

REVIEW OF THE NEARCTIC GENERA *MACROZERCON*
BŁASZAK, 1976 AND *MICROZERCON* BŁASZAK, 1976
(MESOSTIGMATA: ZERCONIDAE)

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Diagnosis of genera *Macrozercon* Błaszak, 1976 and *Microzercon* Błaszak, 1976 are redefined. Six new species, *Macrozercon washingtonicus* sp. n., *Microzercon alaskaensis* sp. n., *Microzercon luiseae* sp. n., *Microzercon mahunkai* sp. n., *Microzercon nudus* sp. n., and *Microzercon pardus* sp. n. are described. Genera *Bakeras* BŁASZAK, 1984, *Blaszakiella* SIKORA et SKORACKI, 2008, and *Paleozercon* BŁASZAK *et al.*, 1995 are proposed as junior synonyms of *Microzercon* BŁASZAK, 1976, which results in the following new combinations: *Microzercon americanus* (SIKORA et SKORACKI, 2008) comb. n., *Microzercon cavernicolus* (BŁASZAK *et al.*, 1995) comb. n. and *Microzercon opiparus* (BŁASZAK, 1984) comb. n. A key to the known *Microzercon* species is provided.

Key words: Zerconidae, *Macrozercon*, *Microzercon*, taxonomy, new species, Nearctic, mite.

INTRODUCTION

Taxonomic and faunistic studies of zerconid mites have mostly focused on Europe and Asia, however, on the basis of the relatively few papers published the diversity of Zerconidae is presumably enormous in North America. Species of 20 genera have been discovered so far, mostly from the United States of America, which is a large number considering that only 37 Zerconidae genera are known worldwide. However, it is important to note that several endemic American genera were established on the basis of a single species only (e.g., BŁASZAK 1981*a, b* 1984, BŁASZAK *et al.* 1995, SIKORA & SKORACKI 2008), and thus the generic diagnoses were sometimes confusing, enumerating derivative characters which are excellent for specific distinction, but less so on generic level.

Elaborating a huge material of the Hungarian Natural History Museum and the Canadian National Collection of Insects, Arachnids and Nematodes, more than 50 new American Zerconidae species have been found so far, which gave us a solid basis for re-evaluation of the generic concepts of the American genera. The aim of present paper is to provide an appropriate delimitation for genera *Macrozercon* Błaszak, 1976 and *Microzercon* Błaszak, 1976.

MATERIAL AND METHODS

The Berlese samples of the Hungarian Natural History Museum (HNHM) and slides of the Canadian National Collection of Insects, Arachnids and Nematodes (CNC) were

examined. Specimens were cleared with lactic acid, mounted in glycerin and examined using light microscopy; drawings were made with the aid of a drawing tube. Type specimens are deposited in the Collection of Soil Zoology of HNHM Budapest and CNC Ottawa, on slides or in 70% ethanol. The terminology of setae follows LINDQUIST and 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 ATHIAS-HENRIOT (1969) and JOHNSTON and MORAZA (1991). The epistome typology follows UJVÁRI (2011a). All measurements including scale bars of the figures are given in micrometres.

TAXONOMY

Macrozercon Błaszak, 1976

Macrozercon BŁASZAK, 1976: 565, 567; HALAŠKOVÁ 1977: 69; BŁASZAK 1978: 853; 1979: 101, 103; 1980: 547; 1984: 600; BŁASZAK *et al.* 1995: 254; SIKORA & SKORACKI: 2008: 253; DÍAZ-AGUILAR & UJVÁRI 2010: 26.

Type species: *Prozercon praecipuus* SELLNICK, 1958a: 128, by original designation.

Diagnosis. Idiosoma wide, oval. The slit between peritrematal shields and dorsal shields narrow, posterolateral tips of peritrematal shields truncate. Peritremes of general size, expanded to anterior half of coxae III, straight or bent. Setae r1 and r3 shifted ventrally to peritrematal shields, both short, bristle-like, smooth or barbed. Glands gv2 present, their openings surrounded by small adgenital sclerites. Ventrianal shield wide, with two deep, vertical incisions in its anterolateral region. Anterolateral edge of ventrianal shield nearly reaching posterior margin of peritrematal shields, in males these shields may be fused with each other. Ventrianal shield bearing 19 setae, setae Zv1 absent. Glands gv3 situated anterolateral or lateral to adanal setae. Setae z1 absent. Third pair of opisthonotal pores associated with the J-series (in position gdJ2 or gdJ3). Margin of opisthonotum with 7 pairs of R-setae. Setae S1 and anterior R-setae (R1–2) significantly longer than the rest of R-setae. Posterodorsal cavities well-sclerotized, of moderate size.

Macrozercon praecipuus (Sellnick, 1958) (Figs 1–14)

Prozercon praecipuus SELLNICK, 1958a: 128; SELLNICK 1958b: 364.

Macrozercon praecipuus: BŁASZAK 1976: 554. 1980: 547.

Type locality: USA, California, Santa Cruz County, Ben Lomond, redwood forest.

Material examined. USA, California, Mt. Tamalpais, 1000 m a.s.l., pine forest, moss from trees and dry-rotten wood, 12.01.1985, leg. Neiger, M. (HNHM E-Am-090 – 4 fe-

males, 1 male); USA, California, Mt. Tamalpais, 1000 m a.s.l., huge pine forest, moss from forest floor, 12.01.1985, leg. Neiger, M. (HNHM E-Am-093 – 1 female); USA, California, San Bruno, oak litter, 23.02.1958, leg. Newell (slide CNCAZ0511 – 3 females); USA, California, Monterey Co., Big Sur area, 25 mi. S. Carmel, from mixed tree litter, mostly oak, 14.07.1989, leg. Lindquist, E. E. (slide CNCAZ0512 – 1 deutonymph; slide CNCAZ0515 – 1 female; slide CNCAZ0516 – 1 male; slide CNCAZ0517 – 1 female; slide CNCAZ0518 – 1 female); USA, California, Monterey Co., Big Sur area, 25 mi. S. Carmel, from redwood litter, 14.07.1989, leg. Lindquist, E. E. (slide CNCAZ0523 – 1 female; slide CNCAZ0524 – 1 male; slide CNCAZ0525 – 1 female; slide CNCAZ0526 – 1 female; slide CNCAZ0656 – 1 female).

Diagnosis of female. Dorsal setae pilose except s1. Each J-seta reaching bases of the following one of the series. Marginal setae S1 and R1–2 elongate, brush-like, R3–7 shorter, serrate, bent and pointed. Glands Po2 situated in position *gdS2*, on or below line connecting S2 and Z2, Po3 situated in position *gdJ2*, posterolateral to J2. Anterocentral surface of podonotal shield covered by scales possessing spiny posterior margin. Peritremes anteriorly bent, with 1–3 small branches running towards the inner edge of peritrematal shields.

Description of female. Length of idiosoma: 442 μm (425–467 μm); width: 367 μm (333–398 μm) (n = 10).

Dorsal side (Fig. 1). 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. Each dorsal podonotal seta densely pilose or serrate, except s1 which short, smooth or finely pilose. Setae j1–2 and marginal setae z3, r2, s3, r4–5 and s6 brush like, other pilose setae pointed. Setae s5 situated on level of z6. Glands *gds1* (po1) situated medial or posteromedial to insertions of s1; *gdj4* (po2) situated on line connecting j4 and z4, near z4; *gds4* (po3) on line connecting z6 and s4. Anterocentral surface of podonotal shield covered by scales possessing spiny posterior margin, the rest of podonotal surface smooth, only the characteristic muscle scars are visible in the area of setae j5 and z5.

Opisthonotum with 22 pairs of setae: J1–5, Z1–5 and S1–5, marginal R-series with seven pairs of setae. Setae J1–5, Z1–4 and S2–3 similar in appearance to central podonotal setae, relatively long, pointed, densely pilose, each reaching insertions of the following setae of the series. Setae J1–5 and Z1–4 constitute nearly parallel lines, setae Z4 situated somewhat lateral to the row of Z1–3. Setae S2 situated anterior to S3. Setae Z5 and S4–5 elongate, basally smooth, apically broadening, brush-like. S2–3 not reaching edges of opisthonotum, S4–5 expanding beyond the margins of the shield. Setae S1 and R1–2 similar in appearance, brush-like, longer than the rest of R-setae. R3–7 short, bent, marginally serrate. Length of opisthonotal setae and distances between their insertions as in Table 1. Glands *gdZ1* (Po1) situated anteromedial to insertions of Z1; *gdS2* (Po2) situated above line connecting Z2 and S3; *gdJ2* (Po3) posterolateral to J2; *gdS5* (Po4) on line connecting Z5 and S5, anteromedial to insertions of Jv5. Marginal serration deep and obtuse. Opisthonotal surface smooth. Posterodorsal cavities uniform, well-sclerotized, saddle like, with undulate inner margin. Lateral pair of cavities situated anterior to central pair, between insertions of J5 and Z4, with axes converging anteriorly. Central pair with axes parallel to that of the body.

Ventral side (Fig. 2). Slit between peritrematal shields and dorsal shields narrow. Peritrematal shields truncate on level of S1, possessing a few longitudinal sutures. Peritremes

anteriorly bent, with 1–3 small branches running towards the inner edge of peritrematal shields. Peritrematal setae r1 and r3 short, smooth, bristle-like. Tritosternum with two slender, apically bifurcate, marginally pilose laciniae, tritosternal base vase-like. Sternal shield 75–78 μm long and 57–60 μm wide at the level of setae st2, with straight posterior margin, without conspicuous ornamentation. Sternal setae smooth and needle-like. Glands *gv1* situated posteromedial to setae st3. Genital shield typical for the family, with a few sutures, genital setae smooth and needle-like. A pair of narrow postgenital sclerites may be present behind genital shield. Glands *gv2* present, with two openings surrounded by

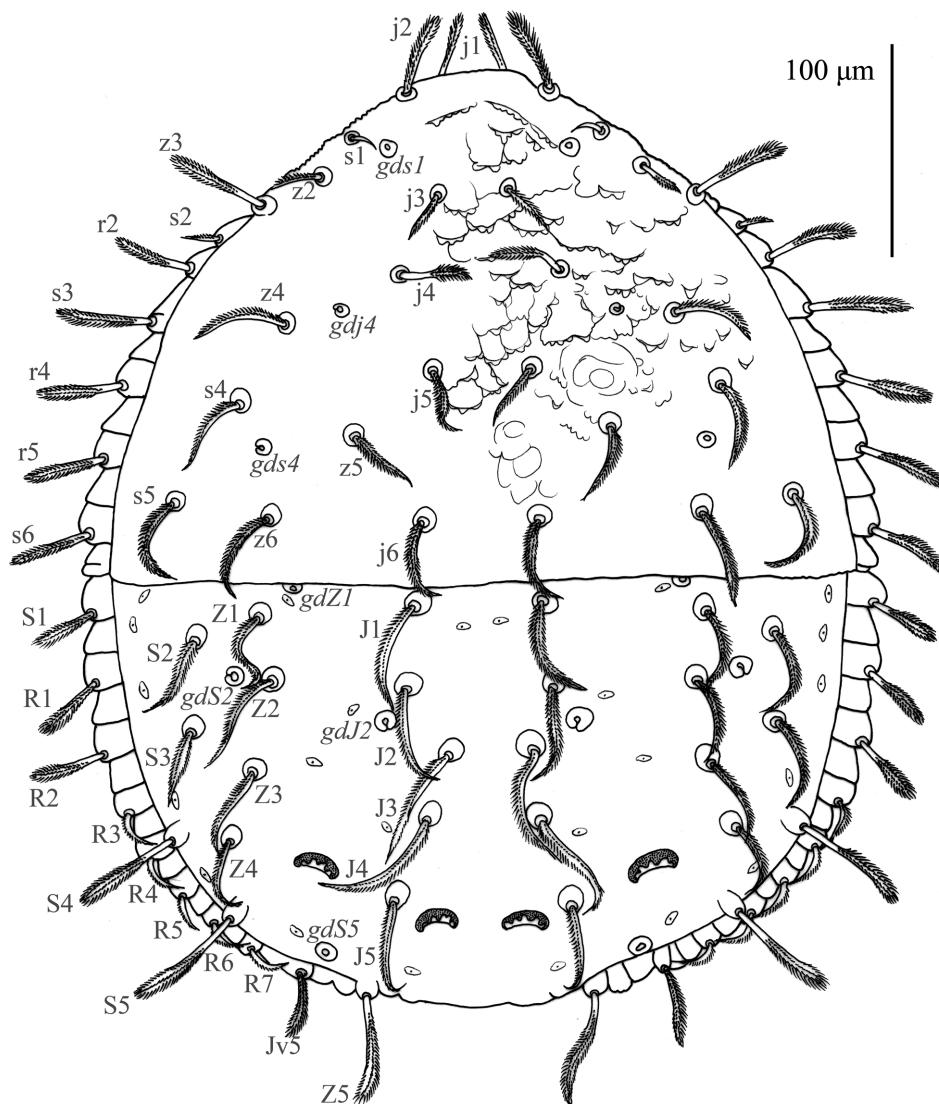
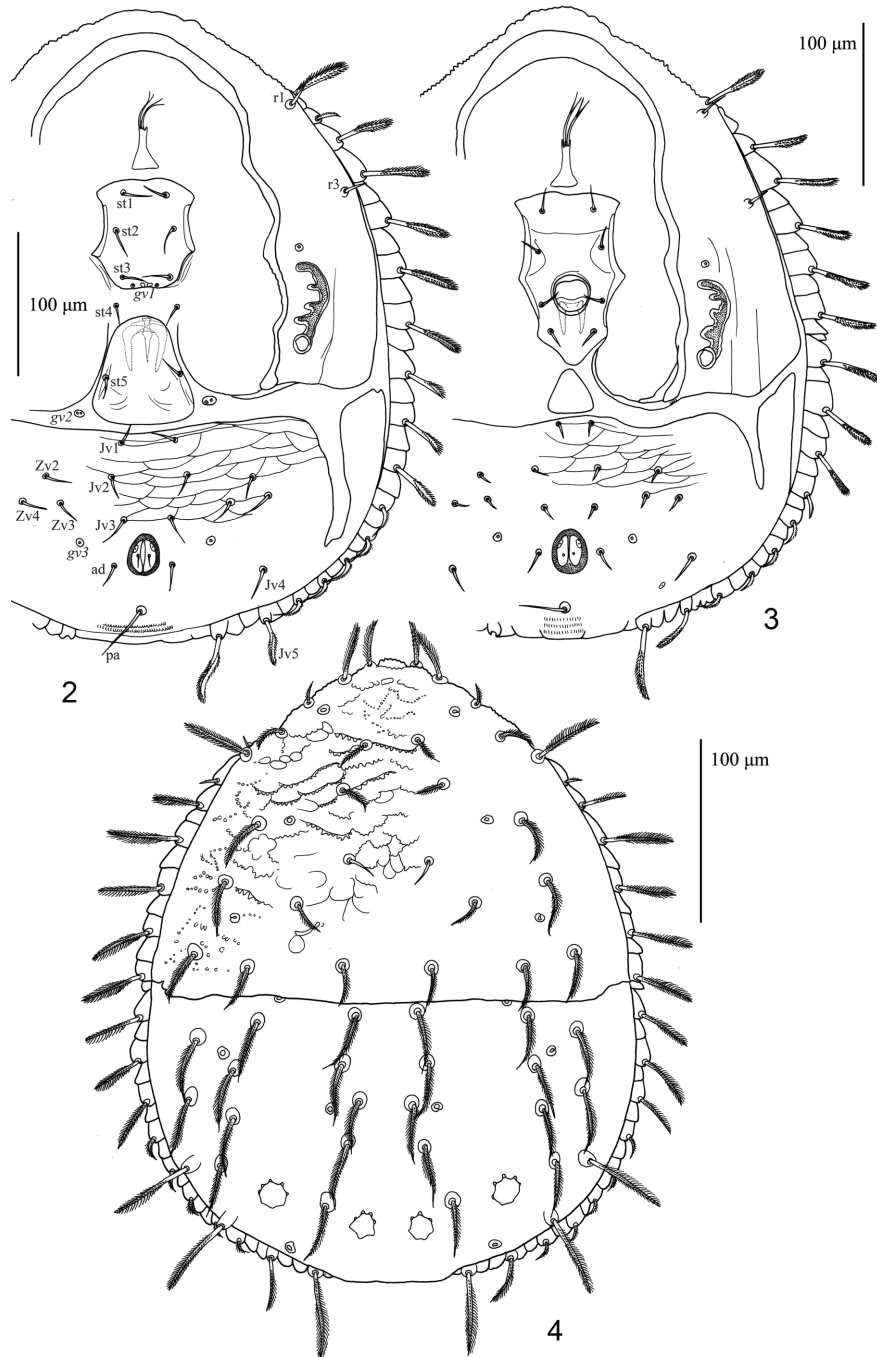
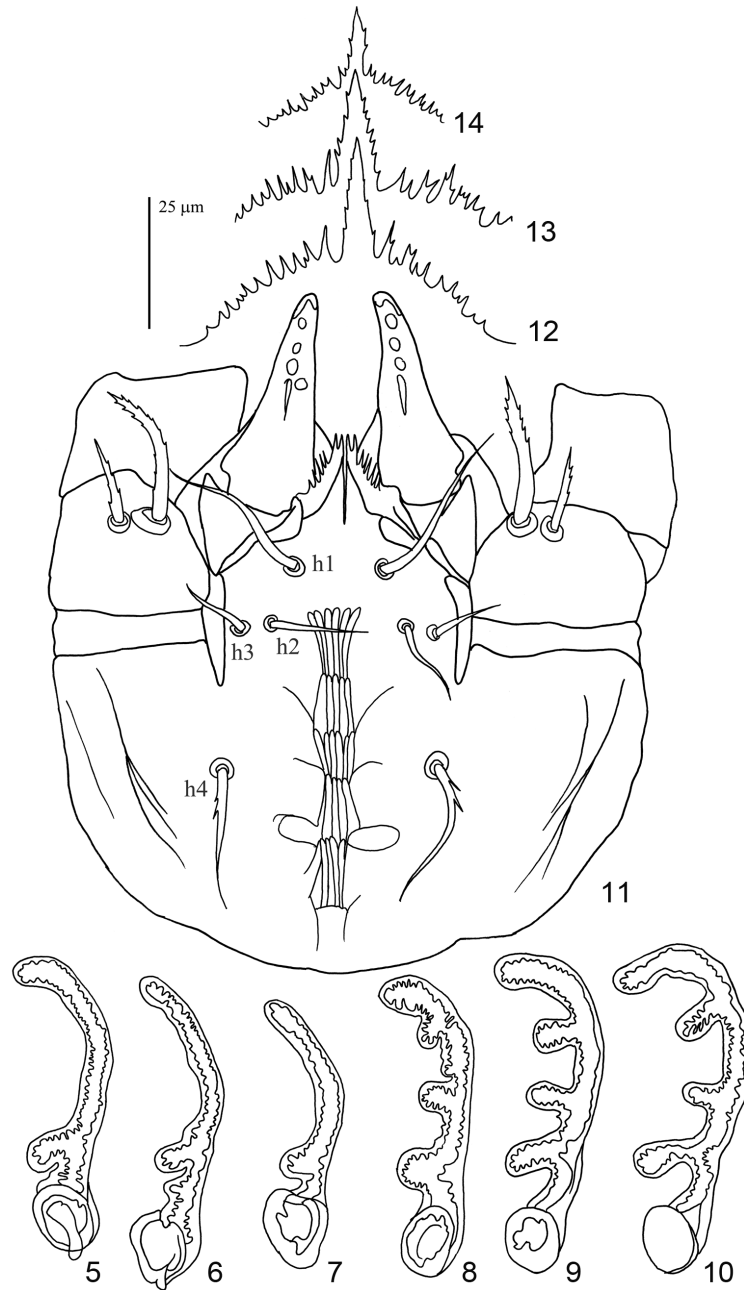


Fig. 1. *Macrozercon praecipuus* (Sellnick, 1958) female, dorsal view.



