014, Samples from litter and soil under *Pinus sylvestris*. 2 ♀♀; Mixed forest, Domaniç district, Kütahya Province, Turkey, 39°50.991′N, 29°31.395′E, 1400 m, 11 October 2014, Samples from litter and soil under *Alnus* sp. and moss pads. 1 ♀ and 1 deutonymph; same data above, samples from litter and soil under *Fagus* sp.

Female (Figure 1A). Length of idiosoma in holotype (excluding gnathosoma) 325, width 207. Measurements in 30 paratypes: mean length 322 (317–331), mean width 208 (203–215).

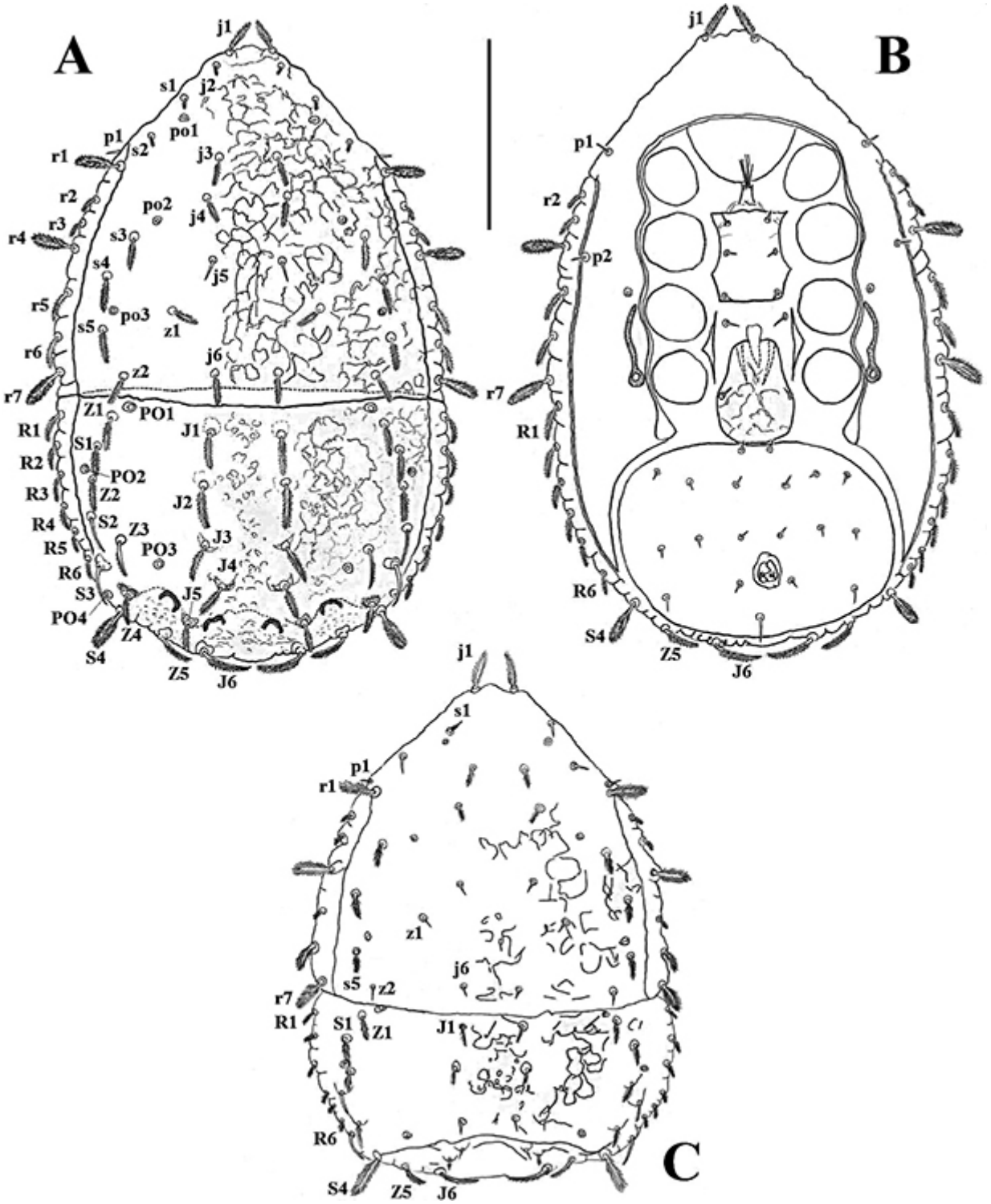

Figure 1. *Prozercon banazensis*: A) Dorsal view of female, B) ventral view of female, C) dorsal view of deutonymph (Scale bar = 100 μm).

