

REVIEW OF THE AMERICAN GENERA  
*ASPAR* HALAŠKOVÁ, 1977 AND *BLASZAKZERCON* KEMAL &  
KOÇAK, 2009 (ACARI, MESOSTIGMATA, ZERCONIDAE)  
WITH DESCRIPTION OF THREE NEW SPECIES

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Two little known genera, *Aspar* HALAŠKOVÁ, 1977 and *Blaszakzercon* KEMAL & KOÇAK, 2009 are reviewed. New diagnoses for both genera are provided with short descriptions and previous records of the known species included. Two new *Aspar* species, *A. opisthoisotrichus* sp. n. and *A. tamalpaisensis* sp. n. and furthermore, a new *Blaszakzercon* species, *B. hexagonatus* sp. n. are described and illustrated.

Key words: Zerconidae, *Aspar*, *Blaszakzercon*, new species, United States of America

## INTRODUCTION

Zerconid mites constitute an important part of the soil fauna in the Northern Hemisphere being one of the most abundant groups of mesostigmatid mites in soil, moss and leaf litter. The Zerconidae fauna of North America is poorly investigated, however the diversity of these mites is probably much greater than that of Europe with the so far registered 20 genera of which 16 are known only from here (against the nine genera of Europe) (DÍAZ-AGUILAR & UJVÁRI 2010). The number of species is still very low compared to Europe, where most of the taxonomic and faunistic surveys of Zerconidae have been carried out. Majority of the unique American genera are monotypic or consist of very few species. The present paper reviews two of these scarcely known genera, *Aspar* HALAŠKOVÁ, 1977 and *Blaszakzercon* KEMAL & KOÇAK, 2009 and enriches our knowledge with new observations and further new species.

## MATERIALS AND METHODS

Specimens of the Collection of Soil Zoology of the Hungarian Natural History Museum (HNHM) were extracted using Berlese-funnels, then cleared with lactic acid and mounted in glycerine. Mites of the Canadian National Collection (CNC) of Insects, Arachnids and Nematodes are fixed in Hoyer medium and stored on slides. Preparations were examined using a light microscope, drawings were made with the aid of a drawing tube. Specimens are deposited in the Collection of Soil Zoology of HNHM, Budapest and CNC, Ottawa. The terminology of setae follows LINDQUIST et EVANS

(1965), with modifications for the caudal region as given by LINDQUIST and MORAZA (1998). The system of notation for dermal glands and lyrifissures is based on both JOHNSTON and MORAZA (1991) and ATHIAS-HENRIOT (1969). All measurements including scale bars of the figures are given in micrometres.

## TAXONOMY

### *Aspar* HALAŠKOVÁ, 1977

*Aspar* HALAŠKOVÁ, 1977: 12.

*Aspar*: BŁASZAK *et al.*, 1995: 254; LINDQUIST *et MORAZA*, 1998: 210; DÍAZ-AGUILAR *et UJVÁRI*, 2010: 26.

Type species: *Aspar anisotrichus* HALAŠKOVÁ, 1977: 13, by original designation.

Diagnosis (female). Posterolateral tips of peritrematal shields expanded posteriorly in female. Peritremes expanded to anterior half of coxae III, straight, converging anteriorly, nearly reaching exopodal shields. Setae r1–3 shifted to peritrematal shields, each plumose, r1–2 short, r3 elongate. Genital shield narrow. Glands gv2 situated on adgenital platelets. Ventrianal shield bearing 21 setae, setae Zv1 present. Glands gv3 situated anterolaterally to adanal setae. Adanal setae longer than postanal seta. Setae z1 absent. On opisthonotum, setae J1–4, Z3–4, J5 and Z5 constitute a central series, Z1, S2, Z2 and S3–5 constitute a submarginal series. Marginal series with six pairs of R-setae. Glands Po3 associated to setae J4. Dorsal cavities inconspicuous. Epistome of *Parazercon*-type (see UJVÁRI 2011).

Remarks. Ventral pores gv2 and gv3 were not conspicuous on the specimens of HALAŠKOVÁ, but these were clearly visible on each USA specimens studied. Therefore the diagnosis is completed with the information of these structures.

According to the observations on homologies of idiosomal setae of LINDQUIST and MORAZA (1998), the genus *Aspar* possesses setae z1. These observations are probably based on the description and figures of HALAŠKOVÁ (1977), where the author did not illustrate setae j1, but remarked that these setae are situated on the ventral side of the podonotal shield. However, on the basis of the species described below it seems that setae z1 are absent in the genus *Aspar*. The composition of dorsal podonotal setae corresponds to the figures of *A. anisotrichus* HALAŠKOVÁ, 1977, but the anteriormost pair of densely plumose setae is j1 on the USA species, there are no other setae on the anteroventral edge of the podonotal shield. HALAŠKOVÁ (1977) may have overlooked the number of setae on the anterior edge of the shield and the setae marked as j2 in the original description of *A. anisotrichus* are most probably setae j1. Therefore, on the modified drawing of

LINDQUIST and MORAZA (1998) setae j2 are also j1, hence setae z1 should be absent, the pair of setae marked as z1 are in fact j2.

**Aspar opisthoisotrichus** sp. n.  
(Figs 1–2, 5–12)

Type material. Female holotype and one female paratype: USA, Oregon, Curry County, Alfred A. Loeb State Park, 8 mi. NE. Brookings, from tan-oak, willow and fern litter, 12.08.1985, coll. E. E. LINDQUIST. (Fig. 44). The type material is deposited in CNC (coll. number of holotype: CNCAZ0620; coll. number of paratype: CNCAZ0619).

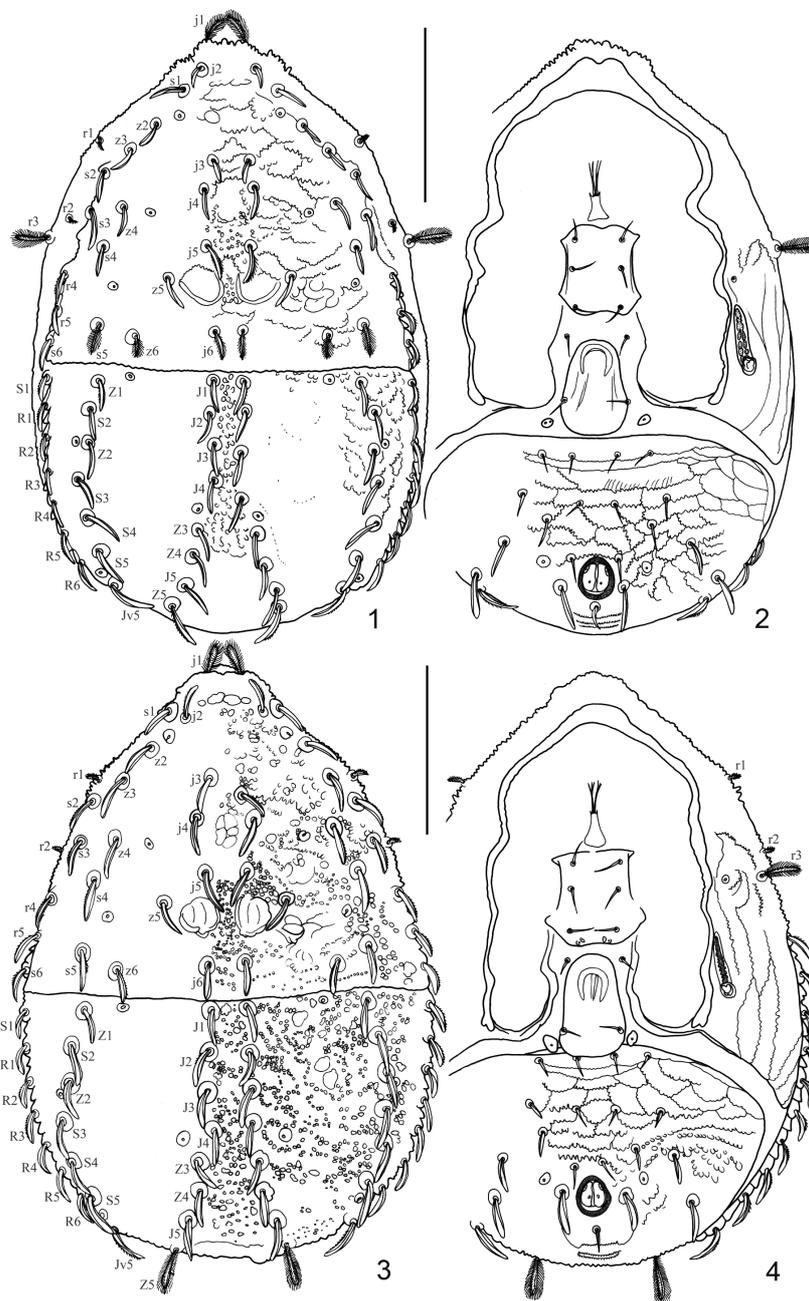
Diagnosis. Setae j1 and r3 elongate, brush-like, plumose, r1–2 short, plumose, j6, z6 and s5 bipectinate, the remaining podonotal and opisthonotal setae thick, blunt, with serrate margins (see Figs 9–12). Glands Po2 situated anterolaterally to Z2. The ornamentation on the surface between submarginal and central setal series of opisthonotum weakly developed.