Figs 2–4. *Macrozercon praecipuus* (Sellnick, 1958): 2 = female, ventral view, 3 = male, ventral view, 4 = deutonymph, dorsal view.



Figs 5–14. *Macrozercon praecipuus* (Sellnick, 1958): 5–7 = peritremes of females from Big Sur area, 8–10 = peritremes of females from Mt. Tamalpais, 11 = ventral view of gnathosoma with chelicerae, female, 12–13 = epistomes of female, 14 = epistome of deutonymph.

small adgenital sclerites. Ventrianal shield wide, expanded to anterolateral direction, nearly reaching posterior edges of peritrematal shields. Anterior edge of the shield split by two anterolateral, nearly vertical incisions expanding to level of setae R4–6. Ventrianal shield with short, smooth and needle-like preanal and adanal setae, setae Zv1 absent. Postanal seta 2–3 times longer than preanal and adanal setae, smooth. Setae Zv3 positioned on level of Zv4. Setae Jv5 moderately long, brush-like, pilose. Anal valves with euanal setae. Glands gv3 situated anterolateral to adanal setae. Anterior surface of ventrianal shield covered by tile-like pattern to level of Jv3–Zv3–Zv4.

Gnathosoma (Fig. 11). Situation of hypostomal and subcapitular setae typical for the family. Setae h1 elongate, apically tapering, smooth. Setae h2–3 shorter than h1, smooth, h4 longer than h3, proximally serrate. Corniculi horn-like, internal malae with a pair of bifurcate antero-central branches and with serrate margins. Chelicerae relatively robust, fixed digit with 6 teeth, movable digit with 4–5 teeth. Epistome of *Prozercon*-type (Figs 12–13).

Description of male (Fig. 3). Length of idiosoma: 364 μm (344–387 μm); width: 287 μm (263–328 μm) (n = 3). Chaetotaxy, adenotaxy and sculptural pattern of dorsal, ventrianal and peritrematal shields similar to those of female. Length of opisthonotal setae and distances between their insertions as in Table 1. Characteristic incisions of ventrianal shield reaching only level of R3. Sternigenital shield divided, the anterior part bearing four pairs of smooth and needle-like setae, setae st5 absent. A small, subtriangular posterior sternigenital sclerite situated between coxae IV, without setae. Sternal setae st3 situated on level of posterior half of genital opening. Posterolateral tips of peritrematal shields not fused to ventrianal shield. Each characters of gnathosoma similar to those of female, but terminal part of fixed digit of chelicerae bifurcate.

Deutonymph (Fig. 4). Length of idiosoma: 339 μm ; width: 285 μm (n = 1). Dorsal chaetotaxy and adenotaxy basically similar to those of adults, except shape of setae j5, which smooth in deutonymphs, and position of glands gdJ2, which located lateral to setae J3. Posterodorsal cavities shallow, weakly developed, with undulate anterior margin. Length of opisthonotal setae and distances between their insertions as in Table 1. Dorsal ornamentation similar to that of adults. Each characters of gnathosoma similar to those of adult female (Fig. 14).

Table 1. Lengths of opisthonotal setae and the distances between their bases in J-, Z- and S-rows of *Macrozercon praecipuus* (Sellnick, 1958) (measurements as mean, in μm). (F = female; M = male; DN = deutonymph).

| | F | M | DN | | F | M | DN | | F | M | DN |
|--------------|----|----|----|--------------|-----|----|----|--------------|----|----|----|
| J1 | 50 | 40 | 35 | Z1 | 42 | 34 | 32 | S1 | 34 | 28 | 31 |
| J1–J2 | 41 | 33 | 28 | Z1–Z2 | 33 | 26 | 28 | S1–S2 | 50 | 41 | 35 |
| J2 | 47 | 38 | 32 | Z2 | 47 | 38 | 33 | S2 | 42 | 34 | 33 |
| J2–J3 | 35 | 28 | 23 | Z2–Z3 | 42 | 34 | 25 | S2–S3 | 43 | 35 | 33 |
| J3 | 58 | 47 | 31 | Z3 | 43 | 35 | 31 | S3 | 41 | 33 | 34 |
| J3–J4 | 35 | 28 | 24 | Z3–Z4 | 33 | 27 | 28 | S3–S4 | 53 | 43 | 38 |
| J4 | 58 | 47 | 36 | Z4 | 38 | 31 | 30 | S4 | 56 | 45 | 46 |
| J4–J5 | 43 | 35 | 35 | Z4–Z5 | 102 | 83 | 77 | S4–5 | 48 | 39 | 37 |
| J5 | 47 | 38 | 31 | Z5 | 54 | 44 | 47 | S5 | 57 | 46 | 45 |

Remarks. There are several differences between the specimens collected on Mt. Tamalpais and other regions of California. The type specimens described by SELLNICK (1958) and the specimens stored in the CNC, collected from several regions of California are corresponding in the following characters: females are small (405–430 μm in length), their s2 setae are pilose, possess simple peritremes (Figs 5–7), and the males have smooth j5 setae. In contrast, the female *M. praecipuus* specimens of Mt. Tamalpais are generally larger (440–462 μm), have smooth s2 setae, possess extraordinary peritremes with several extra tubercles (Figs 8–10), and the males collected in this region have pilose j5 setae.

Macrozercon washingtonicus sp. n.
(Figs 15–26)

Type material. Holotype: female – USA, Washington, Wenatchee county, Pinetum, small pond, leaf litter, 18.09.1978, leg. Jermy, T. (HNHM E-Am-080). Paratypes: 7 females, 5 males, 1 deutonymph – locality and date as for the holotype (HNHM E-Am-080).

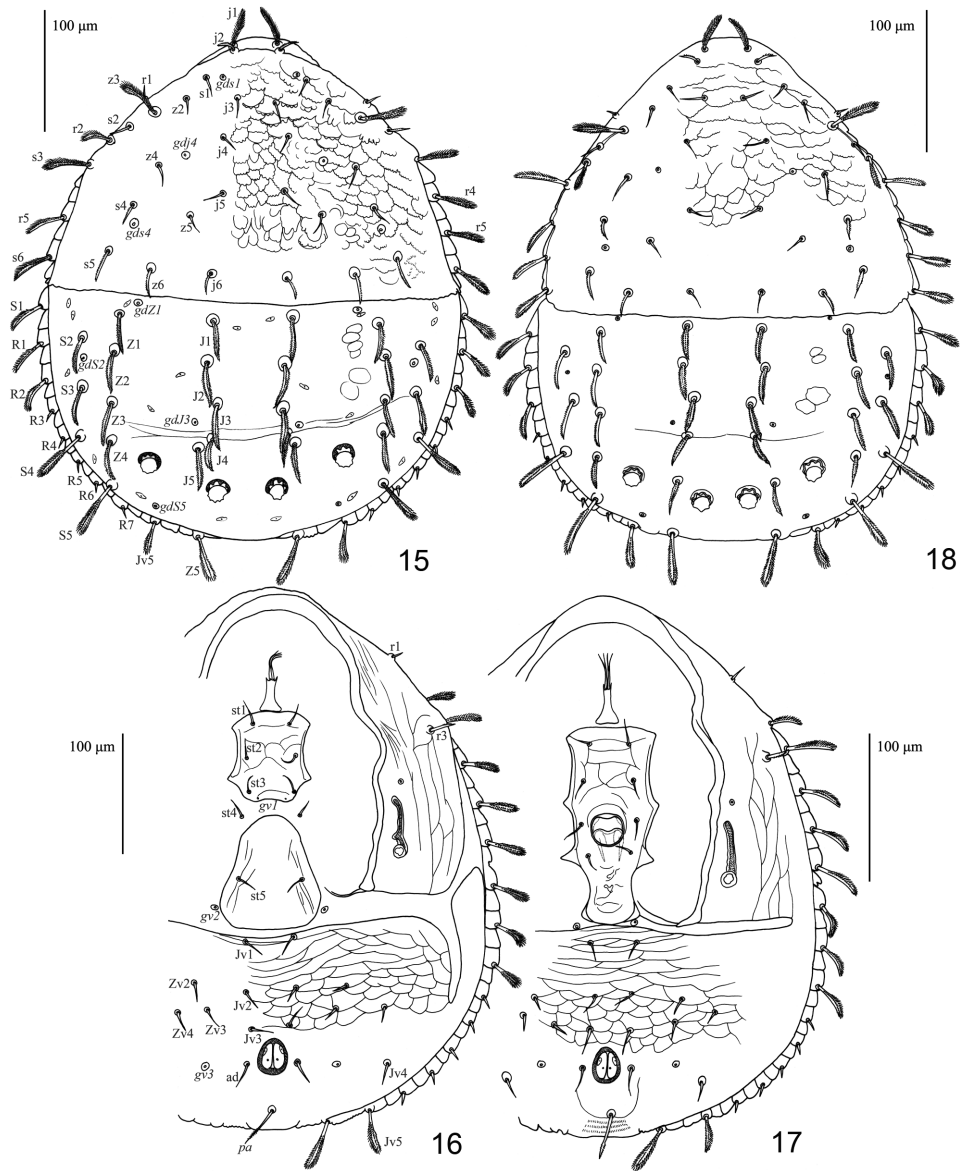
Diagnosis of female. Most central and submarginal podonotal setae smooth or finely serrate. Marginal setae S1 and R1–2 elongate, brush-like, R3–7 short, smooth, bristle-like. Glands Po2 situated in position *gdS2*, on line connecting S2 and S3, Po3 situated in position *gdJ3*, posterolateral to J3. Anterocentral and lateral surface of podonotum covered by scales possessing lacy posterior margin. Peritremes nearly straight, with a small dilation near stigmata.

Description of female. Length of idiosoma: 462 μm (451–483 μm); width: 376 μm (355–398 μm) (n = 8).

Dorsal side (Fig. 15). 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. Setae j1, z3, r2, s3, r4–5 and s6 elongate, brush-like, densely pilose. Setae j2, j6, z6, s2 and s4–5 shorter, finely serrate. Other podonotal setae short, smooth and needle-like. Setae s5 situated near level of z6. Glands *gds1* (po1) situated medial or anteromedial to insertions of s1; *gdj4* (po2) situated on line connecting j4 and z4, near z4; *gds4* (po3) on line connecting s4 and s5. Anterocentral and lateral surface of podonotal shield covered by scales possessing lacy posterior margin, posterocentral podonotal surface smooth.

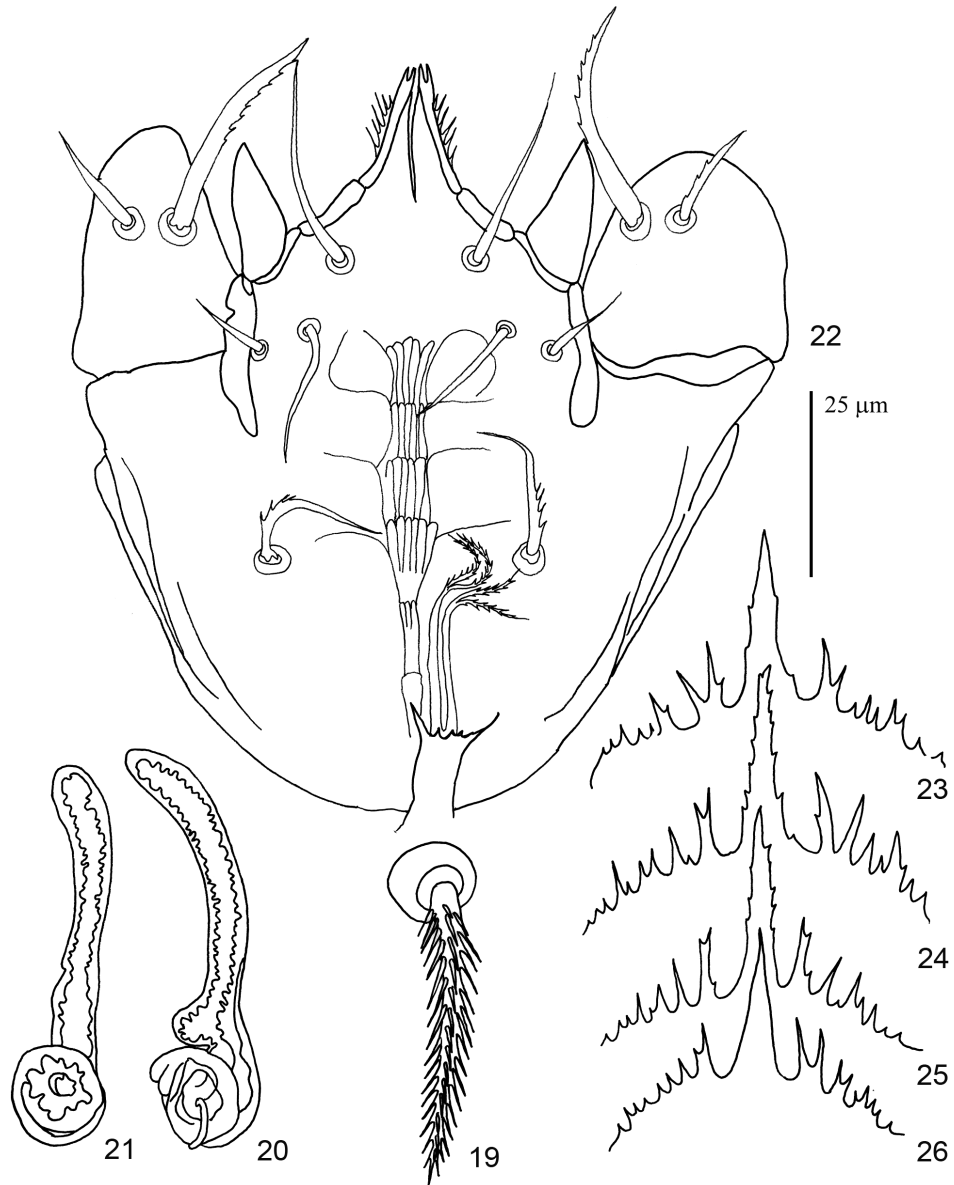
Opisthonotum with 22 pairs of setae: J1–5, Z1–5 and S1–5, marginal R-series with seven pairs of setae. Setae J1–5, Z1–4 and S2–3 similar in appearance, moderately long, pointed, densely pilose (Fig. 19). Setae J1–5 and Z1–4 constitute nearly parallel lines. Setae S2 situated anterior to S3. Setae Z5 and S4–5 elongate, apically broadening, brush-like. S2–3 not reaching edges of opisthonotum, S4–5 expanding beyond the margins of the shield. Setae S1 and R1–2 similar in appearance, brush-like, longer than the rest of R-setae. R3–7 short, smooth, bristle-like, R3 may be finely barbed. Length of opisthonotal setae and distances between their insertions as in Table 2. Glands *gdZ1* (Po1) situated anteromedial to

insertions of Z1; *gdS2* (Po2) situated on line connecting S2 and S3; *gdJ3* (Po3) posterolateral to J3; *gdS5* (Po4) on line connecting Z5 and S5, anterior or anteromedial to insertions of Jv5. Marginal serration moderately deep, obtuse. Opisthotal surface smooth, only some oval muscle scars can be seen medial to Z1–3. Posterodorsal cavities uniform, well-sclerotized,



Figs 15–18. *Macrozercon washingtonicus* sp. n.: 15 = dorsal view of female, 16 = ventral view of female, 17 = ventral view of male, 18 = dorsal view of deutonymph.

saddle like, with undulate inner margin. Lateral pair of cavities situated anterior to central pair, below insertions of J5 and Z4, with axes slightly converging anteriorly. Central pair with axes parallel to that of the body.



Figs 19–26. *Macrozercon washingtonicus* sp. n.: 19 = setae J4 of female, 20 = peritreme of female, 21 = peritreme of male, 22 = ventral view of gnathosoma, female, 23–24 = epistomes of female, 25 = epistome of male, 26 = epistome of deutonymph.

