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NEW ZERCONID MITE SPECIES (ACARI: MESOSTIGMATA: ZERCONIDAE) FROM ROMANIA

UJVÁRI, ZS.[1] and CĂLUGĂR, A.[2]

[1]*Systematic Zoology Research Group of Hungarian Academy of Sciences and Hungarian Natural History Museum at the Eötvös Loránd University Baross str. 13, H-1088 Budapest, Hungary; E-mail: zs_ujvari@yahoo.com*
[2]*Institute of Biological Researches, Lascăr Catargi str. 47, Iaşi, Romania E-mail: cadina_2004@yahoo.com*

Three zerconid mites *Prozercon katae* UJVÁRI et CĂLUGĂR sp. n., *Zercon atypicus* UJVÁRI et CĂLUGĂR sp. n., *Zercon dentatus* UJVÁRI et CĂLUGĂR sp. n. described from Romania. Three species, *Zercon similifoveolatus* IVAN et CĂLUGĂR, 2004, *Z. marinae* IVAN et CĂLUGĂR, 2004 and *Z. magdae* IVAN et CĂLUGĂR, 2004, are redescribed.

Key words: Acari, Zerconidae, *Prozercon*, *Zercon*, new species, Romania

INTRODUCTION

Romania was the target of numerous taxonomical and faunistical studies focusing on the family *Zerconidae* in the last three decades. The first major work reports 15 species new to the fauna of the country (SOLOMON 1980) collected during all four seasons of the year, in the Eastern Carpathians, the secular forest of Slătioara-Rarău. Later on, two new species: *Prozercon tragardhisimilis* SOLOMON, 1982 and *Zercon aniellae* SOLOMON, 1982, have been described from the former locality as well (SOLOMON 1982). Two years later two other species new to science: *Zercon sylvii* SOLOMON, 1984 and *Zercon blaszaki* SOLOMON, 1984, were recorded from the Eastern Carpathians, Calimani Mts (SOLOMON 1984). Recent investigations have been concentrated beyond the chains of Carpathians, studying the fauna of the northeastern regions of Romania, where further species: *Zercon moldavicus* CĂLUGĂR, 1997, *Prozercon (Plumatozercon) plumosus* CĂLUGĂR, 2004, *Zercon similifoveolatus* IVAN et CĂLUGĂR, 2004, *Z. marinae* IVAN et CĂLUGĂR, 2004 and *Z. magdae* IVAN et CĂLUGĂR, 2004 have been found on lower altitudes (CĂLUGĂR 1997, IVAN & CĂLUGĂR 2004). The latter three species are redescribed since the species names and their incomplete descriptions were included in a scientific research report which one was published as a journal supplement without asking and acquainting the authors. The original descriptions are in Romanian and do not contain all the relevant characters, therefore redescription of them are presented herein. Currently, 38 species of the family Zerconidae are known from Ro-

mania (STĂNESCU & JUVARA-BALS 2005, KONTSCHÁN 2006, KONTSCHÁN & UJVÁRI 2008), however, the fauna of most high mountains is currently unknown, where the highest species richness of zerconid mites is expected, and the Transylvanian Basin with the Apuseni Mts – inhibited by several edaphic endemisms e.g. earthworms (CSUZDI & ZICSI 2003) – have not been investigated as well.

MATERIALS AND METHODS

Soil samples were taken from the forest floor of different forest types of Romania. Mites were extracted using Berlese-funnels, then cleared with lactic acid and mounted in glycerine. Preparations were examined using a light microscope, drawings were made with the aid of a drawing tube. Mites are stored in 70% ethanol. The terminology of setae follows SELLNICK (1958), adopted by BŁASZAK (1974) and MAŠÁN and FENĎA (2004). Distinction of porelike structures are either lyrifissures or solenostomes, as distinguished morphologically by ATHIAS-HENRIOT (1969*a, b*) and JOHNSTON and MORAZA (1991). All measurements including the scale bars of the figures are given in micrometers.

Abbreviations for institutions where the type materials are deposited are as follows: HNHM – Collection of Soil Zoology of the Hungarian Natural History Museum, Budapest, Hungary; IBRR – Acarological Collection of the Institute of Biological Researches Iasi, Romania.

Prozercon katae UJVÁRI et CĂLUGĂR sp. n.
(Figs 1–2)

Type material. Female holotype: Romania, Maramureş, Bocicoiu Mare, 6–17.08.1940, coll. J. Fodor and Z. Kaszab. The holotype is deposited in the HNHM.

Diagnosis. Except marginal r-setae and i1, podonotal setae smooth. On opisthonotum, setae I6, Z5 and S2–4 elongated, brush-like, plumose, other opisthonotal setae short, not reaching the bases of the following one. Among the short setae I1, Z1 and S1 smooth, others feathered. Setae I2 situated far from each other. S1 situated antero-laterally to Z1. Pores Po2 lying outside the line connecting S1 and Z2. Dorsal fossae well sclerotized. Podonotum covered by tile-like pattern. Anterior part of opisthonotum reticulated, posterior part finely punctuated.

Description. Female, holotype. Length of idiosoma: 340 μm; width: 250 μm (n = 1).

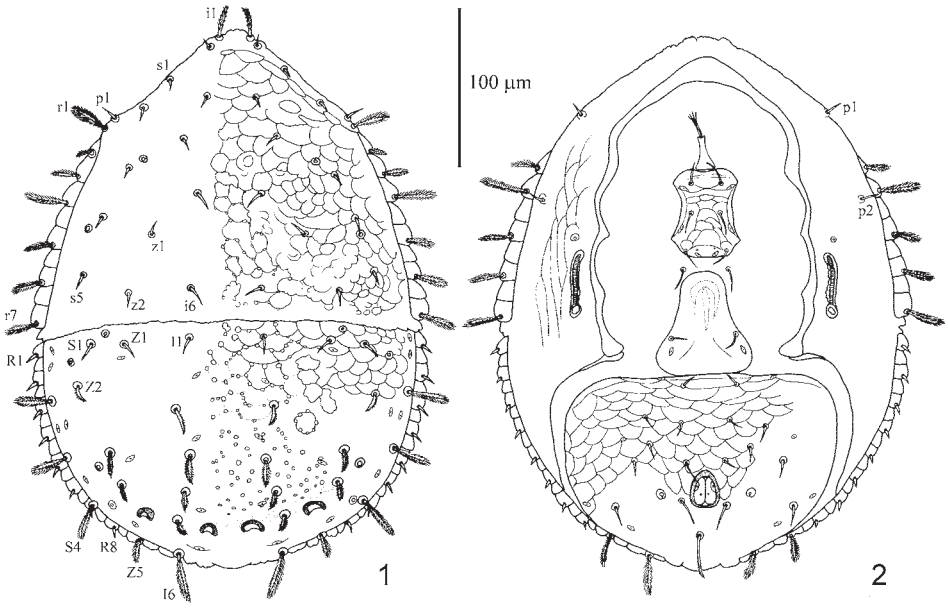
Dorsal side (Fig. 1). Podonotum with 22 pairs of setae: i-row with 6 pairs, z-row with 2 pairs, s-row with 5 pairs, r-row with 7 pairs, p-row with 2 pairs. Setae i1 serrated, marginal r-setae brush-like, plumose, other i-, z- and s-setae short, smooth and needle-like. Podonotum covered by irregular, tile-like pattern, posteromedial region bearing small, irregular pits.

Opisthonotum with 23 pairs of setae: I-row with 6 pairs, Z-row with 5 pairs, S-row with 4 pairs and R-row with 8 pairs. Setae I1, short, smooth and needle-like. Setae I2 situated far from each other, distance between their insertions 61 μm. Setae I2–5 short, pilose or feathered, posteriorly decreasing

Table 1. Lengths of opisthonotal setae and the distances between their bases in I-, Z- and S-rows of *Prozercon katae* sp. n. (measurements as mean).