Description. Female. Length of idiosoma: 317–339  $\mu\text{m}$  (328  $\mu\text{m}$ ); width: 226  $\mu\text{m}$  (n = 2).

Dorsal side. (Fig. 1). Podonotum with 20 pairs of setae, j1–6, z2–6, s1–6 and r4–5 inserted on podonotal shield, r1–3 inserted on peritrematal shields. Setae j1 and r3 elongate, brush-like, plumose, r1–2 short, plumose, j6, z6 (Fig. 7) and s5 (Fig. 8) bipectinate. The remaining podonotal setae uniform, thick, blunt, with serrate margins. Glands *gds1* (po1) situated posteriorly to s1; *gdj4* (po2) situated medially to z4; *gds4* (po3) somewhat medially to line connecting s4 and s5, in equidistant position. Central surface of podonotum between setae j4–5 covered by granulate pattern, other parts with undulate-serrate lines. Central muscle scars behind setae j5 with strongly sclerotized posterior margins.

Opisthonotum with 21 pairs of setae, J1–5, Z1–5, S1–5, R1–6. Each opisthonotal setae of similar appearance, thick, blunt, with serrate margins. Setae J1–4, Z3–4, J5 and Z5 constitute a central series, Z1, S2, Z2 and S3–5 constitute a submarginal series. Row of setae J1–4 parallel, behind these setae, row of Z3–4, J5 and Z5 posteriorly divergent. Length of opisthonotal setae and distances between their insertions as in Table 1. Glands *gdZ1* (Po1) situated medially to insertions of Z1; *gdS2* (Po2) anterolaterally to Z2; *gdZ3* (Po3) on line connecting J4 and Z3, in equidistant position; *gdS5* (Po4) posteriorly to S5. Marginal serration shallow and obtuse. Lateral surface of opisthonotum (around submarginal setal series) bearing a reticulation of granulate ornamentation, central surface between the central setal series with dense, granulate pattern. The ornamentation on the surface between submarginal and central setal series of opisthonotum weakly developed. Dorsal cavities not conspicuous.

Ventral side (Fig. 2). Shape of peritrematal shields, peritremes and peritrematal setae typical for the genus. Posterolateral tips of peritrematal shields reaching beyond insertions of R2. Peritrematal shields covered by longitudinal lines. Sternal shield weakly sclerotized, 49  $\mu\text{m}$  long and 35  $\mu\text{m}$  wide at the level of setae st2, with concave posterior margin; its ornamentation not conspicuous. Genital shield relatively narrow, oval. Adgenital glands *gv2* with a 1–2 openings, situated on adgenital platelets. Ventrianal chaetotaxy complete, setae *Zv1* present. Setae *Jv1–3* and *Zv1–3* smooth, pointed and needle-like. *Zv4*, *Jv4–5* and adanal setae similar in appearance to opisthonotal setae.



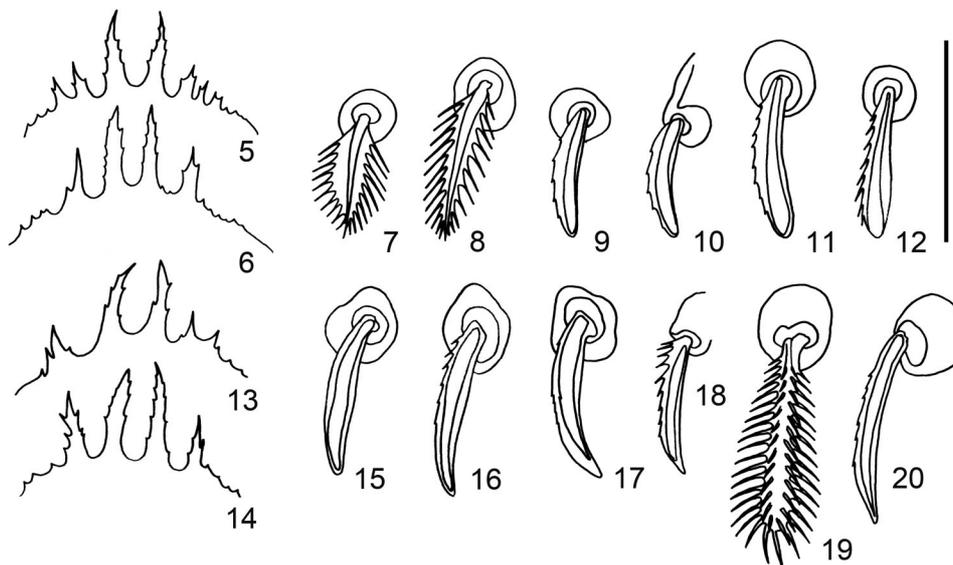
**Figs 1–4.** Females of *Aspar* species: 1 = *A. opisthoisotrichus* sp. n., dorsal view, 2 = *A. opisthoisotrichus* sp. n., ventral view, 3 = *A. tamalpaisensis* sp. n., dorsal view, 4 = *A. tamalpaisensis* sp. n., ventral view (scales: 100  $\mu$ m)

**Table 1.** Lengths of opisthotal setae and the distances ( $\mu\text{m}$ ) between their bases in J-, Z- and S-rows of *Aspar opisthoisotrichus* sp. n. (measurements as mean).

	F		F		F
J1	19	Z1	18	S1	15
J1-J2	17	Z1-Z2	35	S1-S2	27
J2	18	Z2	20	S2	18
J2-J3	20	Z2-Z3	76	S2-S3	38
J3	18	Z3	19	S3	19
J3-J4	22	Z3-Z4	15	S3-S4	21
J4	19	Z4	19	S4	23
J4-J5	55	Z4-Z5	26	S4-S5	20
J5	21	Z5	24	S5	22

Postanal seta short, wide. Anal valves with vestigial euanal setae. Glands *gv*3 situated anterolaterally to adanal setae. Ventrianal shield covered by a web of serrate-undulate lines.

Gnathosoma. Situation of hypostomal and subcapitular setae typical for the family. Setae h1–2 similar in appearance, elongate, needle-like. Setae h3 shorter than h1–2, needle-like, h4 somewhat longer than previous setae, serrate. Corniculi horn-like, internal malae with a pair of bifurcate



**Figs 5–20.** Structures of *Aspar* species (5–12: *A. opisthoisotrichus* sp. n., 13–20: *A. tamalpaisensis* sp. n.): 5–6 = epistomes, 7 = seta z6, 8 = seta s5, 9 = seta J1, 10 = seta R1, 11 = seta Z5, 12 = seta Jv5, 13–14 = epistomes, 15 = seta z6, 16 = seta s5, 17 = seta J1, 18 = seta R1, 19 = seta Z5, 20 = seta Jv5 (scale: 25  $\mu\text{m}$ )

**Table 2.** Lengths of opisthonotal setae and the distances ( $\mu\text{m}$ ) between their bases in J-, Z- and S-rows of *Aspar tamalpaisensis* sp. n. (measurements as mean).

	F		F		F
J1	22	Z1	23	S1	19
J1-J2	26	Z1-Z2	44	S1-S2	34
J2	23	Z2	23	S2	25
J2-J3	23	Z2-Z3	90	S2-S3	44
J3	24	Z3	21	S3	25
J3-J4	22	Z3-Z4	18	S3-S4	23
J4	21	Z4	22	S4	24
J4-J5	57	Z4-Z5	36	S4-5	24
J5	25	Z5	27	S5	28

anterocentral branches and with serrate margins. Chelicerae relatively stout, fixed digit with 5–6 teeth, movable digit with 4–5 teeth. Epistome (Figs 5–6) typical for the genus *Aspar*, of *Parazercon*-type (see UJVÁRI 2011b).

Male and immature stages. Unknown.

Etymology. The name of the new species refers to the uniform opisthonotal setae.

Differential diagnosis. The three *Aspar* species can be distinguished according to Table 3.