Ventral side (Fig. 16). Slit between peritrematal shields and dorsal shields narrow. Peritrematal shields truncate on level of S1, possessing fine reticulation of longitudinal sutures. Peritremes nearly straight, with a small dilation near stigmata (Fig. 20). Peritrematal setae r1 short, smooth and bristle-like, r3 about twice as long as r1, finely serrate. Tritosternum with two slender, apically bifurcate, marginally pilose laciniae, tritosternal base vase-like. Sternal shield 76 μm long and 53 μm wide at the level of setae st2, with finely curved posterior margin, with weakly conspicuous reticulate ornamentation. Sternal setae smooth and needle-like. Glands *gv1* situated posteromedial to setae st3. Genital shield typical for the family, with a few sutures, genital setae smooth and needle-like. Glands *gv2* present, with a single opening surrounded by small adgenital sclerites. Ventrianal shield wide, expanded to anterolateral direction, fitting to the margins, reaching beyond level of posterior edges of peritrematal shields. Anterior edge of the shield split by two anterolateral, nearly vertical incisions expanding to level of setae R3–4. Ventrianal shield with short, smooth and needle-like preanal and adanal setae, setae Zv1 absent. Postanal seta 1.5–2 times longer than preanal and adanal setae, distally pilose. Setae Zv3 positioned on level of Zv4. Setae Jv5 moderately long, brush-like, pilose. Anal valves with vestigial euanal setae. Glands *gv3* situated lateral to adanal setae. Anterior surface of ventrianal shield covered by tile-like pattern to level of Jv3–Zv3–Zv4.

Gnathosoma (Fig. 22). Situation of hypostomal and subcapitular setae typical for the family. Setae h1 elongate, apically tapering, smooth. Setae h2–3 shorter than h1, smooth, h4 as long as h2, proximally serrate. Corniculi horn-like, internal malae with a pair of bifurcate anterocentral branches and with serrate margins. Chelicerae moderately thick, fixed digit with 6 teeth, movable digit with 4–5 teeth. Epistome of *Prozercon*-type (Figs 23–24).

Description of male (Figs 17, 21). Length of idiosoma: 366 μm (355–376 μm); width: 296 μm (290–306 μm) (n = 5). Chaetotaxy, adenotaxy and sculptural pattern of dorsal, ventrianal and peritrematal shields basically similar to those of female. Length of opisthonotal setae and distances between their insertions as in Table 2. Peritrematal shields fused with anterolateral parts of ventrianal shield, only a pair of horizontal incisions can be observed running towards setae S1. Peritremes straight, without any dilation. Sternigenital shield undivided, bearing four pairs of smooth and needle-like setae, setae st5 absent. Sternal se-

Table 2. Lengths of opisthonotal setae and the distances between their bases in J-, Z- and S-rows of *Macrozercon washingtonicus* sp. n. (measurements as mean, in μm). (F = female; M = male; DN = deutonymph).

| | F | M | DN | | F | M | DN | | F | M | DN |
|--------------|----|----|----|--------------|-----|----|----|--------------|----|----|----|
| J1 | 41 | 32 | 25 | Z1 | 38 | 30 | 23 | S1 | 36 | 28 | 29 |
| J1–J2 | 42 | 33 | 28 | Z1–Z2 | 33 | 26 | 29 | S1–S2 | 49 | 38 | 28 |
| J2 | 42 | 33 | 26 | Z2 | 41 | 32 | 26 | S2 | 35 | 27 | 27 |
| J2–J3 | 42 | 32 | 26 | Z2–Z3 | 45 | 35 | 30 | S2–S3 | 46 | 35 | 35 |
| J3 | 42 | 33 | 27 | Z3 | 39 | 30 | 25 | S3 | 38 | 30 | 28 |
| J3–J4 | 28 | 21 | 25 | Z3–Z4 | 33 | 26 | 30 | S3–S4 | 44 | 34 | 37 |
| J4 | 32 | 25 | 24 | Z4 | 38 | 29 | 22 | S4 | 53 | 41 | 42 |
| J4–J5 | 14 | 11 | 35 | Z4–Z5 | 123 | 96 | 78 | S4–5 | 54 | 42 | 40 |
| J5 | 38 | 30 | 24 | Z5 | 46 | 36 | 37 | S5 | 50 | 39 | 43 |

tae st3 situated on level of anterior half of genital opening. Each characters of gnathosoma similar to those of female (Fig. 25), but terminal part of fixed digit of chelicerae bifurcate.

Description of deutonymph (Fig. 18). Length of idiosoma: 355 μm ; width: 290 μm ($n = 1$). Dorsal chaetotaxy, adenotaxy and appearance of posterodorsal cavities basically similar to those of adults, except position of setae J5, which shifted posterior, near the anterolateral edge of central dorsal cavities, thus setae J4 not reaching insertions of J5. Furthermore podonotal setae z4 finely serrate. Length of opisthonotal setae and distances between their insertions as in Table 2. Dorsal ornamentation similar to that of adults, but less expressed. Each characters of gnathosoma similar to those of adult female (Fig. 26).

Table 3. Distinguishing characters of *Macrozercon* species.

| Characters | <i>Macrozercon praecipuus</i> | <i>Macrozercon</i> sp. n. |
|---|--|--|
| Appearance of setae j3–5, z2, and z4–5 | Moderately long (26–44 μm), densely pilose | Short (15–18 μm), smooth, needle-like |
| Appearance of setae j2, j6, z6 and s4–5 | Moderately long (41–45 μm), densely pilose | Short or moderately long (18–31 μm), finely serrate |
| Length of J–setae | 45–60 μm | 31–40 μm |
| Appearance of setae R3–7 | Short (17–23 μm), curved, serrate, pointed | Short (8–12 μm), smooth, bristle-like |
| Position of Po2 | Below line connecting S2 and Z2 | On line connecting S2 and S3 |
| Position of Po3 | In position <i>gd</i> 2 | In position <i>gd</i> 3 |
| Podonotal pattern | Anterocentral surface covered by scales possessing spiny posterior margin | Anterocentral and lateral surface covered by scales possessing lacy posterior margin |
| Shape of peritremes | Anteriorly bent, with 1–3 small branches running towards the inner edge of peritrematal shields | Nearly straight, a small dilation near stigmata |
| Incisions of ventrianal shield | Expanding to level of setae R4–5 | Expanding to level of setae R3 |
| Anterolateral expansion of ventrianal shield | Nearly reaching posterior edges of peritrematal shields | Reaching beyond level of posterior edges of peritrematal shields |
| Appearance of <i>gv</i> 2 | With two openings | With a single opening |
| Appearance of sternigenital shield of male | Divided behind level of setae st4 | Undivided |
| Appearance and relative position of peritrematal and ventrianal shields of male | Peritrematal and ventrianal shields not fused with each other, the vertical incision of ventrianal shield reaching level of setae R1 | Peritrematal and ventrianal shields fused with each other, the vertical incision observed in female absent |

Etymology. The species is named after Washington, the state where it was collected.

Differential diagnosis. The two known *Macrozercon* species can be distinguished according to Table 3.

Microzercon Błaszak, 1976

Microzercon BŁASZAK, 1976: 565, 567; HALAŠKOVÁ 1977: 69; 1978: 853; 1979: 101, 103; 1980: 547; 1984: 600; BŁASZAK *et al.* 1995: 254; SIKORA & SKORACKI: 2008: 253; DÍAZ-AGUILAR & UJVÁRI 2010: 26.

Bakeras BŁASZAK, 1984: 588; BŁASZAK *et al.* 1995: 257; SIKORA & SKORACKI: 2008: 254; DÍAZ-AGUILAR & UJVÁRI, 2010: 26. **syn. n.**

Blaszakiella SIKORA & SKORACKI, 2008: 251; DÍAZ-AGUILAR & UJVÁRI 2010: 26. **syn. n.**

Paleozercon BŁASZAK *et al.*, 1995: 253; SIKORA & SKORACKI 2008: 254; DÍAZ-AGUILAR & UJVÁRI 2010: 26. **syn. n.**

Type species: *Prozercon californicus* SELLNICK, 1958a: 126, by original designation.

Diagnosis. Idiosoma wide, oval. Only a narrow slit can be observed between peritrematal shields and dorsal shields, or these shields are fused with each other. Posterolateral tips of peritrematal shields expanded posteriorly, often fused with ventrianal shield. Peritremes of general size, expanded to anterior half of coxae III, straight or slightly bent. Setae r1 and r3 shifted ventrally to peritrematal shields, both short, bristle-like, usually smooth. Glands gv2 present, their openings surrounded by small adgenital sclerites. Ventrianal shield bearing 19 or 21 setae, setae Zv1 usually absent. Glands gv3 situated anterolateral to adanal setae. Setae z1 absent. Third pair of opisthonotal pores associated with the J-series (in position *gdJ2* or *gdJ3*). Margin of opisthonotum with 7 pairs of R-setae. Setae S1 and most (anterior) R-setae relatively long, densely pilose. Posterodorsal cavities heterogenous in size and development.

Remarks. Redefining the diagnosis of *Microrzercon* according to the previous observations of UJVÁRI (2011b, c, 2013) on derivative characters useful for generic classification resulted in recognising several junior synonymous names as follows.

The genus *Bakeras* was established without comparison to *Microzercon*, while all main characters of these two genera are corresponding. Therefore I propose here that *Bakeras* is a junior synonym of *Microzercon*, which results in a new combination: *Microzercon opiparus* (Błaszak, 1984) **comb. n.**

In the meantime, the genus *Blaszakiella* was established on the basis of the presence of adgenital plates. Both *Microzercon* and *Blaszakiella* possess the characteristic adgenital glands *gv2*, but it has very minor importance whether these glands are surrounded by a small, sclerotized area or not, as so many transitional forms were observed on the newly discovered species presented

herein. Thus *Blaszakiella* is a junior synonym of *Microzercon*, which results in a new combination: *Microzercon americanus* (Sikora et Skoracki, 2008) **comb. n.**

According to the description and reconstructed figures of the fossile genus *Paleozercon* it has also turned out that there is only a minor distinctive feature between it and *Microzercon*. In *Paleozercon*, posterolateral tips of peritrematal shields end freely, while these are fused with the ventrianal shield in the so far known *Microzercon* species. However, as it is described below, some species, e.g. *Microzercon opiparus* (Błaszak, 1984) **comb. n.**, may show both character stages regarding the situation of peritrematal shield tips, thus it cannot be considered as a major distinctive feature of genera. I therefore propose that *Paleozercon* is a junior synonym of *Microzercon*, which results in a new combination: *Microzercon cavernicolus* (Błaszak et al., 1995) **comb. n.**

Microzercon americanus (Sikora et Skoracki, 2008) **comb. n.**

Blaszakiella americana SIKORA & SKORACKI, 2008: 252.

Type localities. USA, Oregon, 20 miles SW of Philomath, fir tree hole. USA, Oregon, Black Rock, moss under fir atand. USA, Oregon, Benton Co., Creek Road, leaf litter.

Diagnosis of female. Central and submarginal setae of podonotum smooth and needle-like. Opisthonotal J-setae, Z1–4 and S2–4 smooth, setiform, S5 densely pilose, feathered. Anterior opisthomarginal setae (S1, R1–4) brush-like, densely pilose, posterior ones smooth, setiform. Glands Po2 in position *gdS2*, situated above line connecting Z1 and S3 or above line connecting Z2 and S3, Po3 in position *gdJ3*, situated lateral to line connecting J2 and J3. Whole surface of podonotal shield covered by scales possessing lacy posterior margin. Surface of opisthonotum with reticulate ornamentation. Posterodorsal cavities asymmetric, strongly sclerotized, with axes converging posteriorly. Posterolateral tips of peritrematal shields fused with ventrianal shield on level of setae R5.

Remarks. Diagnosis of the species is based on the description and figures given by SIKORA and SKORACKI (2008).

Microzercon californicus (Sellnick, 1958)

(Figs 27–37)

Prozercon californicus SELLNICK, 1958a: 126; SELLNICK 1958b: 363.

Microzercon californicus: BŁASZAK 1976: 554. 1980: 547.

Type locality. USA, California, Santa Cruz County, Ben Lomond, redwood forest.

Material examined. USA, California, Mt. Tamalpais, 1000 m a.s.l., pine forest, moss from trees and dry-rotten wood, 12.01.1985, leg. Neiger, M. (HNHM E-Am-090 – 1 female,

1 male). USA, Oregon, Benton Co., McGlynn Creek Ravine, moss on bank, 23.01.1977, leg. Russel, L. (slide CNCAZ0394 – 1 female, earlier identified as '*Microzercon* sp.');

USA, Oregon, Benton Co., Marys Peak, log with moss, 05.12.1976, leg. Russel, L. (slide CNCAZ0613 – 1 female); USA, California, P.O., San Diego, 3 mi. S. Laguna, pine duff and grass, 27.03.1961, leg. Lindquist, E. E. (slide CNCAZ0722 – 1 female); USA, California, Monterey Co., North Fork San Antonio River, 0.7 mi. Indian Agr. Sta., Madrone duff, 29.09.1961, leg. Lindquist, E. E. (slide CNCAZ0725 – 1 female).

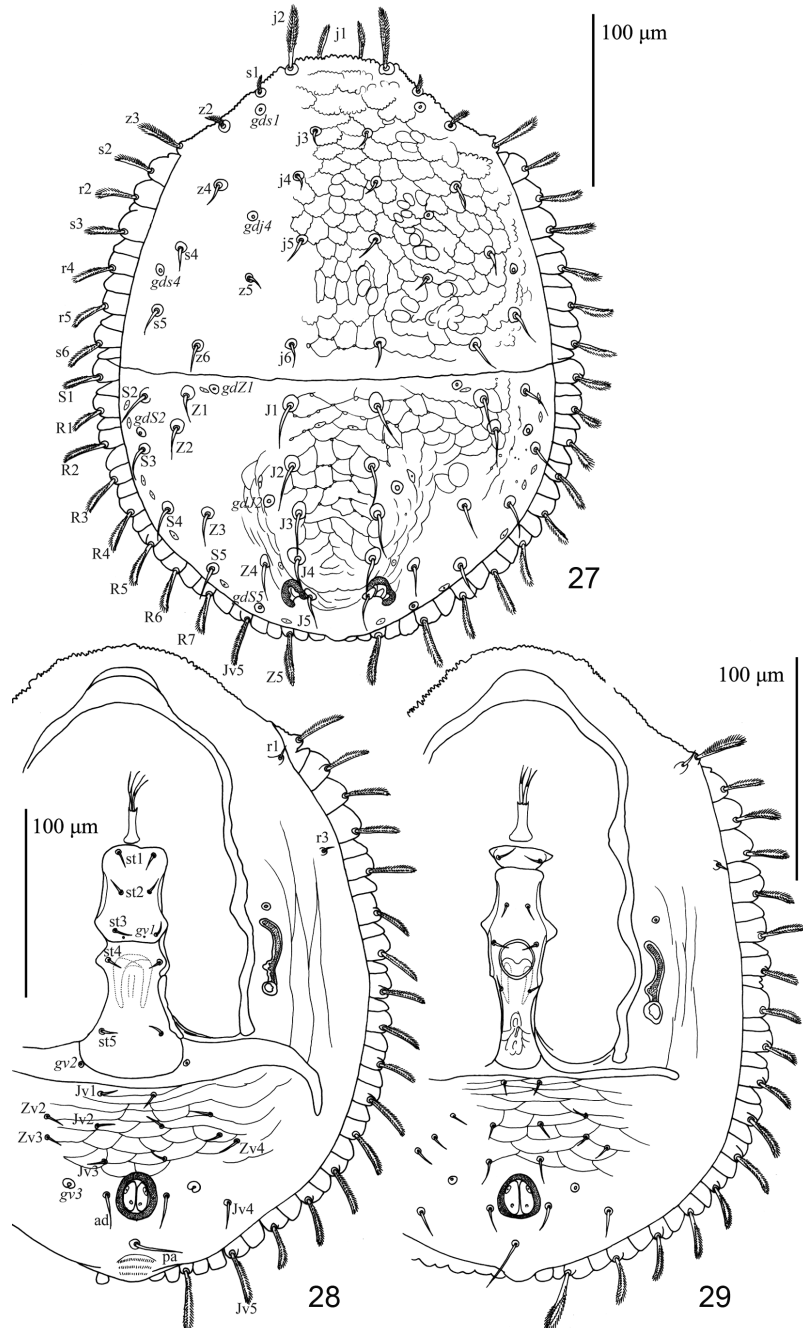
Diagnosis of female. The two opisthonotal J setal rows situated on an elevated central ridge. Central and submarginal setae of podonotum and opisthonotum smooth and needle-like, marginal setae densely pilose, brush-like. Glands po3 situated in position *gds4*, lateral to line connecting s4 and s5. Glands Po2 in position *gdS2*, on line S2 and S3, Po3 in position *gdJ2*, posterolateral to J2. Opisthonotum covered by reticulate pattern, with small pits in the crossing points. Lateral dorsal cavities weakly developed, central cavities large, well sclerotized, with axes converging posteriorly. Posterolateral tips of peritrematal shields fused with ventrianal shield on level of setae R3–4.

Description of female. Length of idiosoma: 348 μm (339–360 μm); width: 293 μm (280–306 μm) (n = 5).

Dorsal side (Fig. 27). 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. Setae j1–2, z3, s2, r2, s3, r4–5 and s6 moderately long, brush-like, densely pilose. Setae s1 and z2 shorter, pilose. Other podonotal setae short, smooth and needle-like. Setae s5 situated between level of z5 and z6. Glands *gds1* (po1) situated posterior to insertions of s1; *gdj4* (po2) situated on line connecting j4 and s4; *gds4* (po3) lateral to line connecting s4 and s5. The whole surface of podonotal shield covered by scales possessing lacy posterior margin, except a small area of the posterocentral surface, which covered by reticulate ornamentation, with small pits in the crossing points.