Dorsum (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 two pairs. On podonotum, all setae pilose or plumose (except seta j_5). Seta j_5 smooth and needle-like. Setae j_{1-4}, j_6, z_{1-2}, s_{1-5}, r_{2-3}, and r_{5-6} plumose. Remaining setae on podonotum (r_1, r_4, and r_7) densely pilose and brush-like. Twenty-one or 22 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 6 or 7 pairs. On opisthonotum, all setae pilose, plumose, or finely serrate. Setae J_{1-5}, Z_{1-2}, Z_4, S_1, and R_{1-7} plumose. Setae Z_3 and S_{2-3} elongated, phylliform, and finely serrate marginally (big majority of setae S_3 and S_4 smooth). Setae J_6 and Z_5 unilateral plumose. Seta S_4 densely pilose and brush-like. Setae J_{1-5}, Z_{1-2}, and S_1 similar in appearance. Setae J_6 and Z_5 reach parallelly to tip edge of opisthonotum. Only setae J_3 and J_5 reaching base of the following seta in the series. Setae Z_4 and S_{3-4} reaching beyond margin of opisthonotum.

Pores (Figure 1A). Three different pores present on podonotum. Pores po_1 under base of s_1, po_2 on line connecting j_4 and s_3, closer to s_3, po_3 located between s_3 and s_5, closer to s_5. Podonotum covered by reticulate pattern. Four different pores present on opisthonotum. Pores Po_1 located anteromedial to base of Z_1, Po_2 outside line connecting Z_2 and S_1, closer to Z_2, Po_3 located between J_4 and Z_3, closer to Z_3, Po_4 outside line connecting S_3 and S_4. Opisthonotum covered by relative small and irregular pits. Dorsal fossae uniform and weakly sclerotized.

Venter (Figure 1B). Ventral shields' shape, chaetotaxy, and the shapes of peritremes typical for genus *Prozercon*. Setae p_1 and p_2 short, smooth, and needle-like. Lateral ends of peritremal shield reach R_6. Adgenital shields absent. Ventroanal shield with 8 pairs of setae. Anterior margin of ventroanal shield with 2 setae and postanal seta is 1. All of them short, smooth, and needle-like.

Deutonymph (Figure 1C). Idiosoma (excluding gnathosoma) in one specimen; length 260, width 193.

Dorsal side, ventral side, shapes of setae on idiosoma, sculpture of podonotum and opisthonotum, and size and appearance of dorsal cavities basically similar to those of female (except podonotal setae j_6, z_{1-2}, s_1, and opisthonotal setae J_{4-5}). Although in female specimens these setae are finely or densely plumose, in deutonymphs these setae are short and smooth.

Pores (Figure 2). On podonotum, pores po_1 under base of s_1, po_2 inside line connecting j_4 and s_3, po_3 inside line connecting s_4 and s_5, closer to s_5. On opisthonotum, pores Po_1 located anterolaterally to bases of Z_1, Po_2 outside line connecting Z_2 and S_1, Po_3 connecting between J_3 and S_3, Po_4 near base of S_4.

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

Remarks. *Prozercon banazensis* sp. nov. is closely related to *P. erdogani* Urhan, 2010. The distinguishing characters of these two related species of the genus *Prozercon* are shown in Table 2.

Etymology. The specific name "*banazensis*" reflects the name of the Banaz district (Uşak, Turkey), where the new species was collected.

Prozercon morazae Ujvári, 2011

(Figures 2A–2C)

Materials: 1 ♀ and 1 ♂; Mixed forest, surroundings of Sofça village, Center, Kütahya Province, Turkey, 39°36.658′N, 30°09.243′E, 909 m, 5 May 2014, Samples from litter and soil under *Quercus* sp. and *Juniperus* sp. 8 ♀♀, 1 ♂ and 1 protonymph; mixed forest, closer to Sabuncupınar village, Center, Kütahya Province, Turkey, 39°34.433′N, 30°06.015′E, 901 m, 5 May 2014, Samples from litter and soil under *Pinus nigra* and moss pads. 2 ♀♀; same data above, samples from litter and soil under *Crataegus* sp.