I1	11	Z1	12	S1	13
I1-I2	45	Z1-Z2	40	S1-S2	42
I2	15	Z2	12	S2	27
I2-I3	32	Z2-Z3	44	S2-S3	36
I3	18	Z3	15	S3	26
I3-I4	23	Z3-Z4	21	S3-S4	36
I4	12	Z4	12	S4	28
I4-I5	18	Z4-Z5	37		
I5	10	Z5	14		
I5-I6	22				
I6	32				

in length. Setae Z1 and I1 similar in shape and length. Z2–4 similar in shape to pilose I-setae, Z2 situated posterolaterally to Z1, Z3 lying far beyond insertions of Z2 (44 μm). Setae Z5 relatively short, brush-like, plumose. Setae S1 similar to I1, situated anterolaterally to Z1. Setae S2–4 elongated, brush-like, plumose, reaching beyond margin of idiosoma. None of opisthonotal setae reaching bases of following setae of the series. Marginal R-setae smooth and pointed. Lengths of setae and distance between setal bases as in in table 1. Anterolateral parts of opisthonotum bearing tile-like pattern. Ir-



Figs 1–2. *Prozercon katae* sp. n. female: 1 = dorsal view, 2 = ventral view

regular depressions between I and Z setal-rows present, other parts finely punctuated. Dorsal fossae small, well sclerotized, saddle-like, with smooth anterior margin and with axes parallel to that of the body.

Dorsal poroidotaxy. Pores po1 situated posteriorly to s1, po2 lying on line connecting bases of setae i4 and s3, closer to s3, po3 outside line connecting s4 and s5. Pores Po1 lying above line connecting Z1 and S1, Po2 situated outside line connecting Z2 and S1, Po3 antiaxial to line connecting Z3 and Z4, Po4 near bases of S4.

Ventral side (Fig. 2). Chaetotaxy and poroidotaxy typical for subgenus *Prozercon*. Both p-setae short and smooth. Posteolateral tips of peritremal shields expanding posteriorly to level of setae R6-7. Peritremes straight, slightly bent anteriorly. Sternal shield well sclerotized, 52 μm long and 32 μm wide at level of setae st2, with reticulate surface. Anterior margin of ventroanal shield with one pair of setae, sculpturing pattern of latter shield tile-like. Seven pairs of preanal setae short, smooth and needle-like, postanal seta prolonged, apically barbed. Ventroanal pores situated anterolaterally to adanal setae.

Male and immature stages. Unknown.

Etymology. The species is dedicated in honour of a dear friend of the first author KATA WOLFF.

Differential diagnosis. The new species is morphologically similar to *Prozercon aristatus* ATHIAS-HENRIOT, 1961 described from the Iberian Peninsula and to *Prozercon neorafalskii* BALAN et SERGIENKO, 1991 described from the Ukrainian Carpathians. In females of these three species anterior setae on opisthonotum are smooth and five pairs of brush-like setae (S2–4, Z5 and I6) are expanding beyond the margin of opisthonotum. The three species can be distinguished by the shape of setae on anterior surface of opisthonotum (I1, Z1 and S1 smooth in *P. katae* sp. n., besides latter three setae I2 and Z2 also smooth in *P. aristatus*, and only I1 and S1 smooth in *P. neorafalskii*), by the length of I-setae (very short, and not reaching the bases of the following setae in *P. katae* sp. n., I3–5 longer, reaching the bases of the following on in *P. aristatus*, I2–5 longer and reaching the insertion of the following setae in *P. neorafalskii*), by the situation of setae Z3 (situated far from Z2, near Z4 in *P. katae* sp. n., situated between Z2 and Z4 equidistantly in other two species), by the shape of Z4 (similar to I3–5 in *P. katae* sp. n. and *P. neorafalskii*, significantly longer than latter setae in *P. aristatus*), by the situation of pores Po1 (situated anterolaterally to Z1 in *P. katae* sp. n. and *P. neorafalskii*, situated anteromedially to Z1 in *P. aristatus*) and by the separation of I setal-rows (widely separated in *P. katae* sp. n., separated only by a narrow surface in other two species).

Zercon atypicus UJVÁRI et CĂLUGĂR sp. n.
(Figs 3–4)

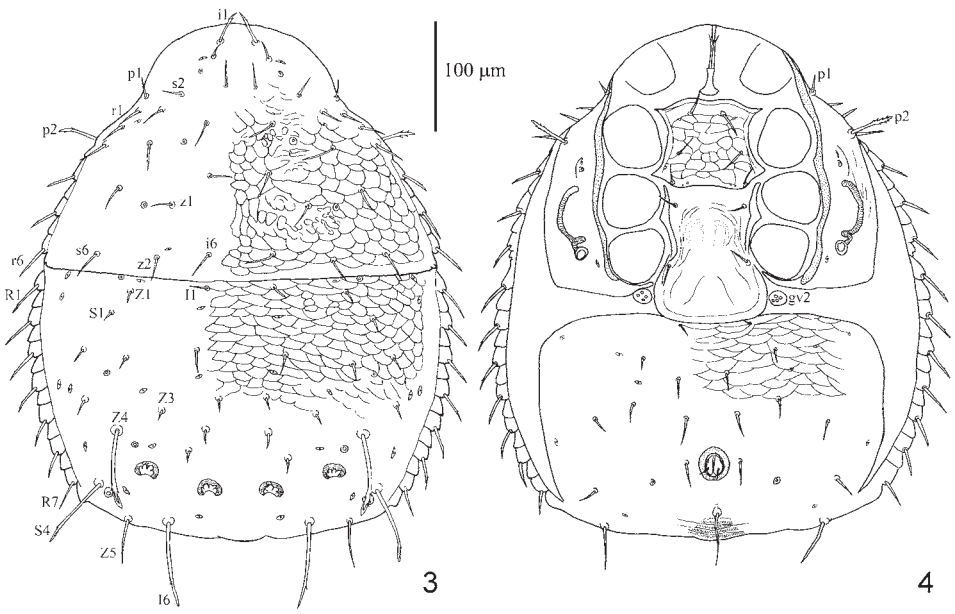
Type material. Female holotype and 5 female paratypes: Romania, Ţarcu Mts, Poiana Mărului, beech forest, N45°23,362', E22°34,475', 890 m a.s.l., from leaf litter, 02.11.2007, leg. Cs.

CSUZDI, J. KONTSCHÁN and V. POP. Two female paratypes: Romania, Ţarcu Mts, Poiana Mărului, beech forest, N45°23,362', E22°34,475', 890 m. a.s.l., from lichen, 02.11.2007, leg. CS. CSUZDI, J. KONTSCHÁN and V. POP. The type material is deposited in the HNHM.

Diagnosis. Anterior margin of ventroanal shield with one pair of setae. On podonotum, setae i1 serrated, marginal r-setae very finely barbed distally. Most of opisthonotal setae short, pairs I6, Z4 and S4 pairs elongated, distally barbed, with hyaline endings. Setae Z3 with an unusual position, situated on the line connecting the bases of setae I3 and Z4. Among the short setae, I3–5 and Z3 with very fine pilosity, other setae smooth. Marginal R-setae finely barbed distally, longer than short members of the I-, Z- and S setal-rows. Pores Po3 situated below the line connecting the bases of setae I5 and Z4, near Z4. Dorsal cavities of general size and appearance, ornamentation of opisthonotum anteriorly tile-like, posteriorly smooth.

Description. Female. Length of idiosoma 473 µm in holotype (455–485 µm in 8 paratypes; mean 470 µm); width of idiosoma 375 µm (370–380 µm; 375 µm).

Dorsal side (Fig. 3). Podonotum with 21 pairs of setae: i-row with 6 pairs, z-row with 2 pairs, s-row with 5 pairs, r-row with 6 pairs, p-row with 2 pairs. Setae s1 absent. Setae i1 rarely serrated, marginal r-setae distally barbed, other podonotal setae short (14–26 µm) and smooth. Podonotal shield covered by irregular, tile-like pattern.



Figs 3–4. *Zercon atypicus* sp. n., female: 3 = dorsal view, 4 = ventral view

Table 2. Lengths of opisthonotal setae and the distances between their bases in I-, Z- and S-rows of *Zercon atypicus* sp. n. (measurements as mean).