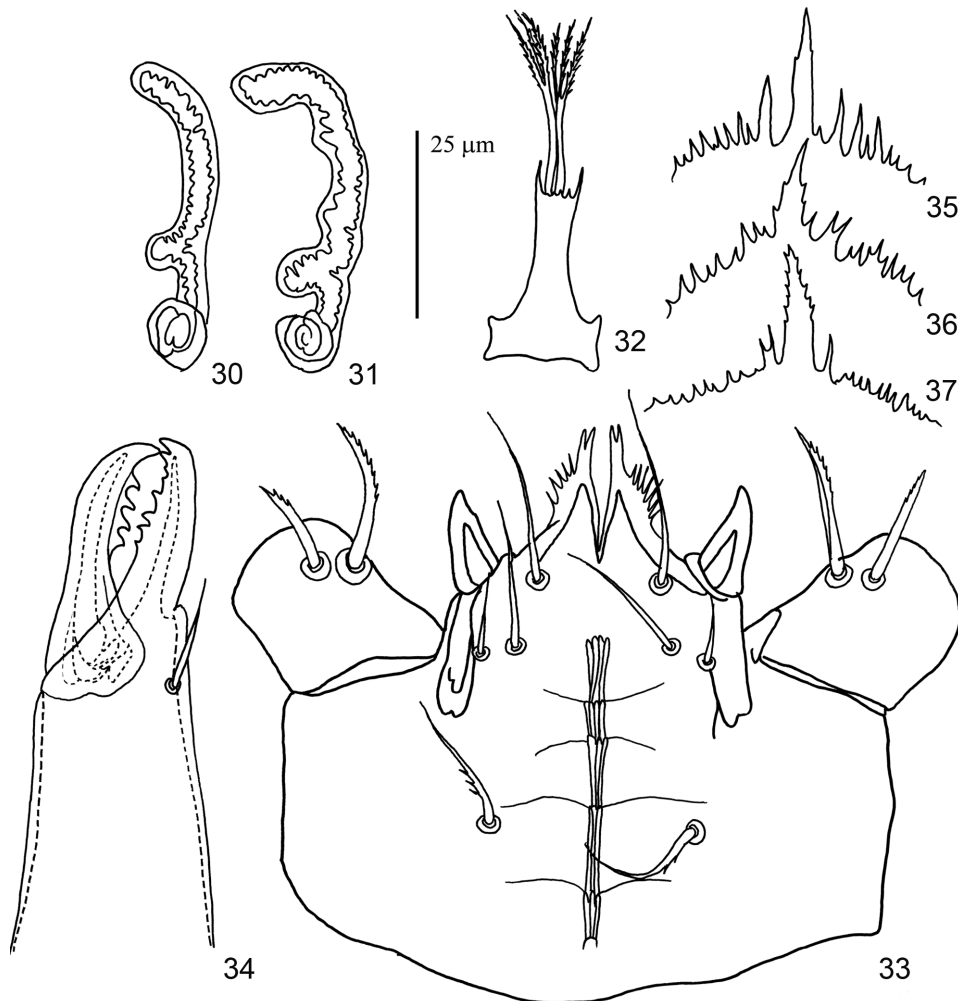
Opisthonotum with 22 pairs of setae: J1–5, Z1–5 and S1–5, marginal R-series with seven pairs of setae. Setae J1–5, Z1–4 and S2–5 similar in appearance, moderately long, smooth, pointed. Setae J1–5 constitute nearly parallel lines, each reaching or nearly reaching insertions of the following one of the series. Setae Z4 shifted towards the J-series, situated on line connecting J4 and S5. Setae S2 situated anterior to S3. Setae Z5, S1 and all the R-setae moderately long, brush-like, densely pilose. S2–4 not reaching edges of opisthonotum, the tips of S5 expanding beyond the margins of the shield. Length of opisthonotal setae and distances between their insertions as in Table 4. Glands *gdZ1* (Po1) situated anteromedial to insertions of Z1; *gdS2* (Po2) situated on line connecting S2 and S3, near S3; *gdJ2* (Po3) posterolateral to J2; *gdS5* (Po4) on line connecting Z5 and S5, anteromedial to insertions of Jv5. Marginal serration deep, obtuse. Opisthonotal surface covered by reticulate pattern, with small pits in the crossing points. Lateral dorsal cavities weakly developed, central cavities large, well sclerotized, with axes converging posteriorly.

Ventral side (Fig. 28). Peritrematal and ventrianal shields fused with body margins. Posterolateral tips of peritrematal shields fused with lateral parts of ventrianal shield on level of setae R3–4, a bent incision between the two shields running towards the body margins. Peritrematal shields ornamented by fine reticulation of longitudinal sutures. Peritremes finely curved, with a small dilation near stigmata (Figs 30–31). Peritrematal setae



Figs 27–29. *Microzercon californicus* (Sellnick, 1958): 27 = dorsal view of female, 28 = ventral view of female, 29 = ventral view of male.

r1 and r3 short, smooth and bristle-like. Tritosternum with two slender, apically trifurcate, marginally pilose laciniae, tritosternal base proximally subrectangular (Fig. 32). Sternal shield 56 μm long and 34 μm wide at the level of setae st2, with straight posterior margin, without ornamentation. Sternal setae smooth and needle-like. Glands *gv1* situated postero-medial to setae st3. Genital shield typical for the family, without ornamentation, genital setae smooth and needle-like. Glands *gv2* present, with a single opening on tiny adgenital sclerites. Ventrianal shield with short, smooth and needle-like preanal setae, setae Zv1 absent. Adanal setae and postanal seta 1.5–2 times longer than preanal setae, smooth. Setae Jv5 moderately long, brush-like, densely pilose. Anal valves with vestigial euanal setae.



Figs 30–37. *Microzercon californicus* (Sellnick, 1958): 30–31 = peritremes of female, 32 = tritosternum of female, 33 = gnathosoma of female, 34 = chelicera of female, 35–37 = epistomes of female.

Table 4. Lengths of opisthonotal setae and the distances between their bases in J-, Z- and S-rows of *Microzercon californicus* (Sellnick, 1958) (measurements as mean, in μm). (F = female; M = male)

| | F | M | | F | M | | F | M |
|--------------|----|----|--------------|----|----|--------------|----|----|
| J1 | 27 | 22 | Z1 | 19 | 16 | S1 | 23 | 19 |
| J1–J2 | 36 | 29 | Z1–Z2 | 20 | 16 | S1–S2 | 30 | 24 |
| J2 | 27 | 22 | Z2 | 21 | 17 | S2 | 21 | 17 |
| J2–J3 | 29 | 24 | Z2–Z3 | 52 | 42 | S2–S3 | 34 | 28 |
| J3 | 26 | 21 | Z3 | 20 | 16 | S3 | 21 | 17 |
| J3–J4 | 27 | 22 | Z3–Z4 | 46 | 38 | S3–S4 | 37 | 30 |
| J4 | 23 | 19 | Z4 | 20 | 16 | S4 | 21 | 17 |
| J4–J5 | 23 | 19 | Z4–Z5 | 45 | 36 | S4–5 | 45 | 37 |
| J5 | 20 | 17 | Z5 | 31 | 25 | S5 | 21 | 17 |

Glands *gv3* situated anterolateral to adanal setae. Anterior surface of ventrianal shield covered by tile-like pattern to level of *Jv3–Zv3–Zv4*.

Gnathosoma (Fig. 33). Situation of hypostomal and subcapitular setae typical for the family. Setae *h1* elongate, apically tapering, smooth. Setae *h2* shorter than *h1*, *h3* half as long as *h2*, each smooth. Setae *h4* as long as *h2*, proximally serrate. Corniculi horn-like, internal malae with a pair of bifurcate antero-central branches and with serrate margins. Chelicerae (Fig. 34) relatively slender, fixed digit with 6–7 teeth, movable digit with 4–5 teeth. Epistome of *Prozercon*-type (Figs 35–37).

Description of male (Fig. 29). Length of idiosoma: 285 μm ; width: 231 μm ($n = 1$). Chaetotaxy, adenotaxy and sculptural pattern of dorsal, ventrianal and peritrematal shields basically similar to those of female. Length of opisthonotal setae and distances between their insertions as in Table 4. Peritrematal shields fused with anterolateral parts of ventrianal shield, only a pair of horizontal incisions can be observed running towards setae *R2*. Sternigenital shield divided, the first pair of sternal setae (*st1*) sitting on a separate piece of sclerotized area, the rest of sternal setae and genital opening situated on the posterior sclerotized area of the sternigenital region, which ends on level of posterior margin of coxae IV. Setae *st5* absent. Sternal setae *st3* situated on level of anterior edge of genital opening. Anal valves with vestigial euanal setae. Each characters of gnathosoma similar to those of female, but terminal part of fixed digit of chelicerae bifurcate.

Microzercon cavernicolus (Błaszak et al., 1995) **comb. n.**

Paleozercon cavernicolus BŁASZAK et al., 1995: 257.

Type locality. USA, New Mexico, Eddy Co., Guadalupe Mts., Lincoln National Forest, Hidden Cave.

Diagnosis of female. Setae *j1–3*, *z2* and *s1* smooth and needle-like, other central and submarginal setae of podonotum barbed or pilose. Opisthonotal

J-setae, Z1–4 and S2–5 densely pilose, pointed. Opisthomarginal setae brush-like, densely pilose. Glands Po2 in position *gdS2*, in the centre of the triangle Z2–S2–S3, Po3 in position *gdJ2*, situated posterolateral to J2. Whole surface of podonotal shield covered by scales possessing lacy posterior margin. Surface of opisthonotum covered by small alveolar pits. Posterodorsal cavities uniform, saddle-like, with undulate inner margin. Posterolateral tips of peritrematal shields end freely on level of setae R5.

Remarks. Diagnosis of the species is based on the description and figures given by BŁASZAK *et al.* (1995).

Microzercon opiparus (Błaszak, 1984) **comb. n.**
(Figs 38–48)

Bakeras opiparus BŁASZAK, 1984: 588.

Type localities. USA, Virginia, Grayson County, Whitetop Mt., 4000 ft. a.s.l. USA, West Virginia, Mercer County, Camp Creek, St. Forest.

Material examined. USA, Tennessee, Cumberland county, 07.07.1956, leg. Bohnsack, K (HNHM E-Am-007 – 3 females, 6 males, 1 deutonymph); USA, North Carolina, Burke Co., Linville Falls gorge area, Blue Ridge Pkwy. 975 m a.s.l., from mixed deciduous & white pine litter, 11.08.1986, leg. Lindquist, E. E. (slide CNCAZ0547 – 1 female); USA, West Virginia, Pocahontas Co., Hills Creek Falls area, 27 km E. Richwood, 915 m a.s.l., ex. deciduous litter, rotten wood, moss & substrate, 03.08.1986, leg. Lindquist, E. E. (slide CNCAZ0636 – 1 male; slide CNCAZ0637 – 1 female; slide CNCAZ0638 – 1 female; slide CNCAZ0640 – 1 female; slide CNCAZ0657 – 1 female; slide CNCAZ0660 – 1 female; slide CNCAZ0708 – 1 female; slide CNCAZ0709 – 1 female); USA, Alabama, De Kalb Co., De Soto State Park, Little River Canyon, ex. *Rhododendron* litter on NW facing bank, 28.09.1992, leg. Behan, V. (slide CNCAZ0781 – 1 female).

Diagnosis of female. Dorsal setae pilose except j4–5. Each J-seta reaching bases of the following one of the series. Each marginal seta similar in appearance, densely pilose, brush-like. Glands Po2 situated in position *gdS2*, on line connecting S2 and S3, near S3, Po3 situated in position *gdJ2*, posterolateral to J2. Anterior surface of podonotal shield covered by scales possessing lacy posterior margin. Opisthonotal surface smooth. Posterodorsal cavities uniform, round, weakly developed. Posterolateral tips of peritrematal shields reaching level of R3, free or fused with lateral parts of ventrianal shield.

Description of female. Length of idiosoma: 382 μm (360–398 μm); width: 327 μm (296–349 μm) ($n = 10$).

Dorsal side (Fig. 38). 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. Dorsal podonotal seta densely pilose, except j4–5 which smooth and needle-like. Marginal podonotal setae

brush-like, submarginal and central setae pointed. Setae s5 situated between level of z5 and z6. Glands *gds1* (po1) situated on line connecting j3 and z2; *gdj4* (po2) situated on line connecting j5 and z4, near z4; *gds4* (po3) slightly medial to line connecting s4 and s5. The surface in front of the line connecting setae s5 covered by scales possessing lacy posterior margin, the posteriormost podonotal surface smooth.

Opisthonotum with 22 pairs of setae: J1–5, Z1–5 and S1–5, marginal R-series with seven pairs of setae. Setae J1–5, Z1–4 and S2–5 similar in appearance, relatively long, pointed, densely pilose (Fig. 42). Setae J1–5 and Z1–4 constitute nearly parallel lines. Setae Z4 situated on line connecting Z3 and S5. Setae S2 situated anterior to S3. Setae S2–4 not reaching edges of opisthonotum, the tips of S5 expanding beyond margins of the shield. Setae Z5, S1 and R1–7 densely pilose, apically broadening, brush-like. R7 significantly shorter than

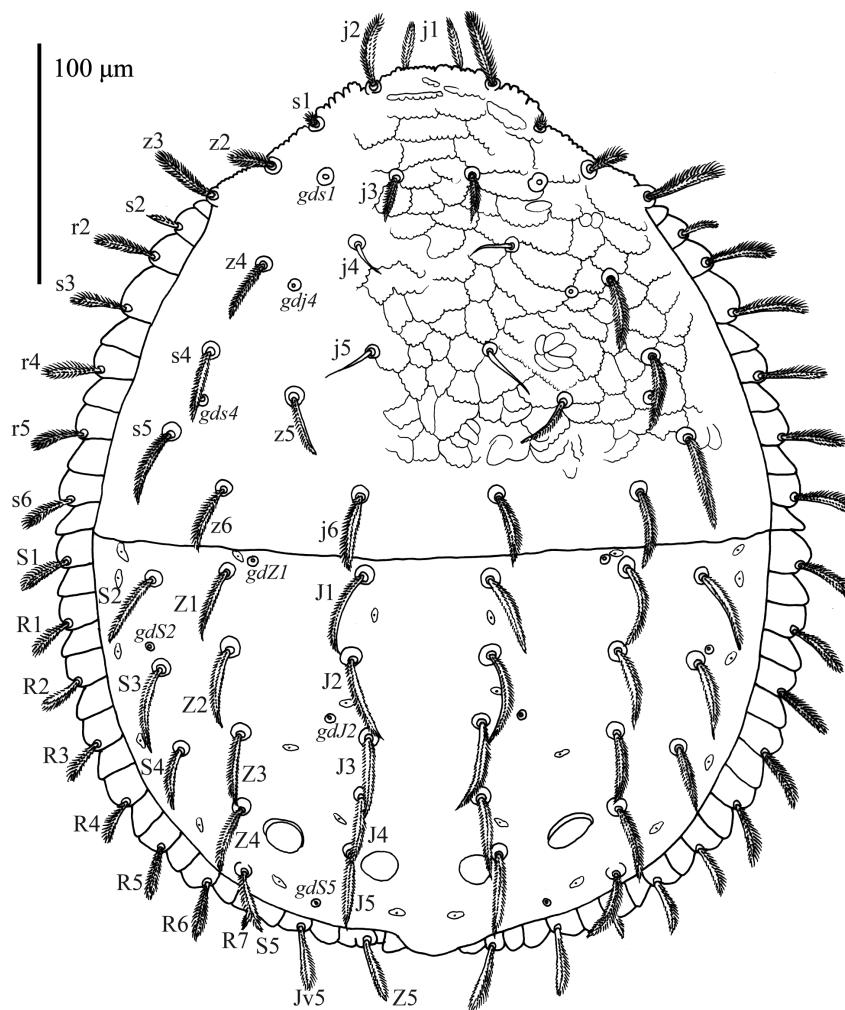


Fig. 38. *Microzercon opiparus* (Błaszak, 1984) comb. n. female, dorsal view.