**Table 3.** Distinguishing characters of *Aspar* species.

Character	<i>A. anisotrichus</i>	<i>A. opisthoisotrichus</i>	<i>A. tamalpaisensis</i>
Setae j <sub>6</sub> , z <sub>6</sub> and s <sub>5</sub>	flat, hyaline	bipectinate	thick, blunt, with serrate margins
Setae Z <sub>5</sub>	brush-like, plumose	thick, blunt, with serrate margins	brush-like, plumose
Setae Jv <sub>5</sub>	brush-like, plumose	thick, blunt, with serrate margins	thick, blunt, with serrate margins
Marginal setae of podonotaum and opisthonotum	barbed	thick, blunt, with serrate margins	thick, blunt, with serrate margins
Ornamentation between central and sub-marginal setal series of opisthonotum	rare, tuberculate (large grains)	weakly developed	dense, granulate (small grains)
Position of glands gdS <sub>2</sub> (Po <sub>2</sub> )	anterolaterally to Z <sub>2</sub>	anterolaterally to Z <sub>2</sub>	posterolaterally to Z <sub>2</sub>

**Aspar tamalpaisensis** sp. n.  
(Figs 3–4, 13–20)

Type material. Female holotype: USA, California, San Francisco, Golden Gate, 19.09.1981, coll. J. Kiss (É-Am-086); three female paratypes: USA, California, Mount Tamalpais, 1000 m a.s.l., pine forest, mosses and lichens among rocks, 12.01.1985, coll. J. Kiss (É-Am-089) (Fig. 44). The type material is deposited in HHNM.

**Diagnosis.** Setae j1, r3 and Z5 elongate, brush-like, plumose, r1–2 short, plumose, the remaining podonotal and opisthonotal setae thick, blunt, with serrate margins (see Figs 15–18). Glands Po2 situated posterolaterally to Z2. The surface between submarginal and central setal series of opisthonotum with granulate ornamentation.

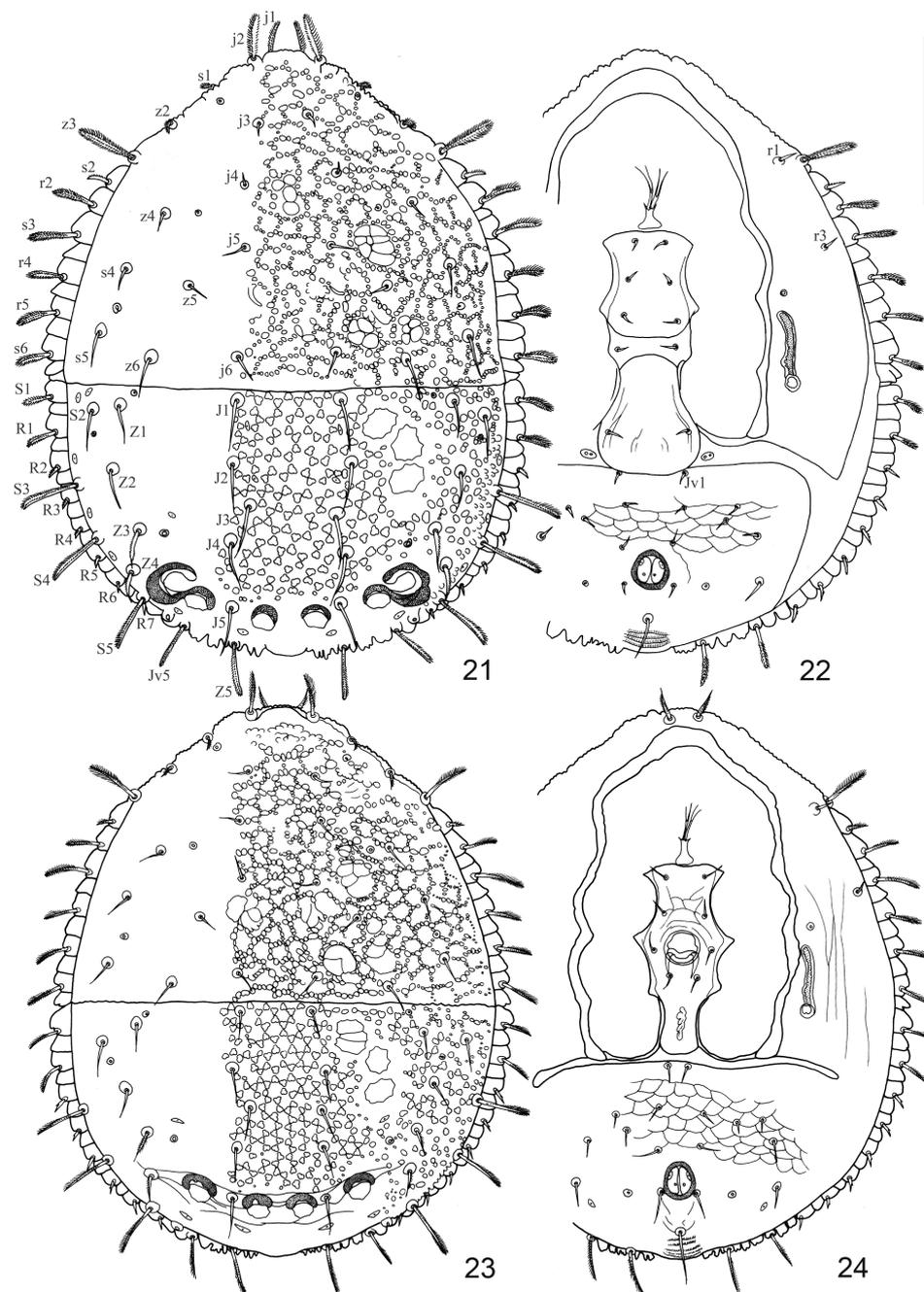
**Description.** Female. Length of idiosoma: 339–350 µm (346 µm); width: 242–247 µm (245 µm) (n = 4).

**Dorsal side** (Fig. 3). Podonotum with 20 pairs of setae, j1–6, z2–6, s1–6 and r4–5 inserted on podonotal shield, r1–3 inserted on peritrematal shields. Setae j1 and r3 elongate, brush-like, plumose, r1–2 short, plumose. The remaining podonotal setae uniform, thick, blunt, with serrate margins. Glands *gds1* (po1) situated posteriorly to s1; *gdj4* (po2) situated medially to z4; *gds4* (po3) medially to line connecting s4 and s5, in equidistant position. The surface of podonotum covered by irregular, granulate pattern. Central muscle scars behind setae j5 with strongly sclerotized posterior margins.

**Opisthonotum** with 21 pairs of setae, J1–5, Z1–5, S1–5, R1–6. Opisthonotal setae of similar appearance, thick, blunt, with serrate margins, except Z5 which brush-like, plumose (Fig. 19). Setae J1–4, Z3–4, J5 and Z5 constitute a central series, Z1, S2, Z2 and S3–5 constitute a submarginal series. Row of setae J1–4 parallel, behind these setae, row of Z3–4, J5 and Z5 posteriorly divergent. Length of opisthonotal setae and distances between their insertions as in Table 2. Glands *gdZ1* (Po1) situated medially to insertions of Z1; *gds2* (Po2) posterolaterally to Z2; *gdZ3* (Po3) laterally to line connecting J4 and Z3; *gds5* (Po4) posteriorly to S5. Marginal serration shallow and obtuse. Whole surface of opisthonotum covered by dense, granulate pattern. Dorsal cavities not conspicuous.

**Ventral side** (Fig. 4). Shape of peritrematal shields, peritremes and peritrematal setae typical for the genus. Posterolateral tips of peritrematal shields reaching beyond insertions of R3. Peritrematal shields covered by longitudinal, serrate lines. Sternal shield weakly sclerotized, 55 µm long and 39 µm wide at the level of setae st2, with approximately straight posterior margin; its ornamentation not conspicuous. Genital shield relatively narrow. Adgenital glands *gv2* with a 1–2 openings, situated on adgenital platelets. Ventrianal chaetotaxy complete, setae Zv1 present. Setae Jv1–3 and Zv1 smooth, pointed and needle-like. Zv2–3 thicker and pointed, Zv4, Jv4–5 (Fig. 20) and adanal setae elongate, similar in appearance to opisthonotal setae. Postanal seta short, similar in to Zv2–3. Anal valves with vestigial euanal setae. Glands *gv3* situated anterolaterally to adanal setae. Ventrianal shield covered by a web of serrate-undulate lines and granulate pattern posterolaterally.

**Gnathosoma.** Situation of hypostomal and subcapitular setae typical for the family. Setae h1–2 similar in appearance, elongate, needle-like. Setae h3 shorter than h1–2, needle-like, h4 somewhat longer than previous setae, serrate. Corniculi horn-like, internal malae with a pair of bifurcate anterocentral branches and with serrate margins. Chelicerae relatively stout, fixed digit with 6 teeth, movable digit with 4–5 teeth. Epistome (Figs 13–14) typical for the genus *Aspar*, of *Parazercon*-type (see UJVÁRI 2011b).