I1	16	Z1	13	S1	12
I1-I2	62	Z1-Z2	63	S1-S2	41
I2	17	Z2	14	S2	14
I2-I3	43	Z2-Z3	57	S2-S3	45
I3	12	Z3	11	S3	15
I3-I4	33	Z3-Z4	54	S3-S4	78
I4	15	Z4	72	S4	70
I4-I5	29	Z4-Z5	80		
I5	14	Z5	42		
I5-I6	62				
I6	79				

Opisthonotum with 22 pairs of setae: I-row with 6 pairs, Z-row with 5 pairs, S-row with 4 pairs and R-row with 7 pairs. Setae I1–5 short, I1–2 smooth and needle-like, I3–5 finely serrated. Setae I6 elongated, thickened, apically barbed and pointed, distance between their bases 128 μm. Setae Z1–3 short, Z1–2 similar in shape and length to I1–2, Z3 similarly to I3–5 finely serrated. Setae Z3 have extraordinary position between regular I- and Z-setal series, situated on line connecting bases of setae I3 and Z4. Setae Z4 elongated, thickened, apically barbed, but differing from setae I6 by pronounced apical hyaline sheaths. Setae Z5 smooth, setiform. Setae S1–3 similar in shape and length to I1–2, setae S4 similar to I6. Marginal setae twice longer than short opisthonotal setae, fine apical serration can be observed on their distal half, principally on anterior ones. Not any of opisthonotal setae reaching bases of following one within the series. Lengths of setae and distances between setal bases as in Table 2. Marginal serration of dorsal idiosoma shallow and obtuse. Tile-like pattern can be found on anterior part of opisthonotum (expanding postero-laterally), medial and posterior parts without ornamentation. Dorsal cavities of general size and appearance, uniform, saddle-like, with smooth anterior margin and with axes parallel to that of the body.

Poroidotaxy. Pores po1 lying below line connecting bases of setae i2 and s2, po2 below line connecting i4 and s4, po3 below line connecting z1 and s5. Pores Po1 situated antero-laterally to Z1, Po2 lying on (or just above) line connecting Z2 and S3, Po3 below line connecting I5 and Z4, Po4 on line connecting Z5 and S4, behind S4.

Ventral side (Fig. 4). Chaetotaxy, poroidotaxy and shape of ventral shields typical for genus *Zercon*. Peritremal shields with shallow fissures as ornamentation. Peritremes bifurcate and curved. Sternal shield well sclerotized, 82 μm long and 80 μm wide at level of setae st2, with slightly arcuate posterior margin and reticulate ornamentation. Large adgenital plates with four gland-openings of gv2. Ventroanal shield covered by tile-like pattern, anterior margin of it with one pair of setae. Seven pairs of preanal setae short, smooth and needle-like, postanal setae prolonged, smooth. Ventroanal pores gv3 situated posterolaterally to adanal setae.

Male and immature stages. Unknown.

Etymology. The epithet “atypicus” refers to the unusual position of setae Z3.

Table 3. Distinguishing characters between *Zercon atypicus* sp. n., *Zercon curiosus* and *Zercon dampfi*.

Zercon atypicus sp. n.	*Zercon curiosus*	*Zercon dampfi*
Setae s1 absent	Setae s1 present	Setae s1 present
Setae I1–2 smooth, I3–5 finely serrated	Setae I1–5 smooth	Setae I1–5 smooth
Z3 situated on line connecting I3 and Z4	Z3 situated on line connecting Z2 and Z4	Z3 situated on line connecting Z2 and Z4
Z2 situated posteromedially to S2	Z2 situated anteromedially to S2	Z2 situated anteromedially to S2
R-setae apically barbed, twice longer than short I-setae	R-setae smooth, as long as short I-setae	R-setae smooth, as long as short I-setae
Dorsal cavities saddle-like, with smooth anterior margin	Dorsal cavities star-like, with lobed anterior margin	Dorsal cavities saddle-like, with smooth anterior margin
Po3 situated below line connecting I5 and Z4, near Z4	Po3 situated on line connecting I5 and Z4, equidistantly	Po3 situated on line connecting I4 and Z4, equidistantly
Anterior margin of ventroanal shield with one pair of setae	Anterior margin of ventroanal shield with two pairs of setae	Anterior margin of ventroanal shield with two pairs of setae

Differential diagnosis. The new species belongs to the group having short I-setae and is most similar to *Zercon curiosus* TRÄGÅRDH, 1910 described from Lappland and to *Zercon dampfi* SELLNICK, 1944 described from Germany by having only 3 pairs of elongated opisthonotal setae (I6, Z4 and S4). *Zercon atypicus* sp. n. can be distinguished from latter two species according to Table 3.

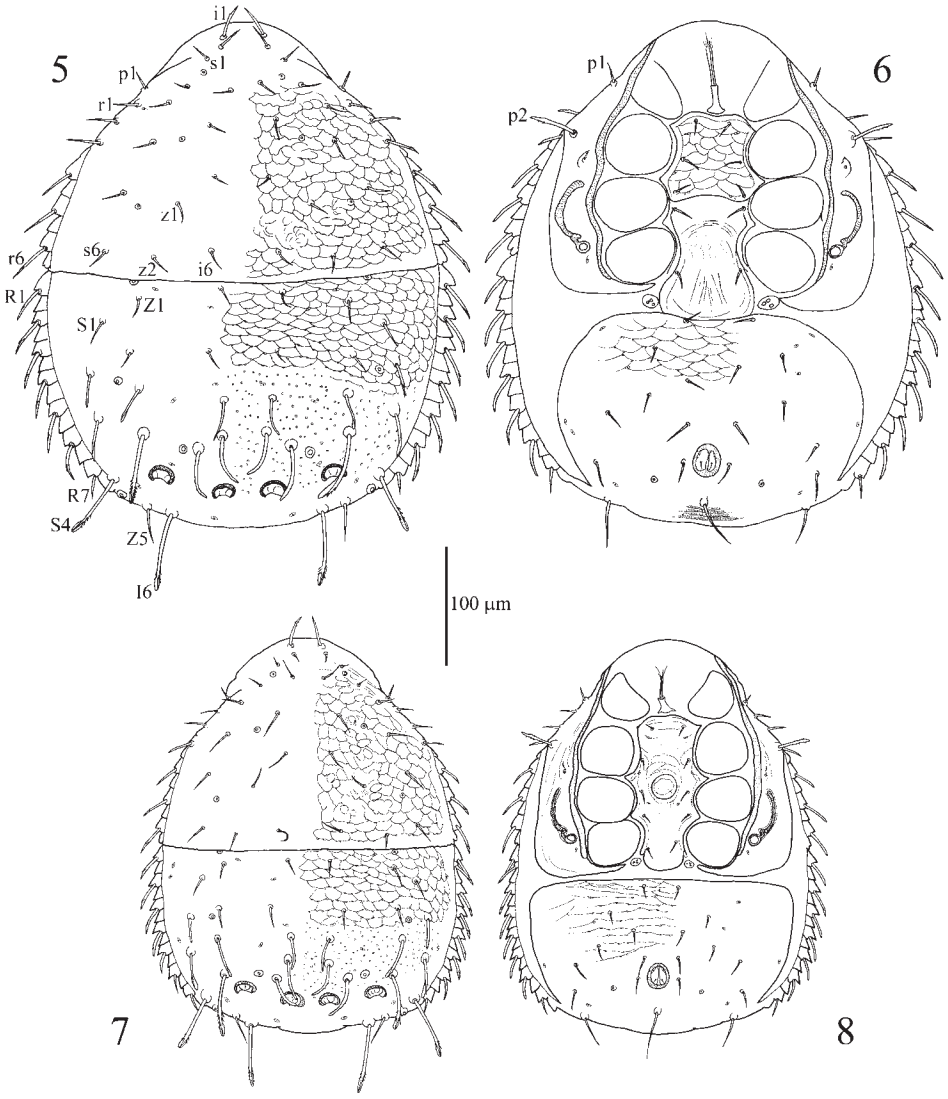
Zercon dentatus UJVÁRI et CĂLUGĂR sp. n.
(Figs 5–8)

Type material. Female holotype and one male paratype: Romania, Oltenia, Dâmbova, oak-hornbeam mixed forest, N44°56,995', E23°11,667', 458 m a.s.l., from leaf litter, 30.10.2007, leg. CS. CSUZDI, J. KONTSCHÁN and V. POP. Two female paratypes: Romania, Cerna Valley, Băile Herculane, 06.04.1938, leg. K. Dorn. All type material is deposited in the HNHM.