Female (Figure 2A). Idiosoma (excluding gnathosoma) in the 11 specimens; mean length 339 (330–356), mean width 226 (219–231).

Dorsum (Figure 2A). 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 two pairs (seta p_1 presented on dorsal figure, above seta r_1, seta p_2 visible on ventral view). On podonotum, all setae pilose or plumose (except seta j_5). Seta j_5 smooth and needle-like. Setae j_{1-4}, j_6, z_{1-2}, s_{1-5}, r_{2-3}, and r_{5-6} plumose. Remaining setae on podonotum (r_1, r_4, and r_7) densely pilose and brush-like. 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 pilose, densely plumose, or thorn-like. Setae J_{1-5}, Z_{1-5}, S_{1-3}, and R_1 densely plumose. Setae J_6 and S_4 densely pilose and brush-like. All marginal *R* setae short, smooth, and thorn-like (except seta R_1). Setae J_{1-3}, Z_{1-3}, and S_{1-3} similar in appearance. Only setae J_5 reaching base of the following seta in the series. Setae J_5, Z_4, and S_{3-4} reaching beyond margin of opisthonotum.

Pores (Figure 2A). Three different pores present on podonotum. Pores po_1 under base of s_1, po_2 on line connecting s_1 and s_3, closer to s_3, po_3 inside line connecting s_4 and s_5, closer to s_5. Podonotum covered by reticulate pattern. Four different pores present on opisthonotum. Pores Po_1 located anterolaterally to bases of Z_1, Po_2 on line connecting Z_2 and S_1, Po_3 inside line connecting Z_3 and Z_4, Po_4 located between Z_5 and S_4, closer to Z_5. Opisthonotum covered by relative extensive and irregular pits. Dorsal fossae uniform and weakly sclerotized.

Venter. Chaetotaxy and poroidotaxy of ventral shields typical for genus *Prozercon*. Setae p_1 and p_2 (peritremal setae) short, smooth, and needle-like. Lateral ends of