**Figs 21–24.** *Blaszakzercon hexagonatus* sp. n.: 21 = dorsal view of female, 22 = ventral view of female, 23 = dorsal view of male, 24 = ventral view of male (scales: 100  $\mu$ m)

Male and immature stages. Unknown.

Etymology. The new species is named after one of its type-localities, Mount Tamalpais.

Differential diagnosis. The three *Aspar* species can be distinguished according to Table 3.

### *Aspar anisotrichus* HALAŠKOVÁ, 1977

*Aspar anisotrichus* HALAŠKOVÁ, 1977: 13.

Diagnosis. Setae j1 and r3 elongate, brush-like, plumose, i3–5 smooth, thorn-like, j6, z4–6 and s4–5 flat and hyaline (according to HALAŠKOVÁ 1977), the remaining podonotal setae distinctly barbed. Opisthonotal setae J1–5, Z1–4 and S2–5 flat and hyaline, marginal setae barbed, Z5 and Jv5 elongate, plumose. Glands Po2 situated anterolaterally to Z2. The surface between submarginal and central setal series of opisthonotum with tuberculate ornamentation.

Previous records (Fig. 44). Canada, British Columbia, Tsawwassen (HALAŠKOVÁ 1977)

Remarks. I had no occasion to study the type specimens, but the accurate description and reliably realistic drawings of HALAŠKOVÁ (1977) suggest that the shape of most dorsal setae and ornamentation of both dorsal shields are basically different from the species collected in the USA.

### *Blaszakzercon* KEMAL & KOÇAK, 2009

*Allozercon* BŁASZAK, 1984: 596.

*Allozercon*: BŁASZAK *et al.*, 1995: 254; LINDQUIST *et MORAZA*, 1998: 210; DÍAZ-AGUILAR *et UJVÁRI*, 2010: 26.

*Blaszakia*: KOÇAK & KEMAL, 2008: 5. nom. nov. pro *Allozercon* BŁASZAK, 1984 non *Allozercon* VITZTHUM, 1926.

*Blaszakzercon*: KEMAL & KOÇAK, 2009: 10. nom. nov. pro *Blaszakia* KOÇAK & KEMAL, 2008 non *Blaszakia* SKORACKI & SIKORA, 2008.

Type species: *Allozercon pulcher* BŁASZAK, 1984: 596, by original designation.

Diagnosis. Podonotal shield carapace-like. Peritrematal shields of female separated from dorsal shields by a triangular slit of membranous cuticle, their posterolateral tips expanded posteriorly. Peritrematal shields of male fused laterally to the ventrianal shield. Peritremes expanded to anterior half of coxae III, straight or slightly bent. Setae r1 and r3 shifted ventrally to peritrematal shields,

both short, smooth (or finely barbed). Glands *gv2* situated on small adgenital platelets. Ventrianal shield bearing 19 setae, setae *Zv1* absent. Glands *gv3* situated (antero) laterally to adanal setae. Setae *z1* absent. Margin of opisthonotum with seven pairs of R-setae. Glands *Po3* situated between setae *J4* and *Z3*. Females characteristically possess strongly sclerotized, lobe-like structures covering the lateral pair of posterodorsal cavities. Epistome of *Zercon*-type (see UJVÁRI 2011).

### **Blaszakzercon hexagonatus** sp. n.

(Figs 21–31, 42)

Type material. Female holotype, four female, one male and one deutonymph paratypes: USA, Tennessee, Blount County, Cades cove, 30.07.1956, coll. K. BOHNSACK (É-Am-013); 25 female paratypes: USA, Tennessee, Great Smoky Mountains National Park, 4000 ft. a.s.l., 28.07.1956, coll. K. BOHNSACK (É-Am-033). (Fig. 44). The holotype, each paratypes of É-Am-013 and 20 paratypes of É-Am-033 are deposited in HHNM, 5 female paratypes of É-Am-033 are deposited in CNC (coll. number of CNC specimens: CNCAZ0794–0798).

Diagnosis. Central podonotal setae smooth and needle-like, marginal setae and *j1–2* pilose. Setae *J3–4* finely pilose, *S2* smooth and pointed. *Z3–4* delicately pilose, shorter than *S3–5*. Lateral posterodorsal cavities covered by strongly sclerotized lobes. Podonotum covered by a reticulation of circular squamae, central surface of opisthonotum with distinct, clover-shaped protuberances arranged in a hexagonal pattern.

Description. Female. Length of idiosoma: 350–366  $\mu\text{m}$  (357  $\mu\text{m}$ ); width: 296–317  $\mu\text{m}$  (305  $\mu\text{m}$ ) ( $n = 10$ ).

Dorsal side (Figs 21, 25). Podonotum with 20 pairs of setae, *j1–6*, *z2–6*, *s1–6*, *r2* and *r4–5* inserted dorsally, *r1* and *r3* inserted ventrally, on peritrematal shields. Marginal setae of podonotum (*s1–3*, *z2–3*, *r2*, *r4–5*, *s6*) and *j1–2* densely pilose, feathered. Setae *j3–6*, *z4–6* and *s4–5* smooth and needle-like. Glands *gds1* (*po1*) situated on line connecting *j3* and *s1*, near *s1*; *gdj4* (*po2*) medially to *z4*; *gds4* (*po3*) on line connecting *s4* and *s5*, in equidistant position. Podonotum covered by a reticulation of circular squamae.

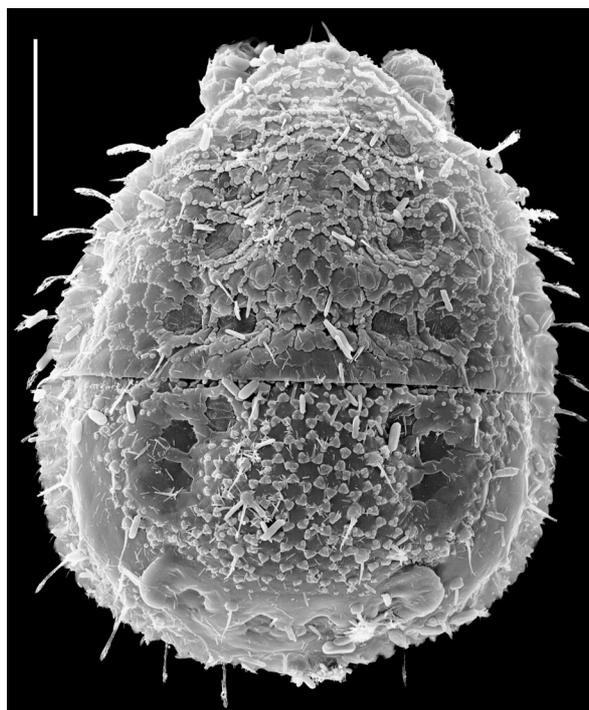
Opisthonotum (Figs 26, 42) with 22 pairs of setae, *J1–5*, *Z1–5*, *S1–5*, *R1–7*. Setae *J1–2* smooth, pointed, *J1* not reaching insertions of *J2*. *J3–4* pointed, finely pilose, *J5* smooth. Setae *Z1–2* smooth and needle-like, none of them reaching bases of the following one in the series. *Z3–4* delicately pilose, pointed, shorter than *S3–5*. *S2* similar in appearance to *Z1–2*, situated laterally or somewhat posterolaterally to *Z1*. Setae *S3–5* and *Z5* elongate, densely pilose, feathered. Setae *S1* and *R1* three times longer than other R-setae, pilose. *R2–5* short, pointed, barbed, *R6–7* smooth, thorn-like. Length of opisthonotal setae and distances between their insertions as in Table 4. Glands *gdZ1* (*Po1*) situated anteromedially to insertions of *Z1*; *gds2* (*Po2*) on line connecting *Z2* and *S2*, closer to *S2*; *gdZ3* (*Po3*) situated on line connecting *J4* and *Z3*, near *Z3*; *gds5* (*Po4*) on line connecting *S5* and *Jv5*, near *Jv5*. Marginal serration deep and obtuse. Central and lateral surface of opisthonotum bearing

**Table 4.** Lengths of opisthonotal setae and the distances ( $\mu\text{m}$ ) between their bases in J-, Z- and S-rows of *Blaszakzercon hexagonatus* sp. nov. (measurements as mean).