Diagnosis. Anterior margin of ventroanal shield with one pair of setae. Marginal r- and R-setae finely barbed distally. Setae I3–5 elongated, thickened, smooth or very finely pilose on distal half. I5 situated posterolaterally to I4. Z3 reaching the bases of Z4. I6, Z4 and S4 long, apically pilose, with wide hyaline sheaths. Pores Po3 situated below the line connecting I5 and Z4, near I5. Marginal serration deep and acuminous. Dorsal cavities of general size and appearance. Anterior surface of opisthonotum covered by tile-like pattern, posterior part punctuated.

Description. Female. Length of idiosoma 423 µm in holotype (417–434 µm in 3 paratypes; mean 425 µm); width 352 µm (348–360 µm; 355 µm).

Dorsal side (Fig. 5). Podonotum with 22 pairs of setae: i-row with 6 pairs, z-row with 2 pairs, s-row with 6 pairs, r-row with 6 pairs, p-row with 2 pairs. Setae i1 distally serrated, marginal setae r3–6 with fine apical pilosity, thickened, approximately 1.5 times longer than the remaining short and needle-like podonotal setae. Podonotum covered by tile-like ornamentation.



Figs 5–8. *Zercon dentatus* sp. n.: 5 = dorsal view of female, 6 = ventral view of female, 7 = dorsal view of male, 8 = ventral view of male

Table 4. Lengths of opisthonotal setae and the distances between their bases in I-, Z- and S-rows of *Zercon dentatus* sp. n. (measurements as mean).

	♀	♂		♀	♂		♀	♂
I1	18	13	Z1	18	13	S1	19	12
I1-I2	36	26	Z1-Z2	32	25	S1-S2	34	23
I2	23	16	Z2	21	14	S2	33	25
I2-I3	30	22	Z2-Z3	27	22	S2-S3	46	34
I3	22	15	Z3	22	19	S3	36	25
I3-I4	29	22	Z3-Z4	26	20	S3-S4	45	40
I4	23	17	Z4	42	28	S4	38	27
I4-I5	43	33	Z4-Z5	55	37			
I5	22	17	Z5	10	10			
I5-I6	19	12						
I6	37	28						

Opisthonotum with 22 pairs of setae: I-row with 6 pairs, Z-row with 5 pairs, S-row with 4 pairs and R-row with 7 pairs. Setae I1–2 short, smooth and needle-like, never reaching bases of followings. Setae I3–5 similar in shape, elongated, thickened, their length growing posteriorly. Last three pairs scarcely pilose, serration most pronounced on I5 with low distal ridge, but without hyaline sheaths on them. Setae I5 lying posterolaterally to I4, I3 and I4 reaching beyond bases of following setae in the serie. Setae I6 elongated, apically pilose, bearing hyaline endings. Setae Z1–2 similar in shape to I1–2, not reaching following's bases. Setae Z3 similar in length to I3, but differ in shape by bearing distinct hyaline sheaths. Setae Z4 similar in shape to I6, setae Z5 smooth, setiform. S-setae growing in size posteriorly. S1 setiform, smooth, S2 similarly to r- and R-setae, scarcely pilose on their distal half, S3 resembling Z3, with hyaline endings, not reaching margin of idiosoma, S4 similar in shape to I6. Marginal R-setae thickened, approximately twice longer than setae I1–2, very finely pilose on their distal half. Lengths of setae and distance between setal bases as in Table 4. Marginal serration of dorsal shields deep and acuminous. Anterior surface of opisthonotum bearing tile-like pattern, posteriorly – through a reticulate pattern – finely punctuated ornamentation can be observed. Dorsal cavities of general size and appearance, uniform, saddle-like, with smooth anterior margin and with axes parallel to that of body.

Poroidotaxy. Pores po1 lying on line connecting bases of setae i2 and s2, po2 below line connecting i4 and s4, po3 below line connecting z1 and s5. Pores Po1 situated anterolaterally to Z1, Po2 lying below line connecting Z2 and S2, Po3 below line connecting I5 and Z4, near I5, Po4 on line connecting Z5 and S4, behind S4.

Ventral side (Fig. 6). Chaetotaxy, poroidotaxy and shape of ventral shields typical for genus *Zercon*. Peritremes firmly curved. Sternal shield well sclerotized, 77 μm long and 61 μm wide at level of setae st2, with reticulate surface and slightly arcuate posterior margin. Adgenital platelets with three pairs of gland-openings. Ventroanal shield covered by tile-like pattern and finely punctuated. Anterior margin of ventroanal shield with one pair of setae. Seven pairs of preanal setae short, smooth and needle-like, postanal seta prolonged, smooth. Ventroanal pores situated posterolaterally to adanal setae.

Male (Figs 7–8). Length of idiosoma: 330 μm; width: 255 μm (n = 1).

Chaetotaxy and poroidotaxy of dorsal shields as in female, except: setae I3–5 with more distinct pilosity, setae Z3 and S3 reaching the followings bases, and marginal serration deeper and more strongly

acuminous. Sternogenital shield bearing five pairs of setae, a weakly sclerotized band between st1 and st2 can be observed. Ventroanal shield expanded laterally, with wide, straight anterior margin.

Immature stages. Unknown.

Etymology. The epithet "dentatus" means dentate, which refers to the shape of marginal serration of dorsal shields.

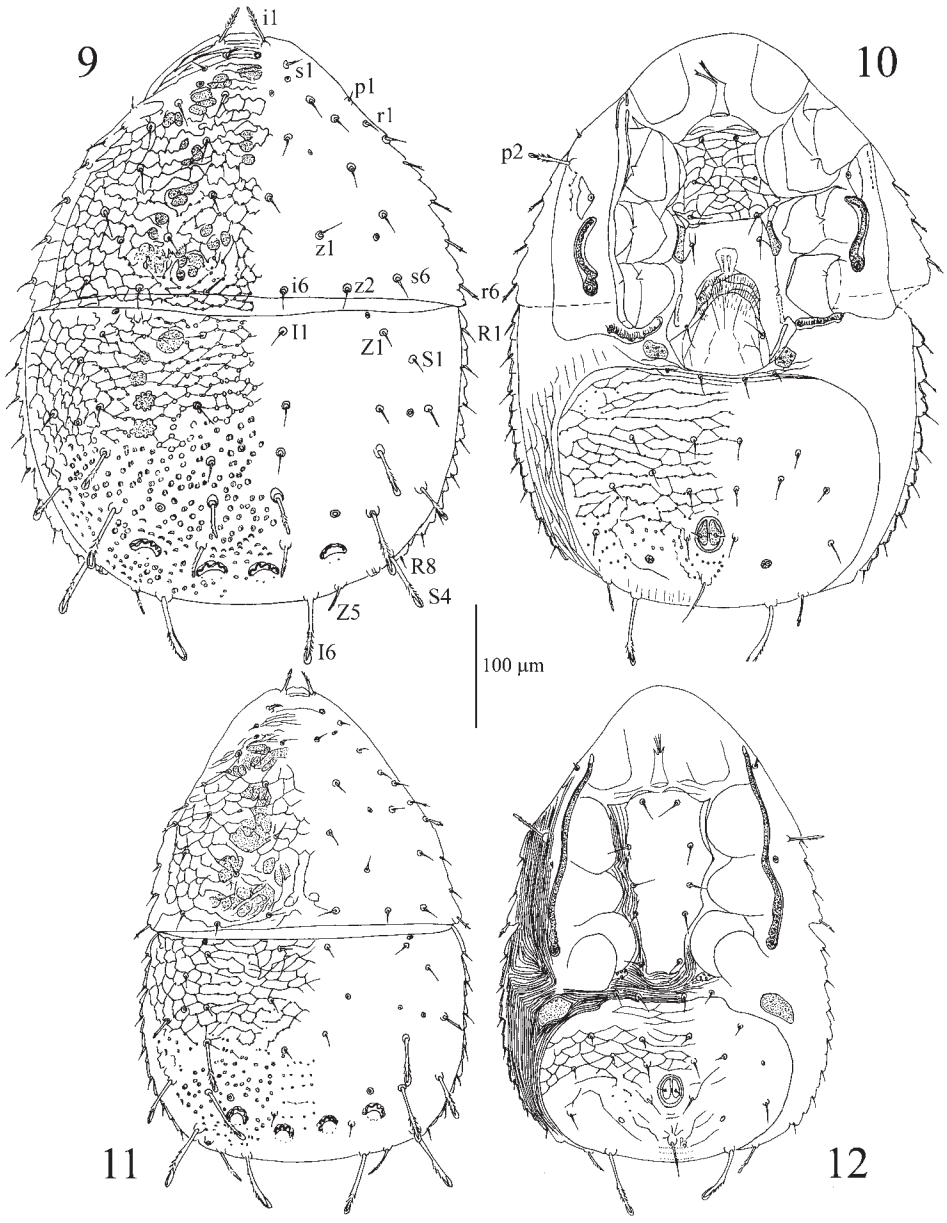
Differential diagnosis. The new species belongs to the group with full complement of podonotal and opisthonotal setae, deep and acuminous marginal serration, and is morphologically similar to *Zercon gurensis* MIHELČIČ, 1962 described from the Tirol Alps by the position and shape of setae I3–5. The two species can be distinguished according to the following features: in *Zercon dentatus* sp. n. setae I3–5 smooth or very finely pilose, setae Z3 two times shorter than Z4 and not reaching their bases, setae S3 not reaching the margin of idiosoma, the posterior surface of opisthonotum punctuated and Po3 situated near I5; in *Zercon gurensis* setae I3–5 densely pilose on their distal half, setae Z3 similar to Z4 and reaching their bases, setae S3 expanding beyond the margin of idiosoma, posterior surface of opisthonotum smooth and Po3 situated near Z4.