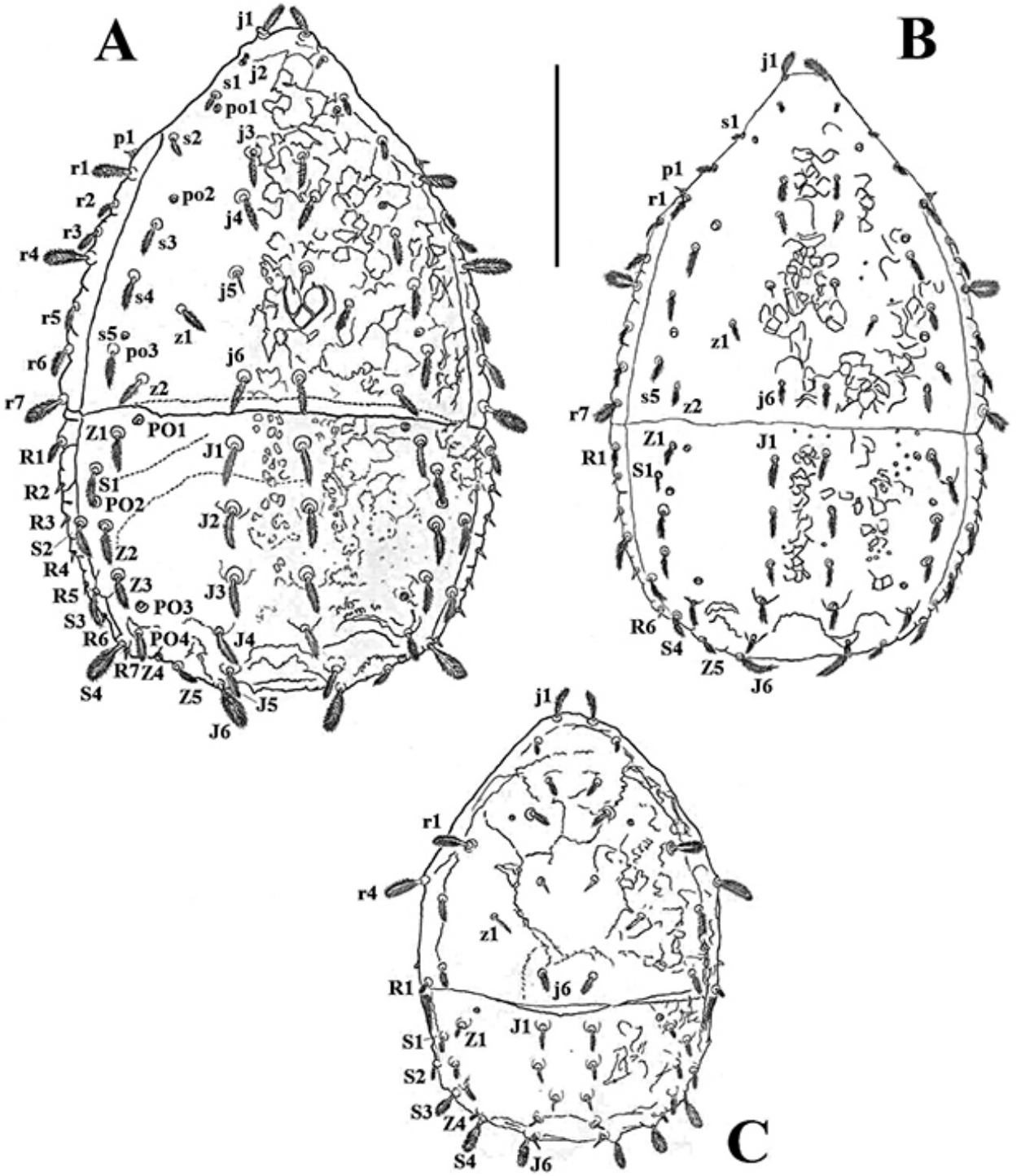

Figure 2. Dorsal views of *Prozercon morazae*: A) Female, B) male, C) protonymph (scale bar = 100 µm).

Table 1. Lengths of opisthonotal setae and the distances between their bases in *J*-, *Z*-, and *S*- rows of *Prozercon banazensis* sp. nov.

Seta	F	DN	Seta	F	DN	Seta	F	DN
J_1	21	9	Z_1	18	13	S_1	16	15
J_1–J_2	25	23	Z_1–Z_2	33	28	S_1–S_2	38	28
J_2	24	9	Z_2	17	10	S_2	19	12
J_2–J_3	34	28	Z_2–Z_3	36	25	S_2–S_3	25	22
J_3	22	7	Z_3	19	10	S_3	21	15
J_3–J_4	21	18	Z_3–Z_4	30	–	S_3–S_4	27	19
J_4	19	6	Z_4	16	–	S_4	23	24
J_4–J_5	23	7	Z_4–Z_5	28	–			
J_5	15	6	Z_5	19	14			
J_5–J_6	15	9						
J_6	25	28						
J_6–J_6	52	55						

F: female, DN: deutonymph.

Table 2. Distinguishing characters of *Prozercon banazensis* sp. nov. and *P. erdogani*.

	Prozercon banazensis sp. nov.	*Prozercon erdogani*
Setae J_6 and Z_5	Unilateral plumose, seta J_6 reaching parallelly to tip edge of opisthonotum	Bilateral plumose, seta J_6 not reaching parallelly to tip edge of opisthonotum
Setae Z_3 and S_2	Elongated, phylliform, and finely serrate marginally	Plumose and apically tapering
Seta S_3	Present	Absent
Pores Po_2	Outside line connecting between setae Z_2 and S_1	On line connecting between setae Z_2 and S_1
Pores Po_4	Above the base of seta S_4	Below the base of seta S_4

peritremal shield reach R_5. Adgenital shields absent (an important feature of the genus *Prozercon*). Ventroanal shield with 8 pairs of setae. Anterior margin of ventroanal shield with 1 pair of setae, and postanal seta is 1. All of them short, smooth, and needle-like. The shapes of peritremes are typical for the genus *Prozercon*.

Male (Figure 2B). Idiosoma (excluding gnathosoma) in the 2 specimens; mean length 290 (288–292), mean width 190 (189–190).