Table 5. Lengths of opisthonotal setae and the distances between their bases in J-, Z- and S-rows of *Microzercon opiparus* (Błaszak, 1984) comb. n. (measurements as mean, in μm). (F = female; M = male; DN= deutonymph)

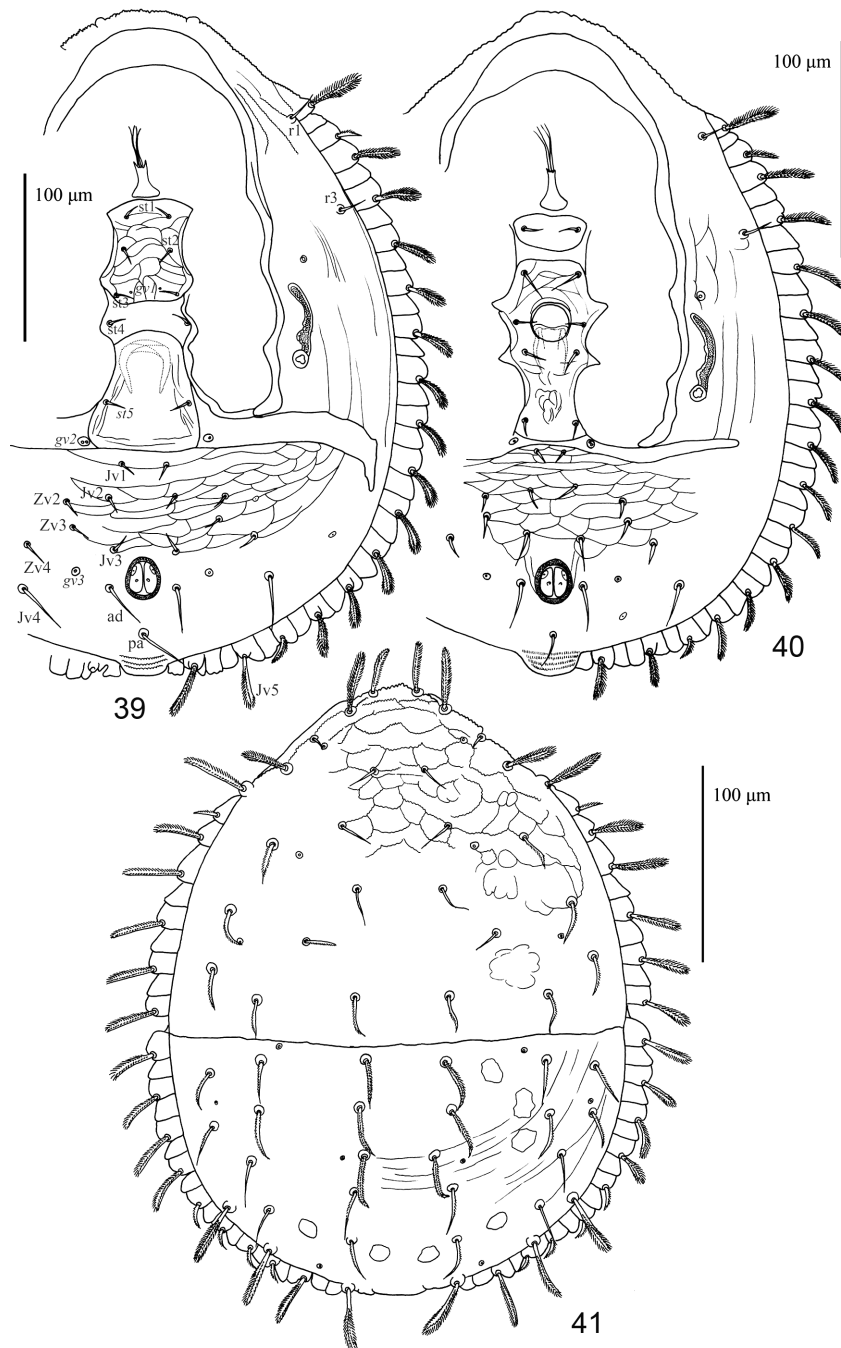
| | F | M | DN | | F | M | DN | | F | M | DN |
|--------------|----|----|----|--------------|----|----|----|--------------|----|----|----|
| J1 | 36 | 30 | 26 | Z1 | 34 | 28 | 22 | S1 | 26 | 21 | 26 |
| J1–J2 | 35 | 29 | 24 | Z1–Z2 | 35 | 29 | 27 | S1–S2 | 40 | 33 | 29 |
| J2 | 38 | 32 | 26 | Z2 | 35 | 29 | 24 | S2 | 35 | 29 | 21 |
| J2–J3 | 32 | 27 | 25 | Z2–Z3 | 37 | 30 | 23 | S2–S3 | 38 | 32 | 26 |
| J3 | 38 | 31 | 25 | Z3 | 32 | 26 | 22 | S3 | 36 | 30 | 20 |
| J3–J4 | 30 | 24 | 19 | Z3–Z4 | 33 | 27 | 28 | S3–S4 | 37 | 30 | 43 |
| J4 | 34 | 28 | 24 | Z4 | 31 | 26 | 21 | S4 | 28 | 23 | 32 |
| J4–J5 | 25 | 21 | 26 | Z4–Z5 | 80 | 65 | 57 | S4–5 | 61 | 50 | 31 |
| J5 | 36 | 29 | 21 | Z5 | 30 | 24 | 32 | S5 | 29 | 24 | 31 |

the rest of R-setae. Length of opisthonotal setae and distances between their insertions as in Table 5. Glands *gdZ1* (Po1) situated anteromedial to insertions of Z1; *gdS2* (Po2) situated on line connecting S2 and S3, near S3; *gdJ2* (Po3) posterolateral to J2; *gdS5* (Po4) on line connecting Z5 and S5, anteromedial to insertions of Jv5. Marginal serration deep and obtuse. Opisthonotal surface smooth. Posterodorsal cavities uniform, round, weakly developed. Lateral pair of cavities situated anterior to central pair, between insertions of J5 and Z4.

Ventral side (Fig. 39). The slit between peritrematal shields and body margins narrow. Posterolateral tips of peritrematal shields free or fused with lateral parts of ventrianal shield on level of setae R3. Peritrematal shields ornamented by fine reticulation of longitudinal lines. Peritremes finely curved, with 1–3 small dilations. Peritrematal setae r1 and r3 short, smooth and needle-like. Tritosternum with two slender, apically bifurcate, marginally pilose laciniae, tritosternal base vase-like. Sternal shield 51 μm long and 37 μm wide at the level of setae st2, with nearly straight posterior margin, with reticulate ornamentation. Sternal setae smooth and needle-like. Glands *gv1* situated anteromedial to setae st3. Genital shield typical for the family, without ornamentation, genital setae smooth and needle-like. Glands *gv2* present, with single or double openings surrounded by small adgenital sclerites. Ventrianal shield with smooth and needle-like setae, setae Zv1 absent. Adanal setae, Jv4 and postanal seta 2 times longer than other preanal setae. Setae Jv5 moderately long, brush-like, densely pilose. Anal valves with vestigial euanal setae. Glands *gv3* situated anterolateral to adanal setae. Anterior surface of ventrianal shield covered by tile-like pattern to level of Jv3–Zv4.

Gnathosoma (Fig. 46). Situation of hypostomal and subcapitular setae typical for the family. Setae h1 elongate, apically tapering, smooth. Setae h2 shorter than h1, h3 shorter than h2, each smooth. Setae h4 slightly longer than h2, proximally 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 teeth. Epistome of *Prozercon*-type (Figs 47–48).

Description of male (Fig. 40). Length of idiosoma: 312 μm (296–333 μm); width: 265 μm (247–296 μm) (n = 7). Chaetotaxy, adenotaxy and sculptural pattern of dorsal, ventrianal and peritrematal shields basically similar to those of female, except shape of j3 which smooth in male. Length of opisthonotal setae and distances between their insertions as in Table 5. Peritrematal shields fused with anterolateral parts of ventrianal shield, only a

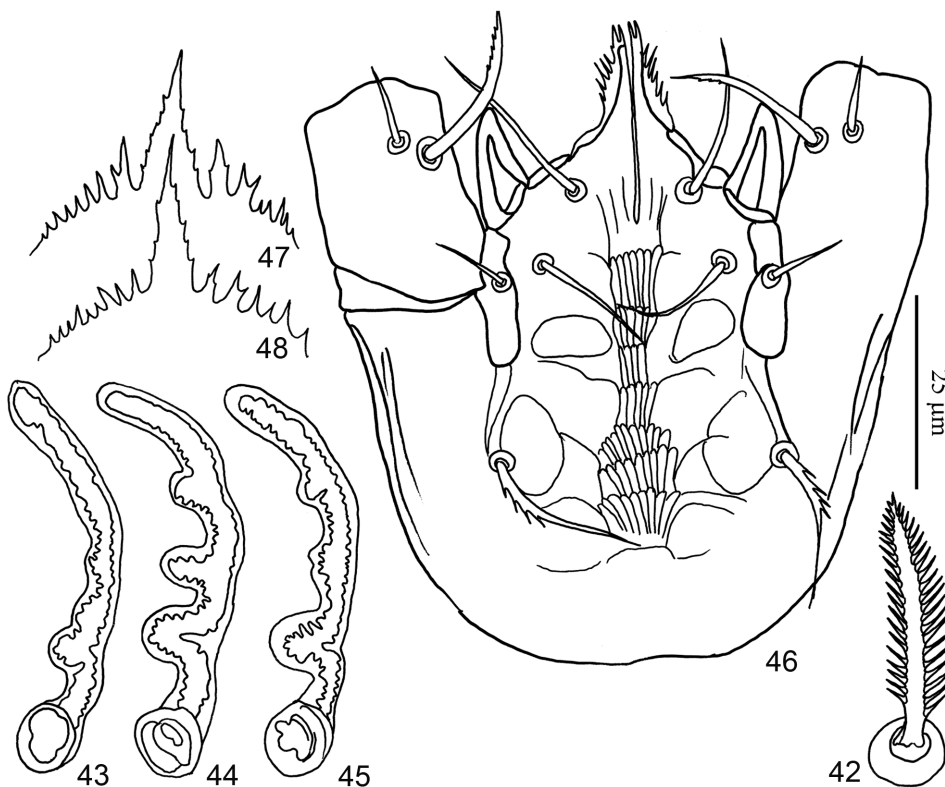


Figs 39–41. *Microzercon opiparus* (Błaszak, 1984) comb. n.: 39 = ventral view of female, 40 = ventral view of male, 41 = dorsal view of deutonymph.

pair of horizontal incisions can be observed running towards setae R1. Sternigenital shield divided, the first pair of sternal setae (st1) sitting on a separate piece of sclerotized area, the rest of sternal setae and genital opening situated on the posterior sclerotized area of the sternigenital region, which ends on level of posterior margin of coxae IV. Setae st5 present. Sternal setae st3 situated on level of central part of genital opening. Anal valves with vestigial euanal setae. Each characters of gnathosoma similar to those of female, but terminal part of fixed digit of chelicerae bifurcate.

Description of deutonymph (Fig. 41). Length of idiosoma: 311 μm ; width: 258 μm (n = 1). Dorsal chaetotaxy, adenotaxy and appearance of posterodorsal cavities basically similar to those of adults, except shape of central and submarginal setae of dorsal shields, which less pilose than those of adults, setae s1, j3–5 and Z3–4 appears to be smooth or barely pilose. Length of opisthonotal setae and distances between their insertions as in Table 5. Dorsal ornamentation similar to that of adults, but less expressed. Each characters of gnathosoma similar to those of adult female.

Remarks. Similarly to that of *Macrozercon praecipuus*, some differences can be observed between the specimens of the CNC and HNHM collections. The



Figs 42–48. *Microzercon opiparus* (Błaszak, 1984) comb. n.: 42 = setae J3 of female, 43 = peritreme of female from Tennessee, 44–45 = peritremes of females from West Virginia, 46 = ventral view of gnathosoma, female, 47–48 = epistomes of female.

CNC specimens correspond with the type specimens described by BŁASZAK (1984), they are relatively large (376–398 μm), posterolateral tips of their peritrematal shields end freely, and their peritremes possess extra tubercles (Figs 44–45). In contrast, the HNHM specimens are smaller (360–370 μm), posterolateral tips of their peritrematal shields are fused with the ventrianal shield, and their peritremes have only a single tubercle (Fig. 43).

Microzercon alaskaensis sp. n.

(Figs 49–54)

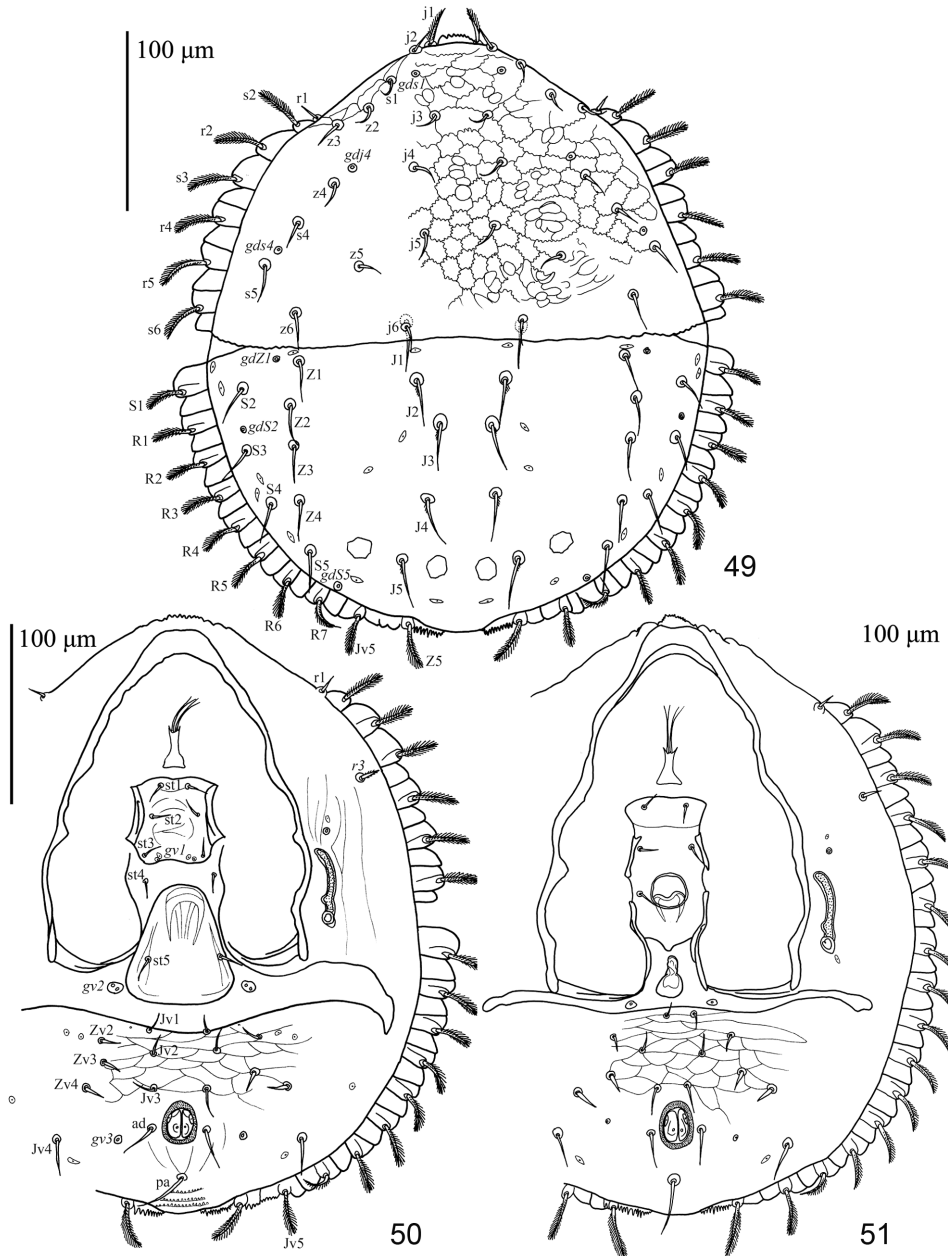
Type material. Holotype: female – USA, Alaska, Semidi Island, 25.08.1980, leg. Hatch, M. A. (slide CNCAZ0378). Paratypes: locality and date as for the holotype (slide CNCAZ0376 – 1 male; slide CNCAZ0377 – 1 male); USA, Alaska, Aleutians, Amchitka Island, 09.1976 (slide CNCAZ0365 – 1 male identified earlier as '*Microzercon californicus*'); slide CNCAZ0366 – 1 male identified earlier as '*Microzercon californicus*'); USA, Alaska, Buldir Island, Elev. 10 m. Slope 25°. Aspect 40° A2, *Calamagrostis utkaensis*, *Carex*, Base Q, Hillside facing alluvial valley, 03.09.1976 (slide CNCAZ0367 – 1 female identified earlier as '*Microzercon californicus*'; slide CNCAZ0368 – 1 male identified earlier as '*Microzercon californicus*').

Diagnosis of female. Setae j2 and z3 smooth and needle-like, as well as other central and submarginal setae of podonotum. Each marginal seta similar in appearance, densely pilose, brush-like. Opisthonotal J-setae finely serrate proximally, pointed, other central and submarginal setae of opisthonotum smooth, needle-like. Glands Po2 in position *gdS2*, on line S2 and S3, Po3 absent. Anterior surface of podonotal shield covered by scales possessing lacy posterior margin. Surface of opisthonotum smooth. Posterodorsal cavities uniform, weakly developed. Posterolateral tips of peritrematal shields fused with ventrianal shield on level of setae R2.

Description of female. Length of idiosoma: 330 μm (328–333 μm); width: 315 μm (312–317 μm) (n = 2).

Dorsal side (Fig. 49). 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. Setae j1, s2, r2, s3, r4–5 and s6 moderately long, brush-like, densely pilose. Other podonotal setae short, smooth and needle-like. Setae s5 situated on level of z5. Glands *gds1* (po1) situated medial to insertions of s1; *gdj4* (po2) situated above line connecting j4 and z4, near z4; *gds4* (po3) on line connecting s4 and s5, near s5. Anterior surface of podonotal shield covered by scales possessing lacy posterior margin, a small area of the posterocentral surface without ornamentation.