Zercon similifoveolatus IVAN et CĂLUGĂR, 2004
(Figs 9–12)

Type material examined. Female holotype and paratypes: 2 females and 1 deutonymph: Romania, Glăvăneşti – Bacău County, pedunculate oak-hornbeam forest with sessile oak, ash and lime tree, from leaf litter, 30.04.1998, leg. N. VASILIU (deposited in the IBRR).

Additional material. One female: Romania, Drislea-Cozancea – Botoşani County, sessile oak forest, leg. O. IVAN; Five females: Romania, Seaca Movileni – Vaslui County, *Quercus pedunculiflora* and *Quercus pubescens* (downy oak), leg. N. VASILIU.

Diagnosis. Anterior margin of ventroanal shield with two pairs of setae. Podonotal setae smooth, with the exception of i1, i2 and marginal setae. Setae I1–2, Z1–2 and S1–2 short, with one barb. I3 short, with a few barbs. I4–5 stouter, medium-sized, barbed and with a hyaline sheath. Setae I5 not reaching the insertions of the following setae of the row. I6, Z3–4 and S3–4 elongated, barbed, with hyaline sheath. Z3 reaching the insertion of the next setae. Marginal setae short, the anterior two pairs barbed, others simple. Po3 situated above the line connecting insertions of setae I5 and Z4, equidistantly. Sculpturing pattern of opisthonotum reticulate-punctate. Dorsal cavities saddle-like, with smooth anterior and undulate posterior margins.



Figs 9–12. *Zercon similifoveolatus* IVAN et CĂLUGĂR, 2004: 9 = dorsal view of female, 10 = ventral view of female, 11 = dorsal view of deutonymph, 12 = ventral view of deutonymph

Table 5. Lengths of opisthonotal setae and the distances between their bases in I-, Z- and S-rows of *Zercon similifoveolatus* IVAN et CĂLUGĂR, 2004 (measurements as mean)

	♀	DN		♀	DN		♀	DN
I1	17	10	Z1	12	10	S1	17	12
I1–I2	35	43	Z1–Z2	35	43	S1–S2	25	42
I2	18	12	Z2	17	10	S2	18	20
I2–I3	28	43	Z2–Z3	21	28	S2–S3	37	63
I3	18	10	Z3	42	42	S3	37	38
I3–I4	20	–	Z3–Z4	27	40	S3–S4	35	48
I4	27	absent	Z4	58	53	S4	57	52
I4–I5	22	–	Z4–Z5	42	32			
I5	28	15	Z5	23	25			
I5–I6	30	42						
I6	63	53						
I6–I6	69	95						

Redescription. Female. Length of idiosoma 461 μm in holotype (448–480 μm in 3 paratypes; mean 463 μm); width 352 μm (335–365 μm; 350 μm).

Dorsal side (Fig. 9). Podonotum with 22 pairs of setae: i-row with 6 pairs, z-row with 2 pairs, s-row with 6 pairs, r-row with 6 pairs, p-row with 2 pairs. Setae i1 and i2 serrated, other podonotal setae short (14–33 μm) and smooth. Lateral surface of shield covered by tile-like pattern, central surface with reticulate ornamentation.

Opisthonotum with 22–23 pairs of setae: I-row with 6 pairs, Z-row with 5 pairs, S-row with 4 pairs and R-row with 7–8 pairs. Setae I1–2, Z1–2 and S1–2 similar in shape and length, short, thin and with one barb. I3 short but more barbed. I4–5 longer, stouter, barbed and with hyaline sheath, I6 approximately twice as long as former setae, but similar in shape. Setae I4 reaching bases of setae I5; I5 not reaching next setae of the row. Z3–Z4 and S3–4 longer and stouter than other setae of corresponding row and provided with hyaline sheath at end. Z3 reaching bases of next setae. Marginal setae short, anterior two pairs barbed, following ones simple. Single pair of supplementary marginal setae may be present. Lengths of setae and distances between setal bases as in table 5. Marginal serration of dorsal idiosoma shallow and obtuse. Sculpturing pattern of opisthonotum reticulated on lateral sides, up to bases of I2, Z3 and S3, posterior surface punctuated. Dorsal cavities equal as to their shape, arranged in parallel direction to body axis.

Poroidotaxy. Pores po1 situated axially to line connecting s1–s2, po2 on line connecting i4–s4, po3 lying axially to line connecting s5–6. Pores Po1 located anteroparaxially to bases of setae Z1, Po2 situated below line connecting setae S2–Z2, near S2, Po3 situated above line connecting setae I5–Z4, equidistantly, Po4 located behind insertion of S4.

Ventral side (Fig. 10). Chaetotaxy, poroidotaxy and shape of ventral shields typical for genus *Zercon*. Peritremes firmly curved. Sternal shield well sclerotized, 77 μm long and 69 μm wide at level of setae st2, with straight posterior margin and reticulate ornamentation. Adgenital platelets with four gland-openings each. Anterior margin of the ventroanal shield bearing two pairs of setae (Vm1 and Vi1). Ventroanal shield with network-type ornamentation anteriorly and punctuation on posterior surface. Ventroanal pores situated posterolaterally to adanal setae.

Deutonymph. Dorsum (Fig. 11). Length of idiosoma: 384 μm; width: 262 μm (n = 1).

Table 6. Distinguishing characters between *Zercon similifoveolatus* IVAN et CĂLUGĂR, 2004 and *Zercon foveolatus* HALAŠKOVÁ, 1969.

Zercon similifoveolatus	*Zercon foveolatus*
Body length 448–480; width 333–365	Body length 482–514; width 371–392
I4 reaching bases of next setae of row	I4 not reaching bases of next setae of row
I5 reaching exterior edge of middle cavities	I5 not reaching cavities level
I4–5 barbed, with hyaline sheath	I4–5 with pilose tips
Z5 barbed, with hyaline ending	Z5 smooth, without hyaline ending
Po1 located anteromedially of bases Z1	Po1 located anteriorly to bases Z1
Po2 on line connecting Z2–S2	Po2 below line connecting Z2–S2

Most of podonotal setae similar to that of adults, however, slightly shorter (10–22 μm). Setae r2, r3 and r6 with 2–3 barbs and with hyaline sheath on their tip. Shield covered by tile-like pattern, irregular pits and elevations.