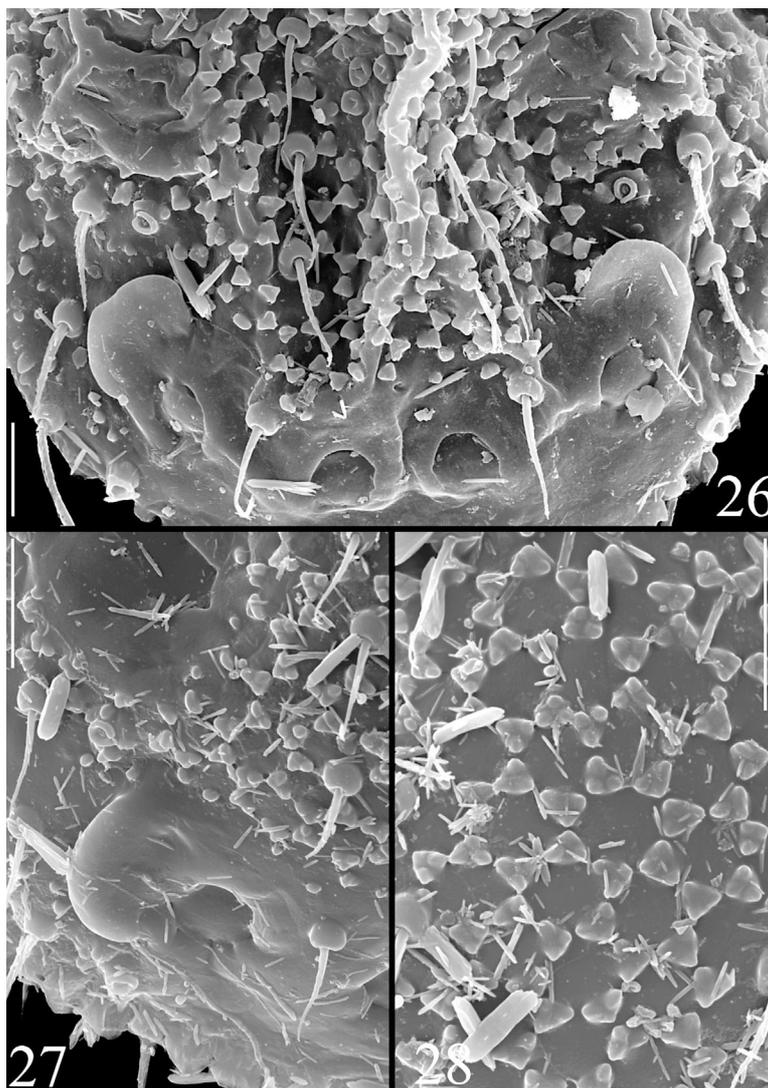
	F	M	DN		F	M	DN		F	M	DN
J1	30	15	14	Z1	22	15	16	S1	20	17	10
J1-J2	38	33	32	Z1-Z2	40	32	33	S1-S2	23	23	25
J2	29	18	15	Z2	23	16	16	S2	24	19	15
J2-J3	29	22	20	Z2-Z3	38	26	28	S2-S3	45	36	33
J3	31	19	19	Z3	23	16	15	S3	37	29	31
J3-J4	23	22	20	Z3-Z4	23	23	23	S3-S4	33	31	30
J4	30	18	17	Z4	19	14	14	S4	37	29	34
J4-J5	33	27	28	Z4-Z5	74	59	53	S4-5	43	36	37
J5	28	21	19	Z5	31	27	28	S5	35	31	38

distinct, clover-shaped protuberances arranged in a hexagonal pattern (Fig. 28). Dorsal cavities uniform, well-sclerotized. Lateral pair covered by strongly sclerotized lobes (Fig. 27).

Ventral side (Fig. 22). Shape of peritrematal shields and peritrematal setae typical for the genus. Posterolateral tips of peritrematal shield reaching beyond insertions of R2. Peritremes slightly

**Fig 25.** SEM photo of *Blaszakzercon hexagonatus* sp. n. female, in dorsal view (scale: 100  $\mu\text{m}$ )

bent, with a distinct dilatation near the stigma. Peritrematal shields covered by longitudinal lines. Sternal shield well sclerotized, 63  $\mu\text{m}$  long and 42  $\mu\text{m}$  wide at the level of setae st2, with straight posterior margin, its ornamentation not conspicuous. Adgenital glands gv2 with two openings, situated on small adgenital platelets. Ventrianal chaetotaxy incomplete, setae Zv1 absent. Preanal and adanal setae short, smooth and needle-like, postanal seta longer, smooth. Setae Jv5 elongate, pilose. Anal valves with vestigial euanal setae. Glands gv3 situated laterally to adanal setae. Anterior surface of ventrianal shield covered by squamous pattern.

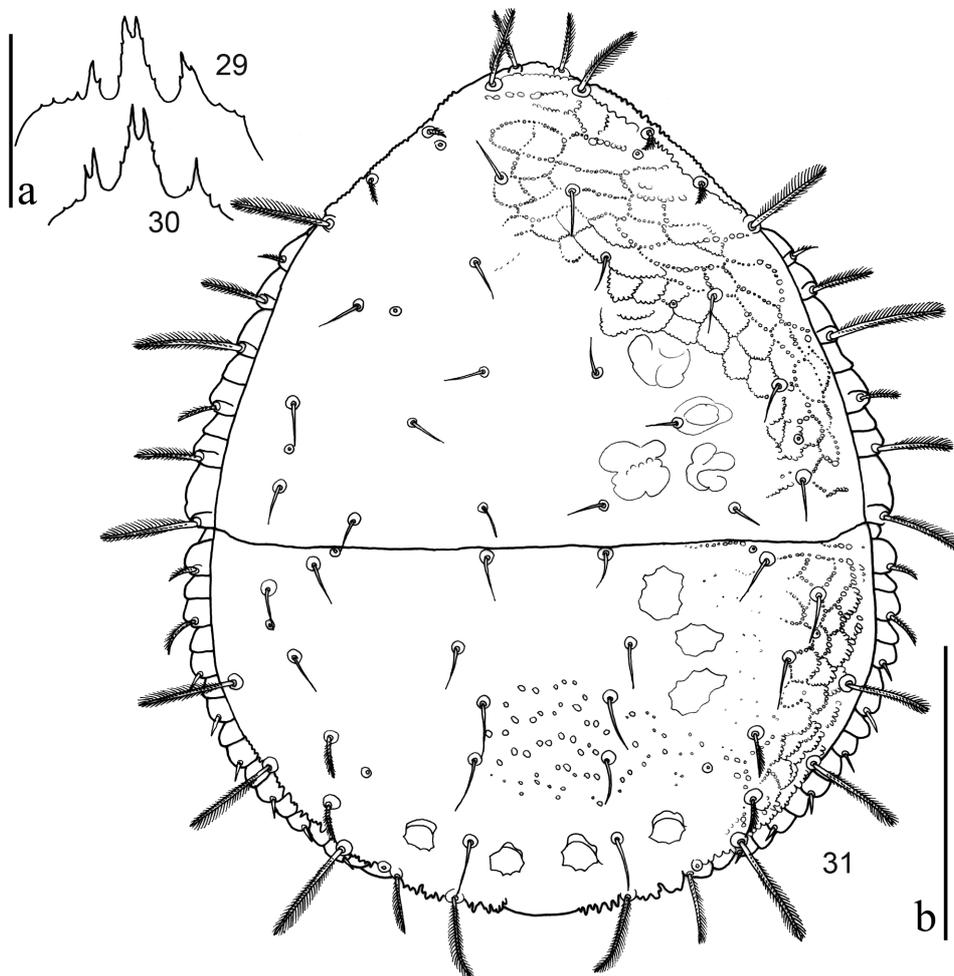


**Figs 26–28.** SEM photos of *Blaszakzercon hexagonatus* sp. n. female: 26 = opisthonotum, 27 = posterodorsal lobe, 28 = central ornamentation of opisthonotum (scales: 25  $\mu\text{m}$ )

Gnathosoma. Situation of hypostomal and subcapitular setae typical for the family. Setae h1–2 similar in appearance, elongate, needle-like. Setae h3 shorter than h1–2, needle-like, h4 somewhat longer than previous setae, serrate. Corniculi horn-like, internal malae with a pair of bifurcate anterocentral branches and with serrate margins. Chelicerae relatively slender, fixed digit with 6 teeth, movable digit with 4–5 teeth. Epistome (Fig. 29) typical for the genus *Blaszakzercon*, of *Zercon*-type (see UJVÁRI 2011b).

Male. Length of idiosoma: 300  $\mu$ m; width: 251  $\mu$ m (n = 1).