Opisthonotum with 22 pairs of setae: J1–5, Z1–5 and S1–5, marginal R-series with seven pairs of setae. Setae J1–5 finely serrate proximally, pointed. Setae J2 reaching insertions of J3, other J-setae not reaching bases of the following one of the series. Setae J5 situated on level of central dorsal cavities. Setae Z1–4 and S2–5 similar in appearance, smooth, pointed, needle-like. Setae J1–5 and Z1–4 constitute nearly parallel lines. Setae Z4 situated



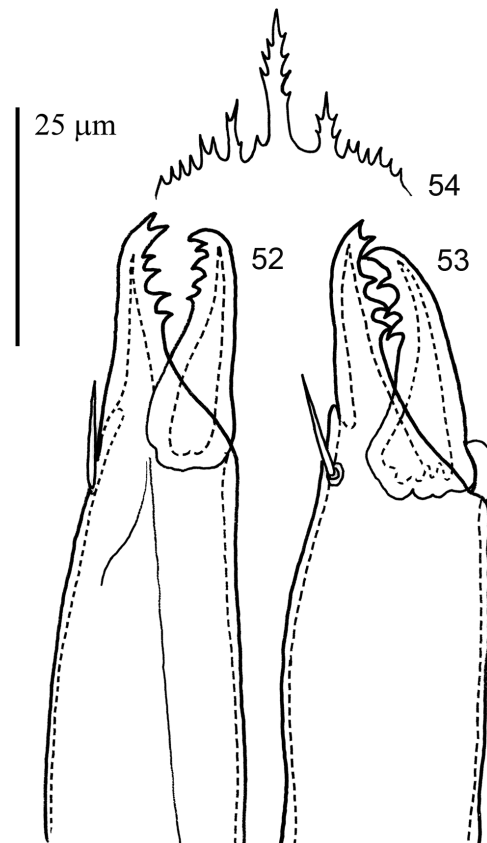
Figs 49–51. *Microzercon alaskaensis* sp. n.: 49 = dorsal view, female, 50 = ventral view, female, 51 = ventral view, male.

on line connecting Z3 and S5. Setae S2 situated anterior to S3. Setae Z5, S1 and R1–6 brush-like, densely pilose, R7 somewhat shorter than previous setae, bent, pointed, pilose. None of S-setae reaching beyond margins of opisthonotum. Length of opisthonotal setae and distances between their insertions as in Table 6. Glands *gdZ1* (Po1) situated lateral to insertions of Z1; *gdS2* (Po2) situated on line connecting S2 and S3, near S3; glands Po3 absent; *gdS5* (Po4) on line connecting Jv5 and S5, equidistantly. Marginal serration deep, obtuse. Opisthonotal surface without ornamentation. Posterodorsal cavities uniform, multangular, weakly developed. Lateral pair of cavities situated anterior to central pair, between insertions of J5 and Z4.

Ventral side (Fig. 50). Peritrematal and ventrianal shields fused with body margins. Posterolateral parts of peritrematal shields fused with lateral parts of ventrianal shield on level of setae R2. Peritrematal shields ornamented by fine reticulation of longitudinal sutures. Peritremes finely curved, with a small dilation near stigmata. Peritrematal setae r1 short, smooth and needle-like, setae r3 short, finely pilose, pointed. Tritosternum with two slender, apically bifurcate, marginally pilose laciniae, tritosternal base vase-like. Sternal shield 48 μm long and 43 μm wide at the level of setae st2, with slightly arcuate posterior margin, with inconspicuous reticulate ornamentation. Sternal setae smooth and needle-like. Glands *gv1* situated medial to setae st3. Genital shield typical for the family, with a few sutures, genital setae smooth and needle-like. Glands *gv2* present, with double openings surrounded by small adgenital sclerites. Ventrianal shield with smooth and needle-like setae, setae Zv1 absent. Adanal setae, Jv4 and postanal seta 1.5–2 times longer than other preanal setae. Setae Jv5 moderately long, brush-like, densely pilose. Anal valves with vestigial euanal setae. Glands *gv3* situated lateral or slightly posterolateral to adanal setae. Anterior surface of ventrianal shield covered by tile-like pattern to level of Jv3–Zv4.

Gnathosoma. Situation of hyposomal and subcapitular setae typical for the family. Setae h1 elongate, apically tapering, smooth. Setae h2 shorter than h1, h3 shorter than h2, each smooth. Setae h4 slightly longer than h2, proximally serrate. Corniculi horn-like, internal malae with a pair of bifurcate anterocentral branches and with serrate margins. Chelicerae relatively slender, fixed digit with 5–6 teeth, movable digit with 4–5 teeth. Epistome of *Prozercon*-type.

Description of male (Fig. 51). Length of idiosoma: 265 μm (258–274 μm); width: 243 μm (231–269 μm) (n = 5). Chaetotaxy,



Figs 52–54. *Microzercon alaskaensis* sp. n. male: 52–53 = chelicerae, 54 = epistome.

Table 6. Lengths of opisthonotal setae and the distances between their bases in J-, Z- and S-rows of *Microzercon alaskaensis* sp. n. (measurements as mean, in μm). (F = female; M = male)

| | F | M | | F | M | | F | M |
|--------------|----|----|--------------|----|----|--------------|----|----|
| J1 | 26 | 22 | Z1 | 22 | 18 | S1 | 22 | 18 |
| J1–J2 | 31 | 26 | Z1–Z2 | 25 | 20 | S1–S2 | 28 | 23 |
| J2 | 26 | 22 | Z2 | 22 | 18 | S2 | 20 | 17 |
| J2–J3 | 27 | 22 | Z2–Z3 | 23 | 19 | S2–S3 | 32 | 26 |
| J3 | 26 | 22 | Z3 | 21 | 18 | S3 | 20 | 17 |
| J3–J4 | 40 | 33 | Z3–Z4 | 32 | 26 | S3–S4 | 34 | 28 |
| J4 | 27 | 22 | Z4 | 23 | 19 | S4 | 23 | 19 |
| J4–J5 | 37 | 30 | Z4–Z5 | 88 | 72 | S4–5 | 35 | 29 |
| J5 | 28 | 23 | Z5 | 26 | 21 | S5 | 24 | 20 |

adenotaxy and sculptural pattern of dorsal, ventrianal and peritrematal shields similar to those of female. Length of opisthonotal setae and distances between their insertions as in Table 6. Peritrematal shields fused with anterolateral parts of ventrianal shield, only a pair of horizontal incisions can be observed running towards setae R2. Sternigenital shield divided, the anterior part bearing setae st1, the central part possess the genital opening and generally has three pairs of smooth and needle-like setae, setae st4 may be absent. A small, subtriangular posterior sternigenital sclerite situated between coxae IV, without setae, setae st5 always absent. Sternal setae st3 situated on level of central part of genital opening. Glands *gv2* with a single opening, surrounded by tiny adgenital sclerites. Each characters of gnathosoma similar to those of female (Fig. 54), but terminal part of fixed digit of chelicerae bifurcate (Figs 52–53).

Etymology. The new species is named after Alaska, the state where it was collected.

Remarks. The known *Microzercon* species can be distinguished according to key presented below.

Microzercon luiseae sp. n.
(Figs 55–61)

Type material. Holotype: female – USA, Washington, Skamania Co., Wind River Crane Canopy Res., 45°49'14"N 121°57'W, ex. Douglas fir, lichens, 29.09.2000, leg. Behan, V. & Eamer, B. (slide CNCAZ0717); Paratype: Canada, British Columbia, Vancouver Island, Mt. Maquilla, 1200 m a.s.l., litter bags with *Abies amabilis* needles on ground below (*A. amabilis*), 22.06–22.08.1998, leg. Fagan (slide CNCAZ0397 – 1 female identified earlier as '*Microzercon* sp.').

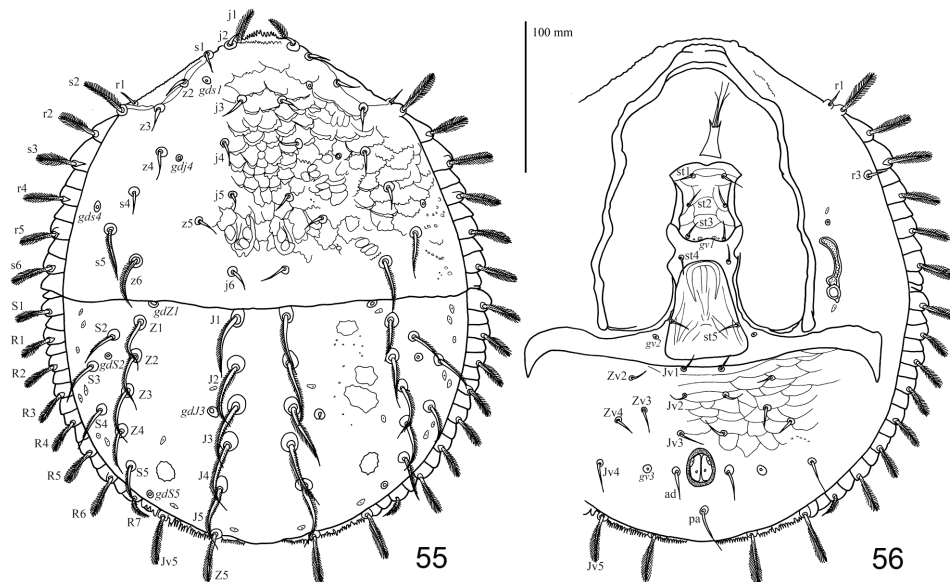
Diagnosis of female. Setae j2 and z3 smooth and needle-like, as well as other central and submarginal setae of podonotum, except z6 and s5 which moderately long, pilose. Opisthonotal J-setae, Z1–4 and S2–5 pointed, densely

covered by short pili. Marginal setae densely pilose, brush-like. Glands Po2 in position *gds2*, below line connecting S2 and S3, Po3 in position *gdj3*, situated posterolateral to J3. Anterior surface of podonotal shield covered by scales possessing spiny and lacy posterior margin. Surface of opisthonotum smooth, with a few tiny pits between the J- and Z-series. Lateral posterodorsal cavities weakly developed, central cavities inconspicuous. Posterolateral tips of peritrematal shields fused with ventrianal shield on level of setae R3.

Description of female. Length of idiosoma: 338–345 μm (342 μm); width: 295–300 μm (298 μm) (n = 2).

Dorsal side (Fig. 55). 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. Setae j1, s2, r2, s3, r4–5 and s6 moderately long, brush-like, densely pilose. Setae j2–6, z2–5, s1 and s4 smooth and needle-like. Setae z6 and s5 moderately long, pointed, densely covered by short pili. Setae s5 situated near level of z5. Glands *gds1* (po1) situated posterior to insertions of s1, medial to setae z2; *gdj4* (po2) situated below line connecting j4 and z4, near z4; *gds4* (po3) lateral to line connecting s4 and s5. Central surface of podonotal shield covered by scales possessing spiny posterior margin, anterolateral surface with scales possessing lacy posterior margin, the posterior area without ornamentation.

Opisthonotum with 22 pairs of setae: J1–5, Z1–5 and S1–5, marginal R-series with seven pairs of setae. Setae J1–5, Z1–4 and S2–5 similar in appearance, moderately long, pointed, densely covered by short pili. J1–4, Z1–3 and S2 reaching insertions of the following setae of the series. Setae J1–5 and Z1–4 constitute nearly parallel lines. Setae Z4 situated on line connecting Z3 and S5. Setae S2 situated anteromedial to S3. Setae Z5, S1 and

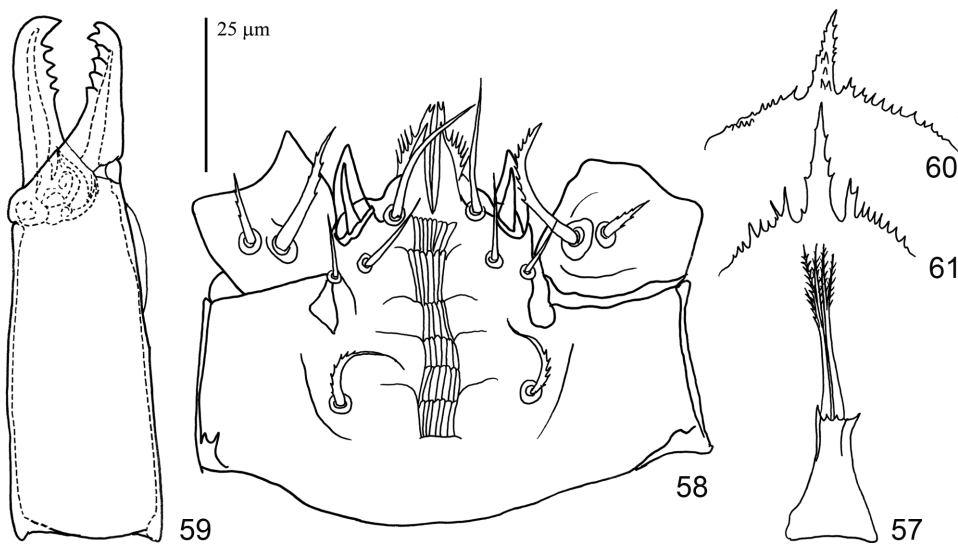


Figs 55–56. *Microzercon luiseae* sp. n., female: 55 = dorsal view, 56 = ventral view.

Table 7. Lengths of opisthonotal setae and the distances between their bases in J-, Z- and S-rows of *Microzercon luisseae* sp. n. (measurements as mean, in μm). (F = female)

| | F | | F | | F |
|-------|----|-------|----|-------|----|
| J1 | 41 | Z1 | 31 | S1 | 25 |
| J1-J2 | 32 | Z1-Z2 | 24 | S1-S2 | 47 |
| J2 | 42 | Z2 | 35 | S2 | 26 |
| J2-J3 | 27 | Z2-Z3 | 22 | S2-S3 | 23 |
| J3 | 43 | Z3 | 34 | S3 | 28 |
| J3-J4 | 25 | Z3-Z4 | 26 | S3-S4 | 31 |
| J4 | 44 | Z4 | 30 | S4 | 27 |
| J4-J5 | 29 | Z4-Z5 | 94 | S4-S5 | 40 |
| J5 | 40 | Z5 | 33 | S5 | 27 |

R1-6 brush-like, densely pilose, R7 somewhat shorter than previous setae, bent, pointed, pilose. Setae S2-4 not reaching beyond margins of opisthonotum, the tips of setae J5 and S5 expanding beyond margins of idiosoma. Length of opisthonotal setae and distances between their insertions as in Table 7. Glands *gdZ1* (Po1) situated anteromedial to insertions of Z1; *gdS2* (Po2) situated below line connecting S2 and S3; *gdJ3* (Po3) posterolateral to insertions of J3; *gdS5* (Po4) on line connecting Jv5 and S5, equidistantly. Marginal serration deep, obtuse. The area of muscle scars between the J- and Z-series covered by several tiny pits, the rest of opisthonotum without sculptural pattern. Lateral posterodorsal cavities multangular, weakly developed, situated between insertions of J5 and S5. Central cavities inconspicuous.



Figs 57-61. *Microzercon luisseae* sp. n. female: 57 = tritosternum, 58 = ventral view of gnathosoma, 59 = chelicera, 60-61 = epistomes.

Ventral side (Fig. 56). Peritrematal and ventrianal shields fused with body margins. Posterolateral tips of peritrematal shields fused with lateral parts of ventrianal shield on level of setae R3. Pattern of peritrematal shields inconspicuous. Peritremes finely curved, with a small dilation near stigmata. Peritrematal setae r1 and r3 short, smooth and bristle-like. Tritosternum with two slender, apically bifurcate, marginally pilose laciniae, tritosternal base vase-like (Fig. 57). Sternal shield 53 μm long and 40 μm wide at the level of setae st2, with slightly arcuate posterior margin, with reticulate ornamentation. Sternal setae smooth and needle-like. Glands *gv1* situated medial to setae st3. Genital shield typical for the family, with a few sutures, genital setae smooth and needle-like. Glands *gv2* present, with a single opening surrounded by tiny adgenital sclerites. Ventrianal shield with smooth and needle-like setae, setae Zv1 absent. Adanal setae, Jv4 and postanal seta 1.5–2 times longer than other preanal setae. Setae Jv5 moderately long, brush-like, densely pilose. Anal valves with vestigial euanal setae. Glands *gv3* situated lateral to adanal setae. Anterior surface of ventrianal shield covered by tile-like pattern to level of Jv3–Jv4.

Gnathosoma (Fig. 58). Situation of hypostomal and subcapitular setae typical for the family. Setae h1 elongate, smooth. Setae h2–3 shorter than h1, smooth, h4 longer than previous setae, serrate. Corniculi horn-like, internal malae with a pair of bifurcate anterocentral branches and with serrate margins. Chelicerae (Fig. 59) relatively slender, fixed digit with 6 teeth, movable digit with 4–5 teeth. Epistome of *Prozercon*-type (Figs 60–61).

Etymology. The new species is dedicated to the memory of Luise Mahunka-Papp, wife of Prof. Dr. Sándor Mahunka.

Microzercon mahunkai sp. n.
(Figs 62–76)

Type material. Holotype: female – Canada, British Columbia, Vancouver Island, Co-mox glacier, dry hemlock, spruce forest, ex. moss, litter, 27.08.1983, leg. Fjellberg, A. (slide CNCAZ0408 – identified earlier as '*Microzercon* sp.'). Paratypes: locality and date as for the holotype (slide CNCAZ0409 – 1 male identified earlier as '*Microzercon* sp.>'; slide CNCAZ0410 – 1 male identified earlier as '*Microzercon* sp.>'); Canada, British Columbia, Vancouver Island, Mt. Cain, 1000 m a.s.l., litter bags with *Abies amabilis* needles on ground below (*A. amabilis*), 22.05.1997–22.05.1998, leg. Fagan (slide CNCAZ0404 – 1 female identified earlier as '*Microzercon* sp.>'); Canada, British Columbia, Vancouver Island, Mt. Cain, 1200 m a.s.l., litter bags with *Abies amabilis* needles on ground below (*A. amabilis*), 22.05.1997–22.05.1998, leg. Fagan (slide CNCAZ0400 – 1 female identified earlier as '*Microzercon* sp.>'); Canada, British Columbia, Vancouver Island, Mt. Cain, 800 m a.s.l., litter bags with *Abies amabilis* needles on ground below (*A. amabilis*), 22.05.–22.09.1997, leg. Fagan (slide CNCAZ0396 – 1 male identified earlier as '*Microzercon* sp.>'; slide CNCAZ0398 – 1 female identified earlier as '*Microzercon* sp.>'; slide CNCAZ0399 – 1 male identified earlier as '*Microzercon* sp.>'; slide CNCAZ0402 – 1 female identified earlier as '*Microzercon* sp.>'); Canada, British Columbia, Vancouver Island, Mt. Cain, 800 m a.s.l., litter bags with *Abies amabilis* needles on ground below (*A. amabilis*), 22.05.–22.09.1998, leg. Fagan (slide CNCAZ0403 – 1 female identified earlier as '*Microzercon* sp.>'); Canada, British Columbia, Vancouver Island, Mt. Cain, 800 m a.s.l., litter bags with *Abies amabilis* needles on ground below (*A. amabilis*), 22.05.–22.08.1998, leg. Fagan (slide CNCAZ0405 – 1 male identified earlier as '*Microzercon* sp.>'; slide CNCAZ0407 – 1 male identified earlier as '*Microzercon* sp.>'); Canada, British Columbia, Vancouver Island, Mt. Cain, 800 m a.s.l., litter bags with *Abies amabilis* needles on

ground below (*A. amabilis*), 22.05.1997–22.05.1998, leg. Fagan (slide CNCAZ0406 – 1 male identified earlier as '*Microzercon* sp.');

Canada, British Columbia, Vancouver Island, Mt. Maquilla, 1200 m a.s.l., litter bags with *Abies amabilis* needles on ground below (*A. amabilis*), 22.06–22.08.1998, leg. Fagan (slide CNCAZ0401 – 1 male identified earlier as '*Microzercon* sp.').