On opisthonotum, setae I1–5 short, with one barb on each of them. In analyzed exemplar setae I4 absent. Shape of setae I6 identical to that of adult forms being barbed and with hyaline sheath at end. Z1–2 similar to I1–5, being short and smooth. Z3–4 similar to I6. Z3 reaching bases of Z4. Z4 exceeding edge of body and together with I6 longest setae of body. Z5 short, barbed, with hyaline sheath at their tips. In S-row, setae S1 short, smooth; S2 short, with one barb and hyaline sheath at end. S3–4 longer, stouter, barbed and distally provided with hyaline sheath, being similar to I6, Z3 and Z4. S3 reaching bases of S4. Marginal setae short, simple and thorn like. Length of setae and distances between setal bases as in Table 5. Sculpture of opisthonotum reticulated up to bases of I3, Z3 and S2; behind line assigned by former setae, surface ornamented by foveolar structure.

Pores Po1 located at exterior of insertion place of Z1. Position of rest of pores similar to that of adults.

Ventral side (Fig. 12). Anterior border of ventroanal plate with two pairs of setae, similarly to adults (Vm1 and Vi1). Surface of ventroanal shield finely covered by reticulated ornamentation.

Differential diagnosis. *Zercon similifoveolatus* IVAN et CĂLUGĂR, 2004 is closely related to *Zercon foveolatus* HALAŠKOVÁ, 1969 described from the East Carpathians by the similar ornamentation and chaetotaxy of dorsal shields. The main differences between the two species are shown in Table 6.

Zercon marinae IVAN et CĂLUGĂR, 2004
(Figs 13–18)

Type material examined. Female holotype and paratypes: 86 females, 2 males and 1 deutonymph: Romania, Vlădeni, Iaşi County, *Lolium perenne* and *Poa bulbosa* meadow, 14.05.1972, leg. N. VASILIU (deposited in the IBRR).

Additional material. 6 females and 3 males: Romania, Gropniţa, Iaşi County, *Lolium perenne* and *Agrostis stolonifera* meadow, 4.05.1971, leg. N. VASILIU.

Diagnosis. Anterior margin of ventroanal shield with one pair of setae. Marginal r- and R-setae finely barbed distally. Setae I1–2 smooth, short. I3–6 thick, barbed and provided with hyaline sheaths, growing in length from I3 to I6. Pores Po3 situated above line connecting I5 and Z4. Dorsal cavities of general size and appearance. Anterior part of opisthonotum with reticulate ornamentation, posterior surface foveolate.

Description. Female. Length of idiosoma: 428 μm in holotype (403–454 μm in 93 paratypes; average 431 μm); width: 320 μm (288–333 μm; 332 μm).

Dorsal side (Fig. 13). Podonotum with 22 pairs of setae: i-row with 6 pairs, z-row with 2 pairs, s-row with 6 pairs, r-row with 6 pairs, p-row with 2 pairs. Podonotal setae short (10–28 μm), most of them smooth, except setae i1 and marginal ones, which barbed and distally provided with hyaline sheath. Lateral surface of shield covered by tile-like pattern, central surface with reticulate ornamentation.

Opisthonotum with 22 pairs of setae: I-row with 6 pairs, Z-row with 5 pairs, S-row with 4 pairs and R-row with 7 pairs. Setae I1–2 short and simple; I3–6 much thicker than anterior two pairs of I-row, barbed and provided distally with hyaline sheath. I3–4 reaching bases of following setae of row. I5 not reaching insertions of next setae of row. In Z-row, setae Z1–2 short and simple. Z3–4 much thicker than other Z-setae. Z5 short, barbed and with hyaline sheath. In S-row, S1 short and smooth, S2 longer than S1, stouter and provided with barbs and hyaline sheaths. Setae S3 longer and stouter than S2, more densely barbed and having hyaline sheath. S4 thick, barbed bearing hyaline sheath at end and exceeding body edge with 2/3 of their length. All marginal setae provided with 2–3 barbs and distally bearing hyaline sheath. Lengths of setae and distances between setal bases as in Table 7. Marginal serration of dorsal idiosoma shallow and obtuse. Opisthonotum reticulated on lateral sides, up to bases of I3, Z2 and S2; rest of it covered by foveolar sculpture. Dorsal fossae equal in size and arranged in parallel direction to body axis.

Poroidotaxy. Pores po1 situated axially to bases of setae s1, po2 lying below line connecting i4-s4, po3 located axially to line connecting s5–6. Pores Po1 situated anteroparaxially to bases of Z1, Po2 located below line connecting setae S2–Z2. Pores Po3 situated on line connecting setae I4–Z4. Pores Po4 located below bases of S4.

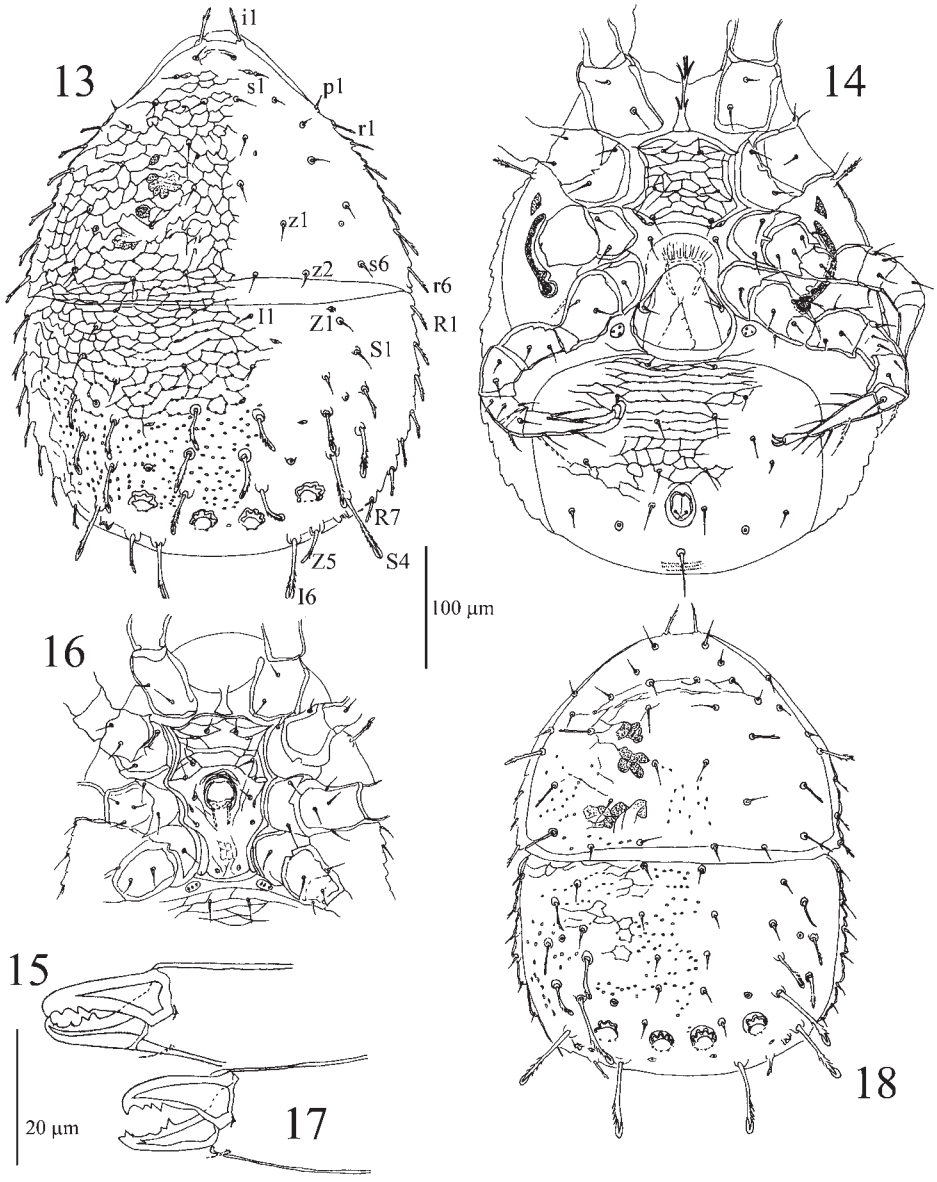
Ventral side (Fig. 14). Chaetotaxy, poroidotaxy and shape of ventral shields typical for genus *Zercon*. Peritremes firmly curved. Sternal shield well sclerotized, 74 μm long and 70 μm wide at level of setae st2, with slightly arcuate posterior margin and reticulate ornamentation. Adgenital platelets present, with three gland-openings each. Anterior side of ventroanal shield bearing one pair of setae (Vm1). Surface of ventroanal shield covered by reticulate pattern. All of ventroanal setae simple, except barbed postanal seta. Ventroanal pores situated posterolaterally to adanal setae.