Dorsal side (Fig. 23). Chaetotaxy, adenotaxy and ornamentation of dorsal shields similar to that of female, but some of the opisthotal setae shorter in proportion to the body-length than in fe-



**Figs 29–31.** *Blaszakzercon hexagonatus* sp. n.: 29 = epistome of female, 30 = epistome of deutonymph, 31 = dorsal view of deutonymph (scales: a = 25  $\mu$ m, b = 100  $\mu$ m)

male. Length of opisthonotal setae and distances between their insertions as in Table 4. The characteristic posterodorsal lobes observed on females absent.

Ventral side (Fig. 24). Posterolateral parts of peritrematal shields fused to ventrianal shield on level of setae R1, the separating membranous slit between ventral and dorsal shields absent. Shape of peritrematal setae as for the female. Peritremes slightly bent anteriorly, the dilatation near the stigma not conspicuous. Peritrematal shields covered by some longitudinal lines. Sternigenital shield possessing four pairs of setae (st5 absent). Anteriorly the genital opening the shield covered by reticulate ornamentation, beyond the level of setae st4 irregular ditches can be observed on its surface. The adgenital region not clearly visible. Setae Jv1 situated much closer to each other than in female. Other ventrianal characters similar to that of female.

Gnathosoma. Not clearly visible.

Deutonymph (Fig. 31). Length of idiosoma: 290  $\mu\text{m}$ ; width: 239  $\mu\text{m}$  (n = 1).

Dorsal side. Chaetotaxy and adenotaxy similar to that of the adults, however some of the opisthonotal setae shorter in proportion to the body-length than in adult specimens. Length of opisthonotal setae and distances between their insertions as in Table 4. Anterior and lateral surface of podonotum covered by a reticulation of granulate pattern and undulate lines, ornamentation of the central surface weakly developed. Lateral surface of opisthonotum covered by a reticulation of granulate pattern, central surface around setae J3–4 with small protuberances. Dorsal cavities weakly sclerotized, the characteristic posterodorsal lobes observed on females absent.

Gnathosoma. Each characters similar to that of female. It is interesting to remark that deutonymphal epistome of each Zerconidae species studied before showed similar morphology, with four conspicuous, prolonged anterior processes, however deutonymphs of *B. hexagonatus* sp. n. possess characteristic, *Zercon*-type epistome (Fig. 30).

Etymology. The name of the new species refers to the hexagonal pattern of clover-shaped protuberances covering the opisthonotum.

Remarks. Specimens from Great Smoky Mountains National Park possess less sclerotized posterodorsal lobes, fewer of posterolateral protuberances on dorsal surface and smooth Z3–4 setae (Fig. 42).

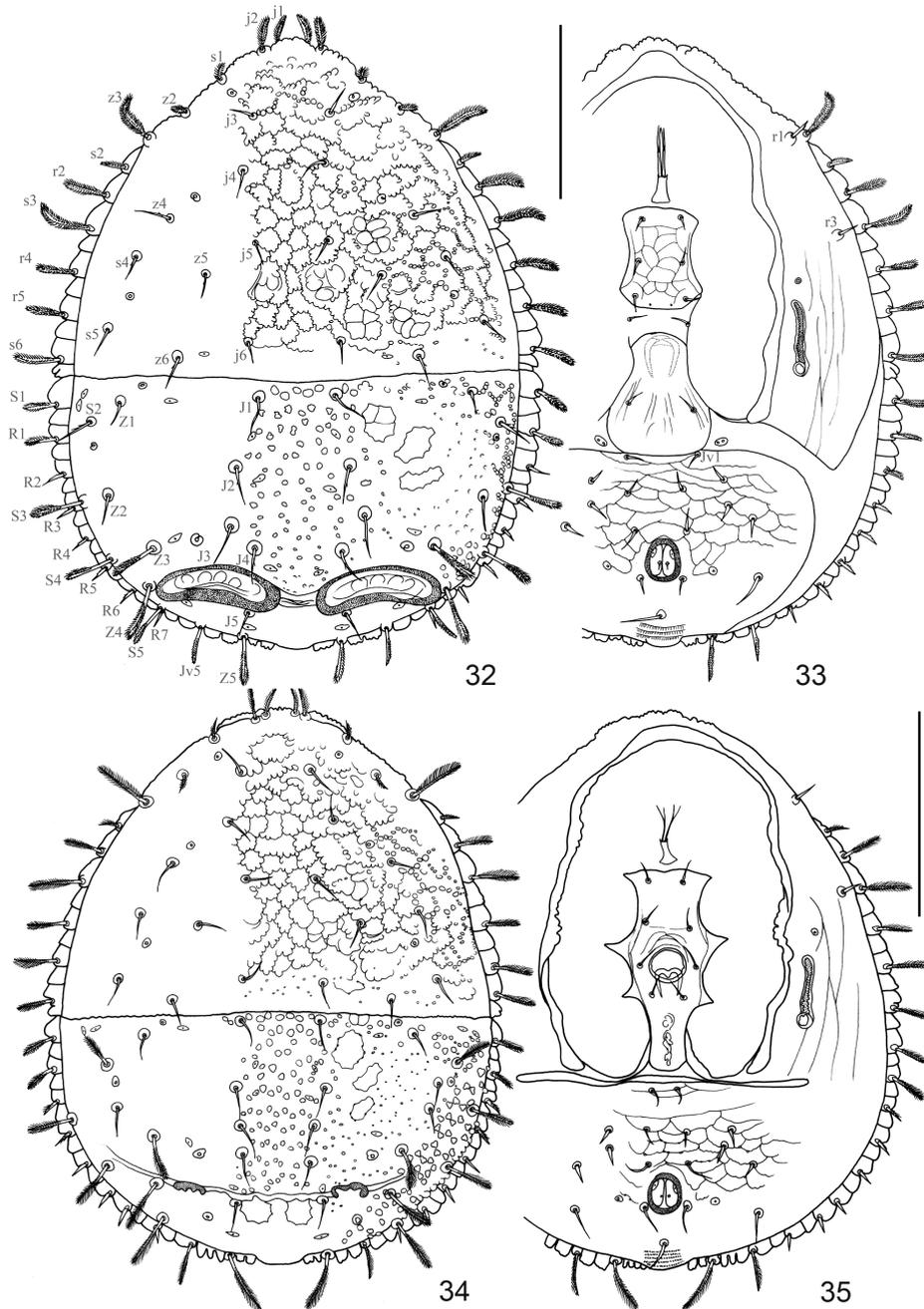
Differential diagnosis. The two *Blaszakzercon* species can easily be distinguished by the following features: opisthonotal ornamentation (distinct, clover-shaped protuberances arranged in a hexagonal pattern in *B. hexagonatus* sp. n., distinct, alveolar pits arranged in a hexagonal pattern in *B. pulcher*), posterodorsal lobes (smaller, laterally sclerotized in *B. hexagonatus* sp. nov., large, bean-like, completely sclerotized in *B. pulcher*) and shape of Z3–4 (pointed and as long as Z1–2 in *B. hexagonatus* sp. n., blunt and twice as long as Z1–2 in *B. pulcher*).

*Blaszakzercon pulcher* (BŁASZAK, 1984)  
(Figs 32–41, 43)

*Allozercon pulcher* BŁASZAK, 1984: 596.

*Blaszakia pulcher*: KOÇAK & KEMAL, 2008: 5.

*Blaszakzercon pulcher*: KEMAL & KOÇAK, 2009: 147.



**Figs 32–35.** *Blaszakzercon pulcher* (BLASZAK, 1984): 32 = dorsal view of female, 33 = ventral view of female, 34 = dorsal view of male, 35 = ventral view of male (scales: 100  $\mu$ m)

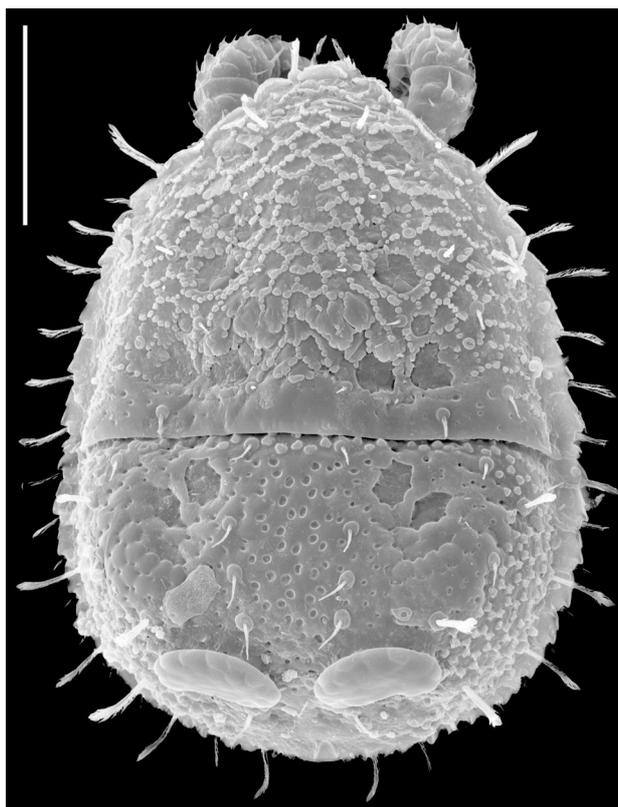
Material examined. USA, Tennessee, Greenbrier Ranger Station, Great Smoky Mountains National Park, 08.08.1956, coll. K. BOHNSACK (É-Am-028, two females, one male); USA, Tennessee, Great Smoky Mountains National Park, 4000 ft. a.s.l., 28.07.1956, coll. K. BOHNSACK (É-Am-033, one female).