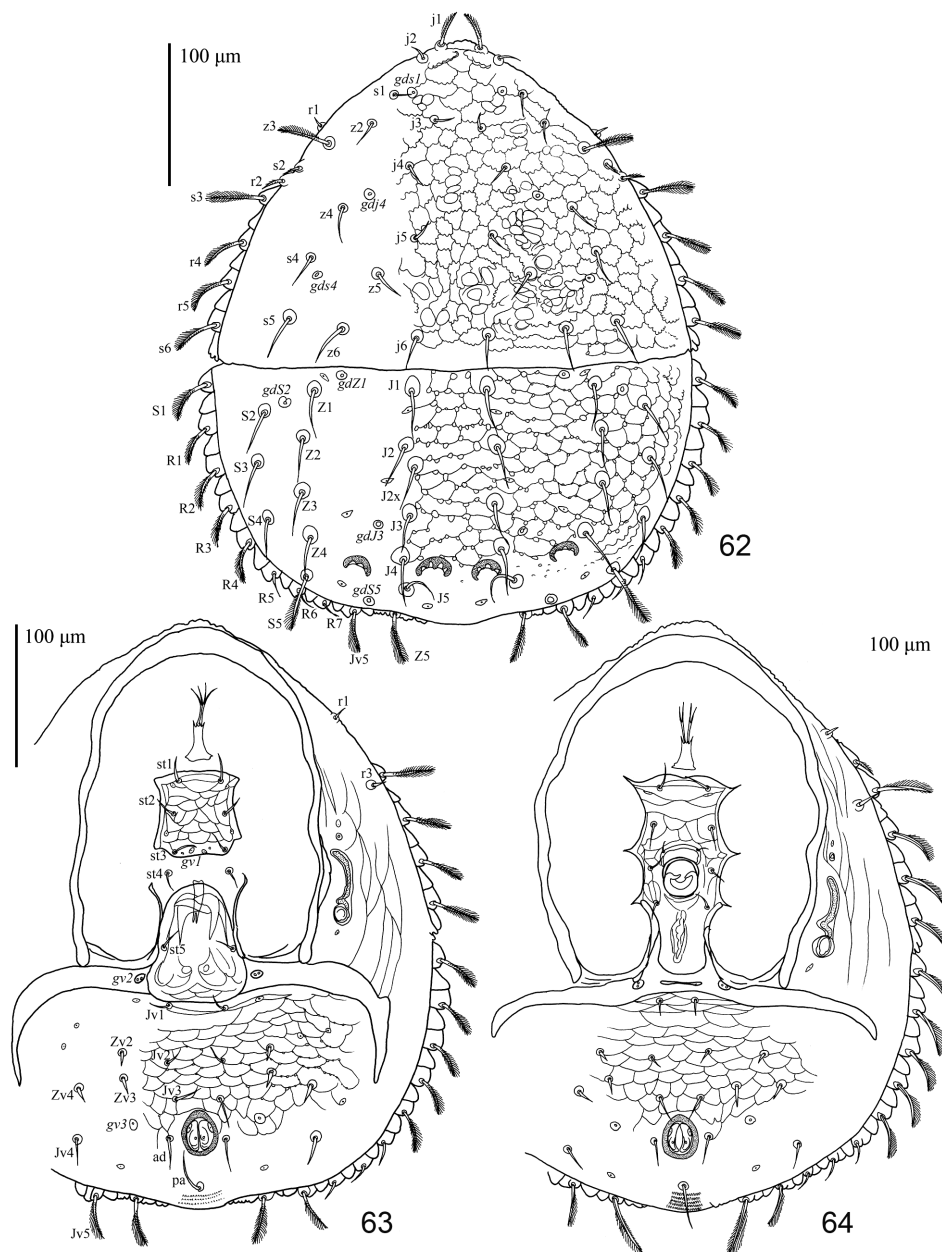
Diagnosis of female. Setae j2 smooth and needle-like, as well as other central and submarginal setae of podonotum. Opisthonotal J-setae, Z1–4 and S2–4 smooth, pointed. Setae S5 densely pilose, feathered. Setae J5 situated beyond level of central posterodorsal cavities. Anterior opisthomarginal setae (S1 and R1–4) feathered, posterior opisthomarginal setae (R5–7) smooth, pointed. Glands Po2 in position *gdS2*, on line Z1 and S2, Po3 in position *gdJ3*, situated posterolateral to J3. Whole surface of podonotal shield covered by scales possessing lacy posterior margin. Surface of opisthonotum reticulate, with pits of moderate size in the crossing points. Posterodorsal cavities uniform, saddle-like, with undulate inner margin. Posterolateral tips of peritrematal shields fused with ventrianal shield on level of setae R3.

Description of female. Length of idiosoma: 410 μm (392–425 μm); width: 346 μm (339–350 μm) (n = 6).

Dorsal side (Fig. 62). 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. Setae j2–6, s1, z2, z4–6 and s4–5 smooth and needle-like. Setae s2 and r3 short, barbed. Setae j1, z3, s3, r4–5 and r6 moderately long, feathered. Setae s5 situated on level of z6. Glands *gds1* (po1) situated medial to insertions of s1; *gdj4* (po2) situated on line connecting j4 and z4; *gds4* (po3) on line connecting s4 and z6, near s4. Whole surface of podonotal shield covered by scales possessing lacy posterior margin.

Opisthonotum with 22 pairs of setae: J1–5, Z1–5 and S1–5, marginal R-series with seven pairs of setae. Setae J1–5, Z1–4 and S2–4 similar in appearance, moderately long, smooth, pointed. Setae J4 reaching beyond insertions of J5. Setae J5 situated beyond level of central posterodorsal cavities. Setae J1–5 and Z1–4 constitute parallel lines. Setae Z4 situated on, or somewhat medial to line connecting Z3 and S5. Setae S2 situated anterior to S3. Setae Z5, S1, S5 and R1–4 feathered, densely pilose. Setae R5–7 at most half as long as anterior R-setae, smooth, pointed. Setae S2–4 not reaching beyond margins of opisthonotum, S5 expanding beyond the margins. Length of opisthonotal setae and distances between their insertions as in Table 8. Glands *gdZ1* (Po1) situated anteromedial to insertions of Z1; *gdS2* (Po2) situated on line connecting Z1 and S2, near S3; glands *gdJ3* (Po3) posterolateral to J3; *gdS5* (Po4) on line connecting Z5 and S5, anteromedial to insertions of Jv5. Marginal serration deep, obtuse. Opisthonotal surface reticulate, with pits of moderate size in the crossing points. Posterodorsal cavities uniform, well-sclerotized, saddle-like, with undulate inner margin. Lateral pair of cavities situated on level of central pair, between insertions of J5 and Z4, with axes slightly converging anteriorly. Central pair with axes parallel to that of the body.

Ventral side (Fig. 63). Peritrematal and ventrianal shields fused with body margins. Posterolateral tips of peritrematal shields fused with lateral parts of ventrianal shield on level of setae R3. Peritrematal shields ornamented by reticulation of longitudinal sutures. Peritremes bent, with a small dilation near stigmata. Peritrematal setae r1 and r3 short, smooth and bristle-like. Tritosternum with two slender, apically bifurcate or trifurcate,



Figs 62–64. *Microzercon mahunkai* sp. n.: 62 = dorsal view of female, 63 = ventral view of female, 64 = ventral view of male.

Table 8. Lengths of opisthonotal setae and the distances between their bases in J-, Z- and S-rows of *Microzercon mahunkai* sp. n. (measurements as mean, in μm). (F = female; M = male)

| | F | M | | F | M | | F | M |
|--------------|----|----|--------------|----|----|--------------|----|----|
| J1 | 35 | 29 | Z1 | 34 | 29 | S1 | 35 | 29 |
| J1–J2 | 41 | 34 | Z1–Z2 | 34 | 28 | S1–S2 | 44 | 37 |
| J2 | 31 | 26 | Z2 | 32 | 26 | S2 | 32 | 27 |
| J2–J3 | 45 | 38 | Z2–Z3 | 38 | 32 | S2–S3 | 37 | 31 |
| J3 | 30 | 25 | Z3 | 32 | 26 | S3 | 34 | 29 |
| J3–J4 | 32 | 27 | Z3–Z4 | 35 | 29 | S3–S4 | 42 | 35 |
| J4 | 34 | 29 | Z4 | 33 | 27 | S4 | 30 | 25 |
| J4–J5 | 23 | 19 | Z4–Z5 | 77 | 64 | S4–5 | 46 | 39 |
| J5 | 26 | 22 | Z5 | 37 | 30 | S5 | 43 | 36 |

marginally pilose laciniae, tritosternal base proximally subrectangular (Figs 65–66). Sternal shield 61 μm long and 52 μm wide at the level of setae st2, with straight posterior margin and distinct, reticulate ornamentation. Sternal setae smooth and needle-like. Glands *gv1* situated medial to setae st3. Genital shield typical for the family, with irregular ornamentation of a few sutures, genital setae smooth and needle-like. Glands *gv2* present, with double openings surrounded by small adgenital sclerites. Ventrianal shield with smooth setae, setae Zv1 absent. Adanal setae, Jv3–4 and postanal seta 1.5–2 times longer than other preanal setae. Setae Jv5 moderately long, densely pilose, feathered. Anal valves with vestigial euanal setae. Glands *gv3* situated anterolateral to adanal setae. Anterior surface of ventrianal shield covered by tile-like pattern to level of adanal setae and Jv4.

Gnathosoma (Fig. 67). Situation of hypostomal and subcapitular setae typical for the family. Setae h1 elongate, apically tapering, smooth. Setae h2 somewhat shorter than h1, h3 half as long as h2, each smooth. Setae h4 slightly longer than h2, proximally serrate. Corniculi horn-like, internal malae with a pair of bifurcate anterocentral branches and with serrate margins. Chelicerae (Figs 68–69) relatively slender, fixed digit with 6–7 teeth, movable digit with 4–5 teeth. Epistome of *Prozercon*-type (Fig 71–73).

Description of male (Fig. 64). Length of idiosoma: 350 μm (322–366 μm); width: 290 μm (285–296 μm) ($n = 8$). Chaetotaxy, adenotaxy and sculptural pattern of dorsal, ventrianal and peritrematal shields similar to those of female. Length of opisthonotal setae and distances between their insertions as in Table 8. Peritrematal shields fused with anterolateral parts of ventrianal shield, only a pair of bent incisions can be observed running towards setae R2. Sternigenital shield undivided, bearing four pairs of smooth and needle-like setae, setae st5 absent. Sternal setae st3 situated on level of anterior part of genital opening. Glands *gv2* with double openings, surrounded by small adgenital sclerites. A narrow postgenital sclerite present between openings of glands *gv2*. Each characters of gnathosoma similar to those of female (Figs 74–76), but terminal part of fixed digit of chelicerae bifurcate (Fig. 70).

Etymology. The new species is dedicated to the memory of Prof. Dr. Sándor Mahunka, Academician, former head of the Systematic Zoology Research Group of the Hungarian Academy of Sciences, world renown oribatidologist.

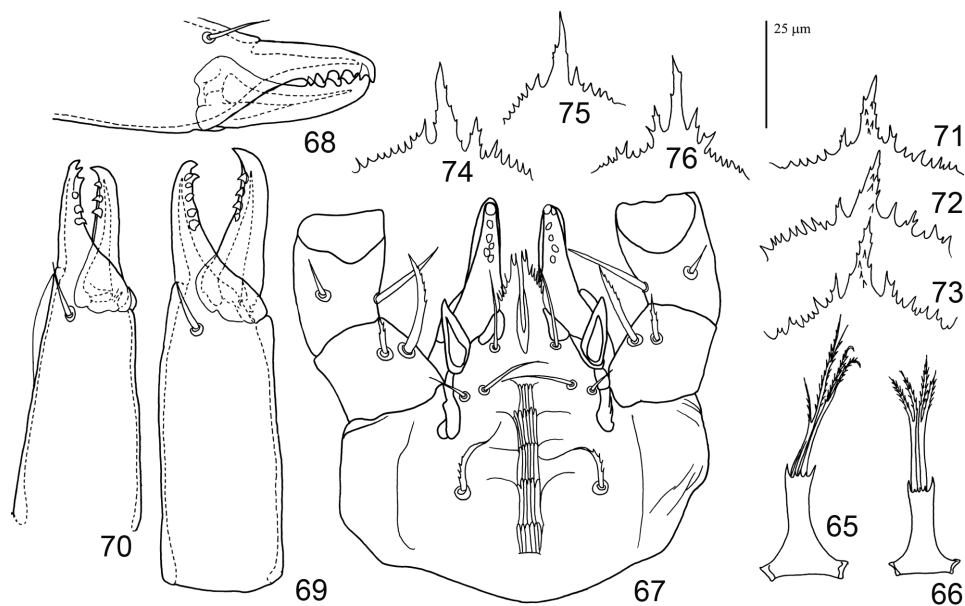
Microzercon nudus sp. n.
(Figs 77–80)

Type material. Holotype – USA, Oregon, Benton Co., McGlynn Cr. Ravine, moss on bank, 23.01.1977, leg. Russel, L. (slide CNCAZ0395 – 1 female).

Diagnosis of female. Central and submarginal setae of podonotum smooth, including j2, setae z3 elongate, pilose. Each marginal seta similar in appearance, densely pilose, brush-like. Central and submarginal setae of opisthonorium smooth, needle-like. Glands Po2 in position *gd*S2, on line S2 and S3, Po3 in position *gd*J3, on line connecting J3 and J4. Anterior surface of podonotal shield covered by scales possessing lacy posterior margin. Surface of opisthonorium smooth. Posterodorsal cavities uniform, weakly developed. Posterolateral tips of peritrematal shields fused with ventrianal shield on level of setae R3.

Description of female. Length of idiosoma: 344 μ m; width: 295 μ m (n = 1).

Dorsal side (Fig. 77). 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. Setae z3, s2, r2, s3, r4–5 and s6 moderately long, brush-like, densely pilose. Setae j1 shorter than previous setae, barbed. Other podonotal setae short, smooth and needle-like. Setae s5 situated on level

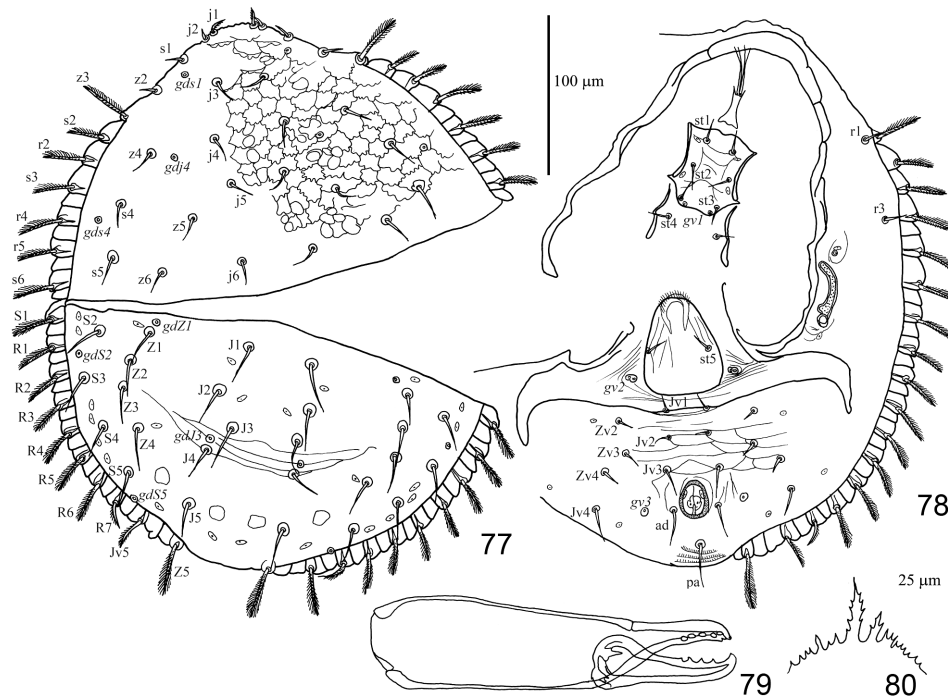


Figs 65–76. *Microzercon mahunkai* sp. n.: 65–66 = tritosternums of female, 67 = gnathosoma of female, 68–69 = chelicerae of female, 70 = chelicera of male, 71–73 = epistomes of female, 74–76 = epistomes of male.