Male (Figs 16–17). Length of idiosoma: 332–352 μm; width: 237–243 μm (n = 5); average: length: 342 μm; width: 239 μm.

Chaetotaxy and poroidotaxy of dorsal shields as in female. Lengths of setae and distances between setal bases as in Table 7. Shape of chelicerae (Fig. 17) differs from that of females (Fig. 15, 17) as presented, without specific peculiarities. As we remarked at different species (*Zercon aniellae* SOLOMON, 1984, *Zercon hungaricus* HALAŠKOVA, 1969, *Zercon fageticola* SELLNICK, 1958, *Prozercon plumosus* CĂLUGĂR, 2004) the terminal part of the fixed chela from the male's chelicera is straighter than of the female's and incised at the end. The female's chelicera has both cheliceral segment curved and sharp, similar to a "parrot beak" (CĂLUGĂR 2006).

Deutonymph. Dorsum (Fig. 18). Length of idiosoma: 358 μm; width: 250 μm (n = 1).

Shape of podonotal setae different to that of adults. Most of podonotal setae smooth, except densely barbed i1, setae s4–s6 and marginal setae r3–r6 which barbed and provided with hyaline sheath at tips. Podonotal ornamentation weakly developed, only fine punctuation present.



Figs 13–18. *Zercon marinae* IVAN et CĂLUGĂR, 2004: 13 = dorsal view of female, 14 = ventral view of female, 15 = chelicera of female, 16 = sternogenital region of male with the anterior margin of ventroanal shield, 17 = chelicera of male, 18 = dorsal view of deutonymph

Table 7. Lengths of opisthonotal setae and the distances between their bases in I-, Z- and S-rows of *Zercon marinae* IVAN et CĂLUGĂR, 2004 (measurements as mean).

	♀	♂	DN		♀	♂	DN		♀	♂	DN
I1	10	8	10	Z1	13	8	13	S1	16	10	17
I1-I2	42	33	37	Z1-Z2	51	35	35	S1-S2	35	25	28
I2	13	8	8	Z2	16	8	13	S2	26	15	25
I2-I3	42	28	33	Z2-Z3	32	22	25	S2-S3	36	25	33
I3	29	12	10	Z3	35	18	33	S3	32	28	28
I3-I4	35	18	28	Z3-Z4	42	23	30	S3-S4	35	42	37
I4	32	13	12	Z4	42	28	57	S4	48	35	52
I4-I5	29	17	25	Z4-Z5	61	48	53				
I5	32	12	12	Z5	26	15	17				
I5-I6	42	40	37								
I6	48	42	57								
I6-I6	109	87	85								

Opisthonotal setae different to that of adult forms. Setae I6 long, thick, barbed and provided with hyaline sheath at end, rest of I-setae smooth and short. In Z-row, only Z1 and Z2 short and smooth, Z3–4 long, thick and provided with hyaline sheath at their end. Z3 reaching bases of setae Z4. Z4 exceeding edge of body. Z5 short, barbed with hyaline sheath. In S row, only setae S1 smooth. S2–4 barbed and provided with hyaline sheath at their end. Marginal R-setae short, smooth. Lengths of setae and distances between setal bases as in Table 7. Reticulate microsculpture of shield weakly

Table 8. Distinguishing characters between *Zercon marinae*, *Zercon balearicus* and *Zercon cretensis*.

Zercon marinae	*Zercon balearicus*	*Zercon cretensis*
I3 and Z3 elongated, pilose, with hyaline sheets	I3 and Z3 short, smooth	I3 and Z3 elongated, scarcely pilose, with obtuse ending
I5–6, Z4 and S3–4 long, apically pilose, with hyaline sheets	I5–6, Z4 and S3–4 long, apically tapering and pilose, with hyaline sheets	I5–6, Z4 and S3–4 long, scarcely pilose, with obtuse ending
Z1 shifted laterally to S-row	Z1 in regular position	Z1 shifted laterally to S-row
Z1–2 and S1 pointed, needle-like	Z1–2 and S1 pointed, needle-like	Z1–2 and S1 with obtuse ending
S3 not reaching margin of idiosoma	S3 not reaching margin of idiosoma	S3 reaching beyond margin of idiosoma
dorsal cavities of general size, with undulate anterior margins and with axes parallel to that of body	dorsal cavities large, with smooth anterior margins and with axes converging posteriorly	dorsal cavities of general size, saddle-like, with smooth anterior margins and with axes parallel to that of body
Po2 situated below line connecting Z2 and S2	Po2 situated below line connecting Z2 and S2	Po2 situated on or above line connecting Z2 and S2

developed. Area between I-rows and lateral surface of shield foveolated. Dorsal cavities equal in size and with axes parallel to that of body.

Pores Po1 not visible, rest of pores with same position as in adult stage.

Differential diagnosis. The species belongs to the group with full complement of podonotal and opisthonotal setae, one pair of setae on the anterior part of the ventrianal shield, I1–I5 heterogeneous in shape and length, of which the first two pairs short and thin and mostly resembles *Zercon balearicus* ATHIAS-HENRIOT, 1961 and *Zercon cretensis* UJVÁRI, 2008 by the similarity of the ornamentation, general shape of the body, the shape and situation of opisthonotal setae. The distinguishing characters between the three species are given in Table 8.

Zercon magdae IVAN et CĂLUGĂR, 2004
(Figs 19–21)

Type material examined. Female holotype and 1 female paratype: Romania, Horia, Botoşani County, saxicolous vegetation with *Bryophytes sinusia* and *Asplenium trichomanes*, 25.10.2000, leg. O. IVAN (deposited in the IBRR).

Diagnosis. Anterior margin of ventroanal shield with two pairs of setae. Podonotal setae smooth, with the exception of i1, i2 and the marginal ones (i1 densely barbed, i2 finely barbed, setae from r row with 3 barbs and distally with a hyaline sheath). Opisthonotum with reticulated lateral sides, up to the insertions of I3, Z2 and S2, the rest covered by a foveolate microsculpture. Dorsal fossae large and ar-

Table 9. Lengths of opisthonotal setae and the distances between setal bases in I-, Z- and S-rows of *Zercon magdae* IVAN et CĂLUGĂR, 2004 (measurements as mean).

I1	16	Z1	16	S1	16
I1-I2	39	Z1-Z2	51	S1-S2	39
I2	24	Z2	19	S2	25
I2-I3	36	Z2-Z3	28	S2-S3	–
I3	29	Z3	30	S3	–
I3-I4	31	Z3-Z4	27	S3-S4	–
I4	34	Z4	38	S4	36
I4-I5	30	Z4-Z5	35		
I5	37	Z5	19		
I5-I6	43				
I6	41				
I6-I6‘	91				

ranged in an oblique direction to the body axis. Opisthonotal setae barbed: I1, Z1 and S1 only with 1–2 barbs. I2–6, Z2–5, S2 and S4 densely barbed, with a hyaline sheath at their end. Setae S3 absent. Marginal setae provided with 2–3 barbs and with a hyaline sheath.

Redescription. Female. Length of idiosoma 403 µm in holotype (429 µm in 1 paratype); width: 301 µm (288 µm).

Dorsal side (Fig. 19). Podonotum with 22 pairs of setae: i-row with 6 pairs, z-row with 2 pairs, s-row with 6 pairs, r-row with 6 pairs, p-row with 2 pairs. Podonotal setae short (10–25), the majority of them smooth, with exception of i1, i2 and marginal ones (i1 densely barbed, i2 finely barbed and those from r-row with 3 barbs and distally provided with hyaline sheath). Lateral surface of shield covered by tile-like pattern, central surface with reticulate ornamentation.