Dorsal side, ventral side, shapes of setae on idiosoma, sculpture of podonotum and opisthonotum, and size and appearance of dorsal cavities basically similar to those of female.

Pores (Figure 2B). On podonotum, pores po_1 near base of s_1, po_2 inside line connecting s_2 and s_3, closer to s_3, po_3 on line connecting z_2 and s_4, closer to s_4. On opisthonotum, pores Po_1 located near base of Z_1, Po_2 on line connecting Z_1 and Z_2, closer to Z_2, Po_3 inside line connecting Z_3 and Z_4, Po_4 near base of Z_5.

Protonymph (Figure 2C). Idiosoma (excluding gnathosoma) in one specimen; length 215, width 148.

Dorsal side, ventral side, shapes of setae on idiosoma, and sculpture of podonotum and opisthonotum basically similar to those of female and male (except opisthonotal setae j_{3-5}). Although setae j_{3-5} are densely plumose in the female and male, they are short, smooth, and needle-like in the protonymph.

Pores (Figure 2C). On podonotum, only pores po_2 visible, located near the base of seta j_3. On opisthonotum, only pores Po_1 visible, located anterolaterally to bases of seta Z_1.

Average lengths of opisthonotal setae and distances between setae within longitudinal rows of female and male and protonymph: see Table 3.

Table 3. Lengths of opisthonotal setae and the distances between their bases in J-, Z-, and S- rows of *Prozercon morazae*.

Seta	F	M	PN	Seta	F	M	PN	Seta	F	M	PN
J_1	21	15	10	Z_1	19	10	8	S_1	18	9	8
J_1–J_2	33	28	19	Z_1–Z_2	48	34	28	S_1–S_2	28	33	15
J_2	19	15	8	Z_2	20	15	8	S_2	18	17	8
J_2–J_3	36	27	18	Z_2–Z_3	27	21	12	S_2–S_3	35	24	18
J_3	20	14	7	Z_3	18	15	8	S_3	19	13	14
J_3–J_4	28	22	14	Z_3–Z_4	31	30	15	S_3–S_4	30	24	19
J_4	19	13	5	Z_4	15	12	5	S_4	26	11	18
J_4–J_5	21	19	9	Z_4–Z_5	27	19	–				
J_5	15	9	6	Z_5	12	10	–				
J_5–J_6	8	12	5								
J_6	19	21	16								
J6–J6	62	56	45								

F: female, M: male, PN: protonymph.

Table 4. Length and width intervals of idiosoma of *Prozercon morazae*.

	Prozercon morazae		
	F	M	PN
Greek specimens Ujvári (2011)	330–347 × 228–242	258 × 194	–
Turkish specimens	330–356 × 219–231	288–292 × 189–190	215 × 148

F: female, M: male, PN: protonymph.

Remarks. In type specimens, the number of setae *R* varies between 5 or 7 pairs, but in the Turkish specimens these setae are 7 pairs. In Turkish female specimens, seta J_1 does not reach the base of seta J_2, but in type specimens it reaches. The lateral ends of peritremal shields reach R_7 in Greek specimens, but in our specimens these shields' lateral ends reach R_5.

4. Discussion

Most Turkish specimens' setal and morphological characters are very similar to those of type specimens of *P. morazae*. The lengths and widths were compared on the basis of the available literature (Table 4). According to Table 4, the Turkish *P. morazae* specimens are approximately the same size as type specimens. Furthermore, the different positions of pores may be a result of geographical variation in Zerconidae members.

On the other hand, nine species of the genus *Prozercon* were recorded from different habitats (especially northern and northeastern regions of country) of Greece by Ujvári in 2011. Six of the species, namely *P. achaeanus*, *P. bulbiferus*, *P. dramaensis*, *P. graecus*, *P. morazae*, and *P. norae*, were proved to be new to science. Three further species (*P. carpathofimbriatus*, *P. carsticus*, and *P. yavuzi*) were recorded for the first time from Greece. Of them, *P. bulbiferus*, *P. graecus*, *P. carpathofimbriatus*, and *P. yavuzi* were already known from Turkey. In addition to these species, one new record (*P. morazae*) is reported from Turkey herein. Most probably, the other 4 species known from Greece are expected to be found in northwestern Turkey in the following investigations.

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