Previous records. USA, North Carolina and Georgia, southern parts of Blue Ridge Mountains, Appalachians (BŁASZAK 1984).

Distribution (Fig. 44). Southern Blue Ridge Mountains, USA.

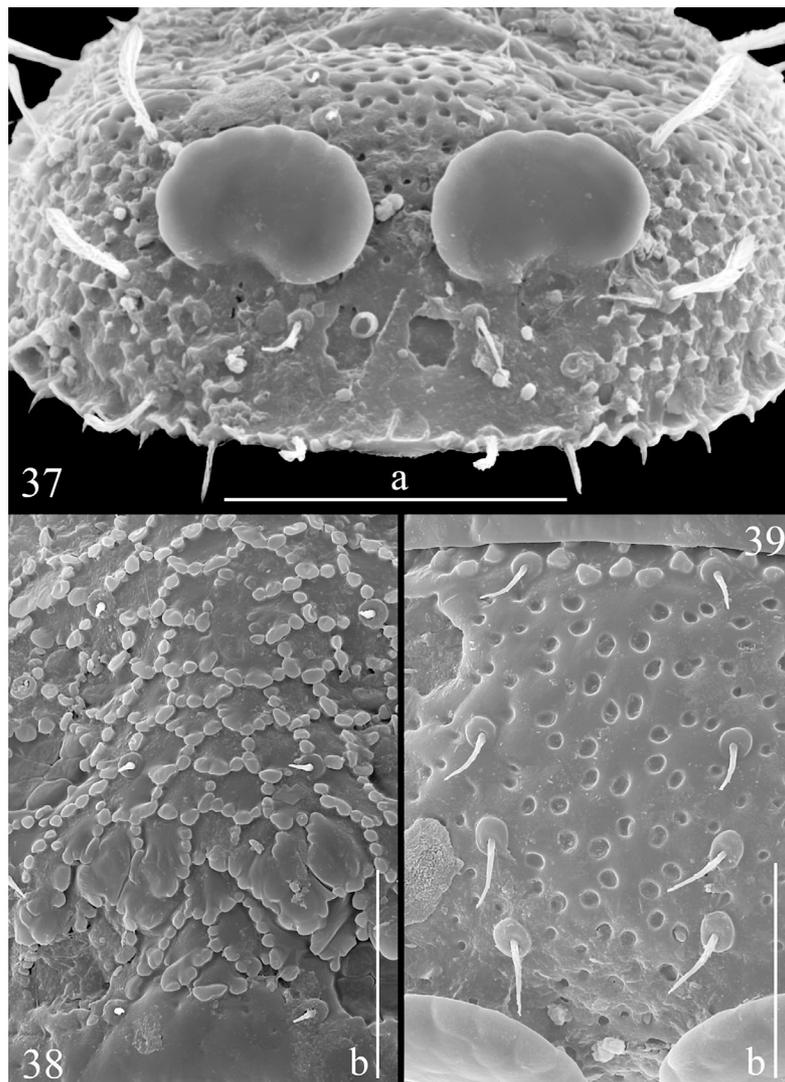
Diagnosis. Central podonotal setae pilose or finely barbed, marginal setae and j1–2 pilose. Setae J1–5 smooth, S2 elongate, pilose. Z3–4 densely pilose, similar in appearance to S2–5. Posterodorsal cavities covered by huge, strongly sclerotized, bean-shaped lobes (Figs 37, 40, 43). Podonotum covered by a reticulation of circular squamae and undulate tiles (Fig. 38), central surface of opisthonotum with distinct, alveolar pits arranged in a hexagonal pattern (Fig. 39).

Description of male. Length of idiosoma: 270  $\mu\text{m}$ ; width: 220  $\mu\text{m}$  (n = 1).



**Fig 36.** SEM photo of *Blaszakzercon pulcher* (BŁASZAK, 1984) female, in dorsal view (scale: 100  $\mu\text{m}$ )

Dorsal side (Fig. 34). Podonotum with 20 pairs of setae, j1–6, z2–6, s1–6, r2 and r4–5 inserted dorsally, r1 and r3 inserted ventrally, on peritrematal shields. Marginal setae of podonotum (s1–3, z2–3, r2, r4–5, s6) and j1–2 densely pilose, feathered. Setae j3–6, z4–6 and s4–5 smooth and needle-like. Glands *gds1* (po1) situated on line connecting j3 and s1; *gdj4* (po2) anteromedially to z4; *gds4* (po3) medially to line connecting s4 and s5, in equidistant position. Podonotum covered by a reticulation of circular squamae and undulate tiles.

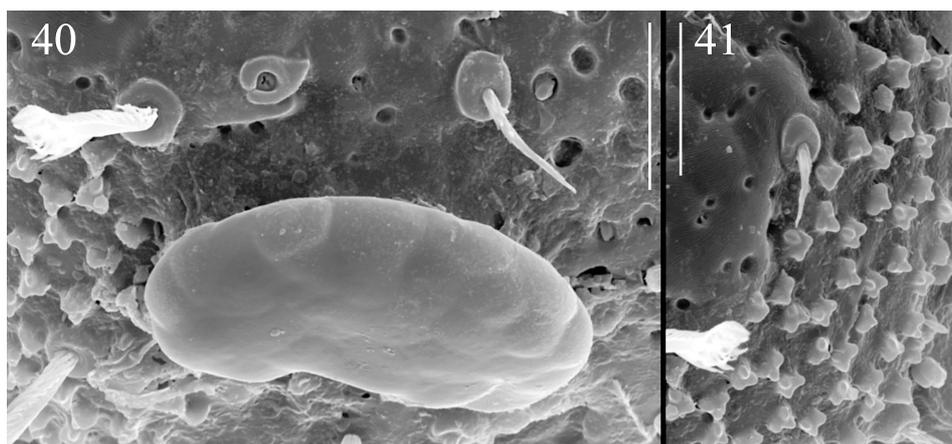


**Figs 37–39.** SEM photos of *Blaszakzercon pulcher* (BŁASZAK, 1984) female: 37 = caudal view of opisthonorium, 38 = central ornamentation of podonotum, 39 = central ornamentation of opisthonorium (scales: a = 100  $\mu$ m, b = 50  $\mu$ m)

**Table 5.** Lengths of opisthotal setae and the distances ( $\mu\text{m}$ ) between their bases in J-, Z- and S-rows of *Blaszakzercon pulcher* male (measurements as mean).