Opisthonotum with 22 pairs of setae: I-row with 6 pairs, Z-row with 5 pairs, S-row with 4 pairs and R-row with 7 pairs. Setae I1 short and provided with one barb; I2–I6 densely barbed; I3–6 provided distally with hyaline sheath and much thicker than anterior two pairs of I-row. I3 and I4 reaching bases of following setae of row. In Z-row, Z1 short and with one barb. Z2–5 more barbed than former setae and distally provided with hyaline sheath. Z3 and Z4 much thicker than rest of Z-setae. Z3 reaching bases of next setae of row. Z5 short, barbed and with hyaline sheath. In S row S1 short and with two barbs. Setae S3 absent. S2 and S3 longer and stouter than S1, densely barbed, with hyaline tips. S4 thick, barbed, with hyaline sheath at end and exceeding body edge with 2/3 of their length. Marginal setae with 2–3 barbs and hyaline sheath. Lengths of setae and distances between bases of setae as in Table 9. Marginal serration of dorsal idiosoma shallow and obtuse. Sculpturing pattern of opisthonotum reticulated on lateral sides, up to insertions of I3, Z2 and S2; rest of it covered by foveolate microsculpture. Dorsal fossae strongly sclerotized, larger comparatively with other species, equal as to their shape and arranged in oblique direction to body axis (Fig. 21).

Poroidotaxy. On podonotum, pores po1 situated posterolaterally to insertions of s1, po2 below line connecting i4–s4, po3 lying axially to line connecting s5–6. On opisthonotum, pores Po1 located anterolaterally to bases of setae Z1, Po2 lying below line connecting setae S2–Z3, Po3 situated on line connecting setae I5–Z4, near I5, Po4 located behind bases of S4.

Ventral side (Fig. 20). Chaetotaxy, poroidotaxy and shape of ventral shields typical for genus *Zercon*. Peritremes firmly curved. Sternal shield well sclerotized, 68 µm long and 67 µm wide at level of setae st2, with slightly arcuate posterior margin and reticulate ornamentation. Adgenital platelets present, with three gland-openings each. Anterior side of the ventroanal shield bearing two pairs of setae (Vm1 and Vi1). Surface of ventroanal shield covered by tile-like and reticulate pattern. Ventroanal setae simple except barbed postanal seta. Anterior part of ventroanal shield with two pairs of setae.

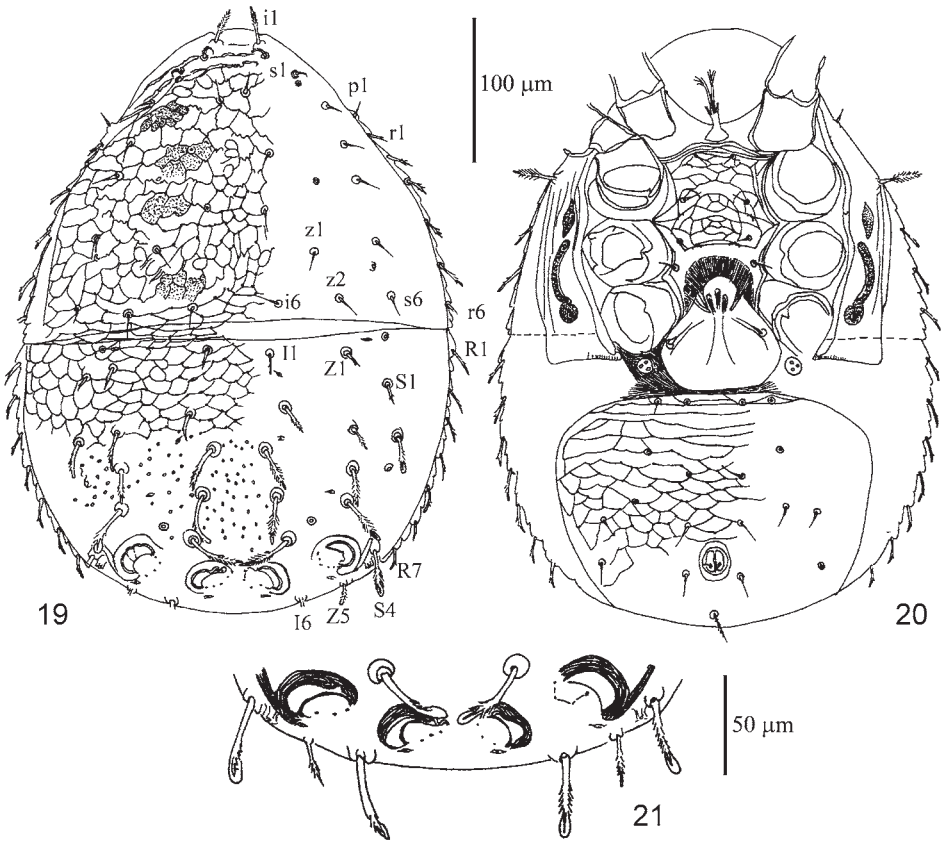
Table 10. Distinguishing characters between *Zercon magdae* and *Zercon athiasi*.

Zercon magdae IVAN et CĂLUGĂR, 2004	*Zercon athiasi* VINCZE, 1965
Body length 403–429; width 288–301	Body length 424–461; width 318–355
I2 23–25 long, barbed	I2 11–16 long, smooth
Z1 barbed, Z2 pilose, with hyaline sheets	Z1–2 short and smooth
S1 and Z1 similar in shape and length	S1 twice longer than Z1, densely pilose
S3 absent	S3 present, densely plumose
I6–I6' 89–92	I6–I6' 94–108

Differential diagnosis. The species belongs to the group having two pairs of setae on the anterior side of the ventrianale shield and mostly resembles *Zercon athiasi* VINCZE, 1965 by the opisthonotal chaetotaxy and the shape of dorsal cavities. The distinguishing characters between the two species are given in Table 10.

DISCUSSION

On the basis of some emergent morphological characters, three among the presented species – *Z. marinae*, *Z. magdae* and *Z. similifoveolatus* – show relationship with some species of Balkanic and Mediterranean distribution. Morphologically, *Z. marinae* and *Z. magdae* belong to the group having strongly sclerotized



Figs 19–21. *Zercon magdae* IVAN et CĂLUGĂR, 2004, female: 19 = dorsal view, 20 = ventral view, 21 = caudal region with dorsal cavities

– in some cases strikingly large – dorsal cavities, often with oblique axes, obtuse and delicately or densely pilose, medium-sized marginal setae, elongated, apically barbed posterodorsal setae, often with hyaline sheets (even the posterior 3–5 pairs of I setae) and punctuated posterodorsal ornamentation. Most of the species with the former traits can be found on the Balkans and Anatolia (especially in the western regions) (e.g. KOŠIR 1974, URHAN & AYYILDIZ 1994*a*), some of them are known from Italy and Spain (ATHIAS-HENRIOT 1961), while other species like *Z. athiasi* VINCZE, 1965 and *Z. bartosi* HALAŠKOVÁ, 1969 apparently have Central European distribution (MAŠÁN & FENĎA 2004), the former also have records from the central region of Poland (BŁASZAK 1974). Therefore it seems that this group has a wider Mediterranean distribution, with a diversity hotspot on the Balkan Peninsula, and is also distributed in the Carpathian basin and alongside the outer Carpathian arc, which explains the presence of the group on the lower hills of outer chains of the Eastern Carpathians. The situation is quite similar regarding *Z. similifoveolatus*. This species can also be related to a special group of Zerconidae having needle-like marginal setae, posterodorsal punctuation, and relatively short, often smooth I-setae. This last group has a distribution very similar to the former one, most of the species are widespread in the Mediterranean area (e. g. URHAN & AYYILDIZ 1994*b*, URHAN 2001), some of them, however, – e.g. *Z. foveolatus* HALAŠKOVÁ, 1969 in the Carpathians – have an expanded area northwards to the Balkans, which explains the presence of a very similar species on the outer chains of the Carpathians.

P. katae, *Z. atypicus* and *Z. dentatus* presumably have Central European relationships on the basis of the distribution of morphologically similar species, according to the low number of latter; however, no such statements should be made as in the case of the other three species.

*

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