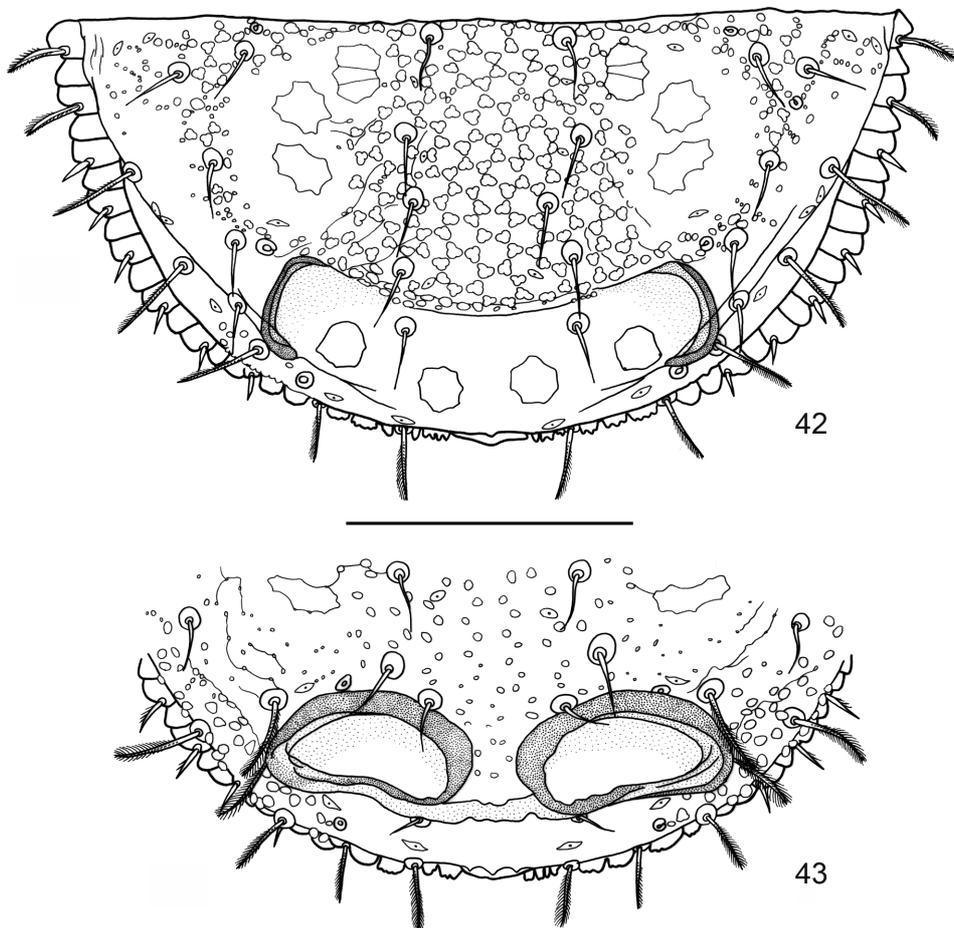
	M		M		M
J1	14	Z1	12	S1	16
J1-J2	33	Z1-Z2	37	S1-S2	25
J2	15	Z2	13	S2	18
J2-J3	19	Z2-Z3	23	S2-S3	27
J3	17	Z3	21	S3	22
J3-J4	16	Z3-Z4	22	S3-S4	29
J4	15	Z4	26	S4	24
J4-J5	22	Z4-Z5	45	S4-5	36
J5	14	Z5	30	S5	27

Opisthotalum with 22 pairs of setae, J1–5, Z1–5, S1–5, R1–7. Setae J1–5 smooth, pointed, J1 reaching approximately half the distance towards insertions of J2. J5 situated on the level of central dorsal cavities. Setae Z1–2 smooth and needle-like, none of them reaching bases of the following one in the series. Z3–5 similar in appearance to S2–5, elongate, feathered. S2 situated posterolaterally to Z1. Setae S1 and R1 three times longer than other R-setae, pilose. R2–3 short, pointed, barbed, R4–7 smooth, thorn-like. Length of opisthotal setae and distances between their insertions as in Table 5. Glands *gdZ1* (Po1) situated anteromedially to insertions of Z1; *gdS2* (Po2) on line connecting Z2 and S2; *gdZ3* (Po3) situated on line connecting J4 and Z3; *gdS5* (Po4) anteriorly to Jv5. Marginal serration relatively deep and obtuse. Lateral surface of opisthotalum bearing distinct, clover-shaped protuberances arranged in a hexagonal pattern (Fig. 41). Central surface of the shield bearing large, alveolar pits between the J-series, the area between J- and Z-series covered by small pits. Dorsal cavities uniform, well-sclerotized. The characteristic, strongly sclerotized, bean-like posterodorsal lobes of female are absent in male.

**Figs 40–41.** SEM photos of *Blaszakzercon pulcher* (BLASZAK, 1984) female: 40 = posterodorsal lobe, 41 = posterolateral ornamentation of opisthotalum (scales: 25  $\mu\text{m}$ )

Ventral side. Posterolateral parts of peritrematal shields fused to ventrianal shield on level of setae R1, the separating membranous slit between ventral and dorsal shields absent. Shape of peritrematal typical for the genus. Peritremes slightly bent anteriorly, the dilatation near the stigma not conspicuous. Peritrematal shields covered by some longitudinal lines. Sternigenital shield possessing four pairs of setae (st5 absent). Anteriorly the genital opening the shield covered by reticulate ornamentation, beyond the level of setae st4 irregular ditches can be observed on its surface. The adgenital region not clearly visible. Ventrianal chaetotaxy incomplete, setae Zv1 absent. Setae Jv1 situated much closer to each other than in female. Each ventrianal setae of approximately similar length, smooth and needle-like, except Jv5 which elongate, pilose. Anal valves with vestigial euanal setae. Glands gv3 situated laterally to adanal setae. Anterior surface of ventrianal shield covered by squamous pattern.

Gnathosoma. Broken off the single specimen.



**Figs 42–43.** *Blaszakzercon* species: 42 = opisthonotum of *B. hexagonatus* sp. n. female, 43 = posterior part of opisthonotum of *B. pulcher* (BLASZAK, 1984) female (scale: 100  $\mu$ m)

Remarks. One of the collected specimens possesses brush-like S2 setae similarly to that of BŁASZAK's specimens, S2 of others from Great Smoky Mountains National Park have smooth, needle-like S2.

## DISCUSSION

Both genera *Aspar* and *Blaszakzercon* were previously monotypic and are quite unique within the family Zerconidae. They share many, apparently important features with other genera (e.g. setae r2 are shifted to the peritrematal shields in *Aspar*, similarly to the genera *Parazercon* TRÄGÅRDH, 1931, *Parhozercon* BŁA-

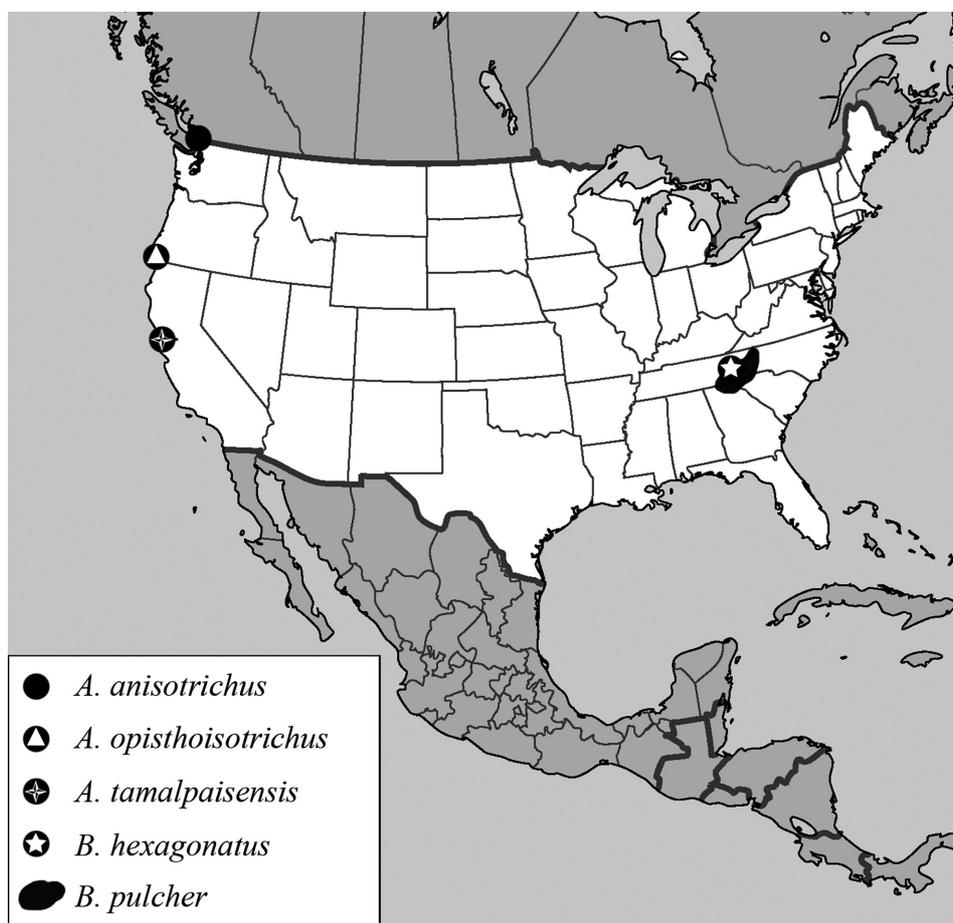


Fig 44. Occurrences of *Aspar* and *Blaszakzercon* species in North America

SZAK, 1981 and *Skeironozercon* HALAŠKOVÁ, 1977), but there is no evidence that these characters reflect phylogenetic relationships reliably. Therefore there is no sufficient basis to interpret the present distribution pattern of *Aspar* and *Blaszakzercon* species based on our general knowledge on other Zerconidae genera. According to the very few data of former genera it seems that *Aspar* inhabits only the western shore of North America, while *Blaszakzercon* seems to be endemic in the Appalachians. For more appropriate conclusions it is inevitable to collect and study further specimens.

\*

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