Table 9. Lengths of opisthonotal setae and the distances between their bases in J-, Z- and S-rows of *Microzercon nudus* sp. n. (measurements as mean, in μm). (F = female)

| | F | | F | | F |
|--------------|----|--------------|----|--------------|----|
| J1 | 28 | Z1 | 21 | S1 | 27 |
| J1-J2 | 32 | Z1-Z2 | 22 | S1-S2 | 31 |
| J2 | 25 | Z2 | 24 | S2 | 24 |
| J2-J3 | 24 | Z2-Z3 | 19 | S2-S3 | 32 |
| J3 | 26 | Z3 | 24 | S3 | 24 |
| J3-J4 | 22 | Z3-Z4 | 26 | S3-S4 | 33 |
| J4 | 21 | Z4 | 25 | S4 | 22 |
| J4-J5 | 36 | Z4-Z5 | 82 | S4-5 | 34 |
| J5 | 24 | Z5 | 34 | S5 | 22 |

of z6. Glands *gds1* (po1) situated posterior to insertions of s1; *gdj4* (po2) situated below line connecting j4 and z4, equidistantly; *gds4* (po3) lateral to line connecting s4 and s5, near s5. Anterior surface of podonotal shield covered by scales possessing lacy posterior margin, a small area of the posterocentral surface without ornamentation.



Figs 77-80. *Microzercon nudus* sp. n., female: 77 = dorsal view, 78 = ventral view, 79 = chelicera, 80 = epistome.

Opisthonotum with 22 pairs of setae: J1–5, Z1–5 and S1–5, marginal R-series with seven pairs of setae. Setae J1–5, Z1–4 and S2–5 similar in appearance, smooth, pointed, needle-like. Setae J2 reaching insertions of J3, J3 reaching J4, other J-setae not reaching bases of the following one of the series. Setae J5 situated on level of central dorsal cavities. Setae Z4 situated somewhat medial to line connecting Z3 and S5. Setae S2 situated anterior to S3. Setae Z5, S1 and R1–6 brush-like, densely pilose, R7 somewhat shorter than previous setae, bent, pointed, pilose. None of S-setae reaching beyond margins of opisthonotum. Length of opisthonotal setae and distances between their insertions as in Table 9. Glands *gdZ1* (Po1) situated anteromedial to insertions of Z1; *gdS2* (Po2) situated lateral to line connecting S2 and S3, equidistantly; glands Po3 on line connecting J3 and J4; *gdS5* (Po4) on line connecting Jv5 and S5, equidistantly. Marginal serration deep, obtuse. Opisthonotal surface without ornamentation. Posterodorsal cavities uniform, weakly developed. Lateral pair of cavities situated anterior to central pair, between insertions of J5 and Z4.

Ventral side (Fig. 78). Peritrematal and ventrianal shields fused with body margins. Posterolateral tips of peritrematal shields fused with lateral parts of ventrianal shield on level of setae R3. Ornamentation of peritrematal shields weakly developed. Peritremes finely curved, with a small dilation near stigmata. Peritrematal setae r1 and r3 short, smooth and needle-like. Tritosternum with two slender, apically bifurcate, marginally pilose laciniae, tritosternal base vase-like. Sternal shield 53 µm long and 35 µm wide at the level of setae st2, with nearly straight posterior margin, with weakly developed reticulate ornamentation. Sternal setae smooth and needle-like. Glands *gv1* situated medial to setae st3. Genital shield typical for the family, with a few sutures, genital setae smooth and needle-like. Glands *gv2* present, with double openings surrounded by small adgenital sclerites. Ventrianal shield with smooth and needle-like setae, setae Zv1 absent. Adanal setae, Jv3–4 and postanal seta 1.5–2 times longer than other preanal setae. Setae Jv5 moderately long, brush-like, densely pilose. Anal valves with vestigial euanal setae. Glands *gv3* situated lateral or slightly anterolateral to adanal setae. Anterior surface of ventrianal shield covered by tile-like pattern to level of Jv3–Zv4.

Gnathosoma. Situation of hypostomal and subcapitular setae typical for the family. Setae h1 elongate, apically tapering, smooth. Setae h2 shorter than h1, h3 shorter than h2, each smooth. Setae h4 slightly longer than h2, proximally serrate. Corniculi horn-like, internal malae with a pair of bifurcate antero-central branches and with serrate margins. Chelicerae (Fig. 79) relatively slender, fixed digit with 5–6 teeth, movable digit with 4–5 teeth. Epistome of *Prozercon*-type (Fig. 80).

Etymology. The name of the new species refers to its smooth dorsal setae and the smooth opisthonotal shield.

***Microzercon pardus* sp. n.**

(Figs 81–85)

Type material. USA, West Virginia, Greenbrier Co., Summit Lake, 1035 m a.s.l., 15 km E. Richwood, ex. deciduous litter & moss rotting wood-humus substrate, 02.08.1986, leg. Lindquist, E. E. (slide CNCAZ0632 – 1 female; slide CNCAZ634 – 1 protonymph); USA, West Virginia, Pocahontas Co., Hills Creek Falls area, 27 km E. Richwood, 915 m a.s.l., ex. deciduous litter, rotten wood, moss & substrate, 03.08.1986, leg. Lindquist, E. E. (slide CNCAZ0639 – 1 male).

Diagnosis of female. Setae j1–3, z2, z6 and s5 pilose, other central and submarginal podonotal setae smooth. Each opisthonotal setae densely pilose, feathered. None of J-, Z- or S-setae reaching insertions of the following setae of the series. Glands Po2 in position *gdS2*, lateral to S3, Po3 in position *gdJ3*, situated posterolateral to J3. Anterior surface of opisthonotum reticulate, with pits of moderate size in the crossing points, posterior surface with a hexagonal pattern of clover-shaped pits. Posterodorsal cavities uniform, weakly developed, with undulate inner margin. Posterolateral tips of peritrematal shields fused with ventrianal shield on level of setae R5.

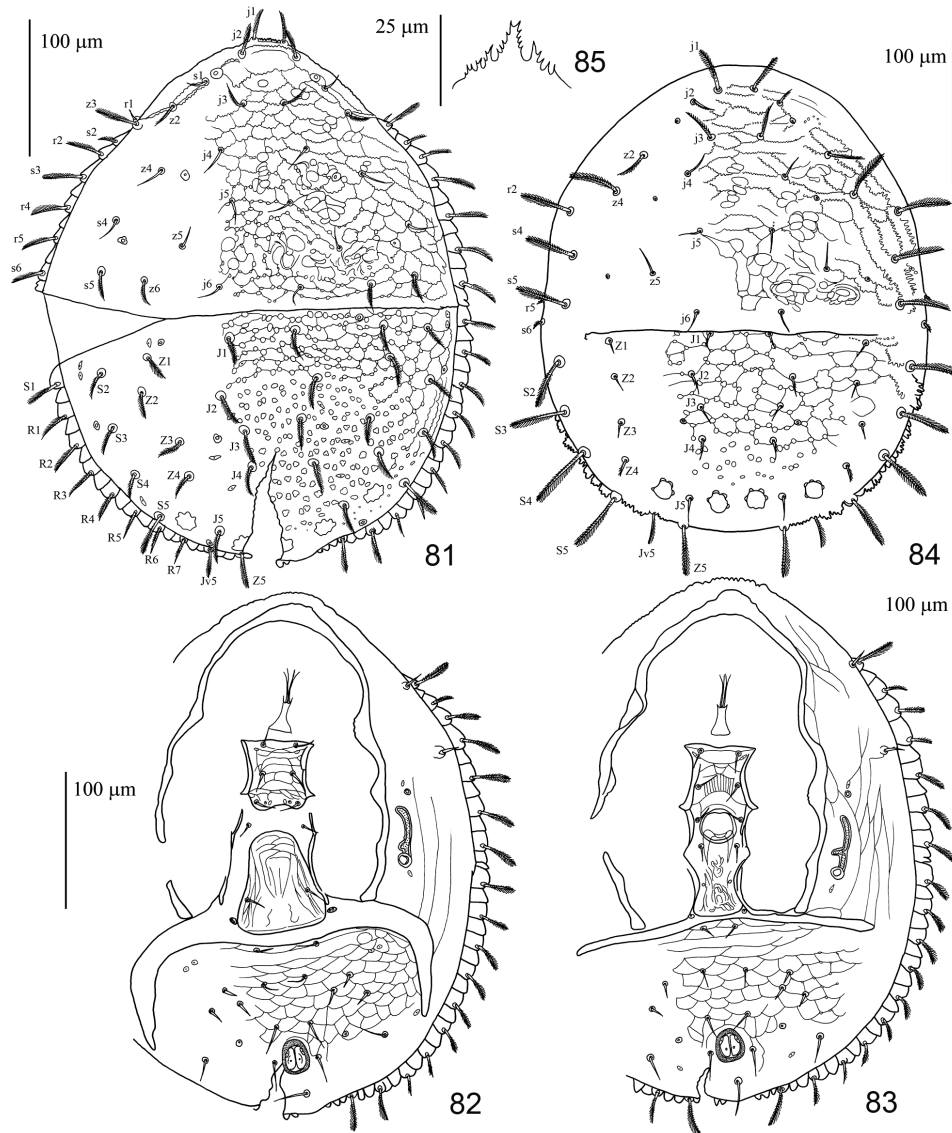
Description of female. Length of idiosoma: 382 μm ; width: 312 μm ($n = 1$).

Dorsal side (Fig. 81). 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. Setae j1–3, z2–3, z6, r2, s3, r4–5 and s5–6 moderately long, pilose, feathered. Setae s2 similar in appearance to previous setae, but short. Other podonotal setae short, smooth and needle-like. Setae s5 situated on level of z6. Glands *gds1* (po1) situated anteromedial to insertions of s1; *gdj4* (po2) situated below line connecting j4 and z4; *gds4* (po3) on line connecting s4 and z6, near s4. Anterior and lateral surface of podonotal shield covered by scales possessing lacy posterior margin, central and posterior surface with reticulate pattern, possessing pits of moderate size in the crossing points.

Opisthonotum with 22 pairs of setae: J1–5, Z1–5 and S1–5, marginal R-series with seven pairs of setae. Each opisthonotal setae similar in appearance, densely pilose, feathered, none of them reaching insertions of the following one of the series. Setae J5 situated slightly above level of central posterodorsal cavities. Setae Z3–4 finely shifted towards the J-series, Z4 situated on, or somewhat lateral to line connecting Z3 and J5. Setae S2 situated anterior to S3. Setae S2–4 not reaching beyond margins of opisthonotum. Setae S5 longer than the rest of central and submarginal opisthonotal setae, expanding beyond margins of idiosoma. R-setae slightly decreasing in length posteriorly. Length of opisthonotal setae and distances between their insertions as in Table 10. Glands *gdZ1* (Po1) situated anteromedial to insertions of Z1; *gdS2* (Po2) situated lateral to S3; glands *gdJ3* (Po3) posterolateral to J3; *gdS5* (Po4) on line connecting Z5 and S5, anterior or anteromedial to insertions of Jv5. Marginal serration deep, obtuse. Anterior surface of opisthonotum reticulate to the line J2–Z2–S4, with pits of moderate size in the crossing points, posterior surface with a hexagonal pattern of subtriangular and clover-shaped pits. Posterodorsal cavities uniform, weakly developed, with undulate inner margin. Lateral pair of cavities situated anterolateral to central pair, between insertions of J5 and S5.

Ventral side (Fig. 82). Peritrematal and ventrianal shields fused with body margins. Posterolateral tips of peritrematal shields fused with lateral parts of ventrianal shield on level of setae R5. Peritrematal shields ornamented by reticulation of longitudinal sutures. Peritremes slightly bent, with a small dilation near stigmata. Peritrematal setae r1 and r3 short, smooth and bristle-like. Tritosternum with two slender, apically bifurcate, marginally pilose laciniae, tritosternal base proximally subrectangular. Sternal shield 52 μm long and 43 μm wide at the level of setae st2, with arcuate posterior margin and distinct, reticulate ornamentation. Sternal setae smooth and needle-like. Glands *gv1* situated medial to setae st3. Genital shield typical for the family, with irregular ornamentation of sutures, genital setae smooth and needle-like. Glands *gv2* present, with double openings surrounded

by small adgenital sclerites. Ventrianal shield with smooth setae, setae *Zv1* absent. Adanal setae, *Jv3–4* and postanal seta 2 times longer than other preanal setae. Setae *Jv5* moderately long, densely pilose, feathered. Anal valves with vestigial euanal setae. Glands *gv3* situated anterolateral to adanal setae. Anterior surface of ventrianal shield covered by tile-like pattern to level of adanal setae and *Jv4*.



Figs 81–85. *Microzercon pardus* sp. n.: 81 = dorsal view of female, 82 = ventral view of female, 83 = ventral view of male, 84 = dorsal view of protonymph, 85 = epistome of protonymph.

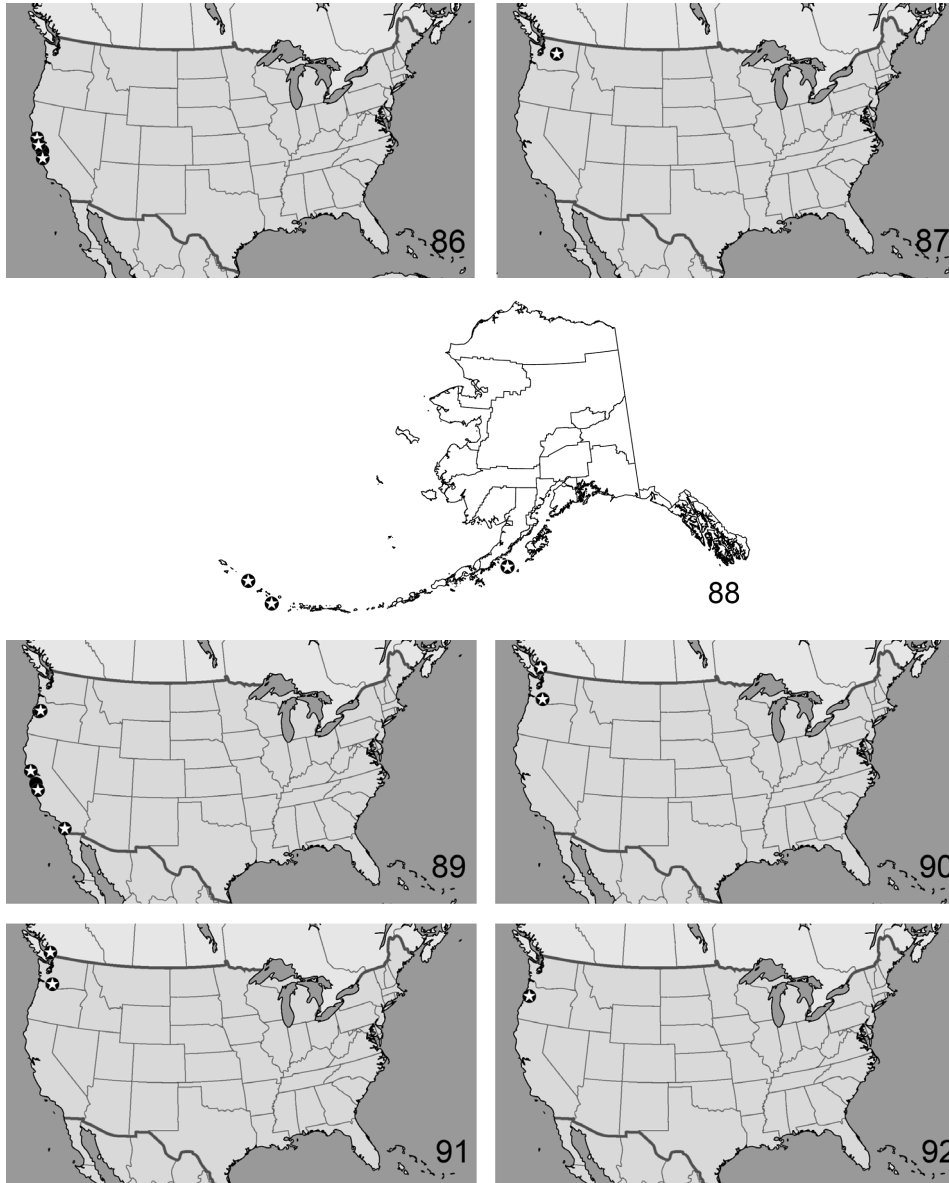
Table 10. Lengths of opisthonotal setae and the distances between their bases in J-, Z- and S-rows of *Microzercon pardus* sp. n. (measurements as mean, in μm). (F = female; M = male; PN = protonymph).

| | F | M | PN | | F | M | PN | | F | M | PN |
|--------------|----|----|----|--------------|----|----|----|--------------|----|----|----|
| J1 | 23 | 16 | 12 | Z1 | 21 | 14 | 10 | S1 | 25 | 17 | – |
| J1–J2 | 41 | 28 | 32 | Z1–Z2 | 25 | 17 | 26 | S1–S2 | 30 | 21 | – |
| J2 | 23 | 16 | 14 | Z2 | 22 | 15 | 11 | S2 | 21 | 14 | 34 |
| J2–J3 | 32 | 22 | 22 | Z2–Z3 | 47 | 33 | 29 | S2–S3 | 40 | 28 | 33 |
| J3 | 25 | 17 | 12 | Z3 | 20 | 14 | 10 | S3 | 22 | 15 | 36 |
| J3–J4 | 30 | 21 | 22 | Z3–Z4 | 27 | 19 | 28 | S3–S4 | 39 | 27 | 29 |
| J4 | 23 | 16 | 13 | Z4 | 21 | 15 | 11 | S4 | 21 | 14 | 42 |
| J4–J5 | 46 | 32 | 39 | Z4–Z5 | 69 | 48 | 59 | S4–5 | 39 | 27 | 37 |
| J5 | 24 | 16 | 16 | Z5 | 26 | 18 | 33 | S5 | 32 | 22 | 39 |

Gnathosoma. Situation of hypostomal and subcapitular setae typical for the family. Setae h1 elongate, smooth. Setae h2-3 shorter than h1, smooth, h4 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 of *Prozercon*-type.

Description of male (Fig. 83). Length of idiosoma: 264 μm ; width: 220 μm (n = 1). Chaetotaxy, adenotaxy and sculptural pattern of dorsal, ventrianal and peritrematal shields similar to those of female. Length of opisthonotal setae and distances between their insertions as in Table 10. Peritrematal shields fused with anterolateral parts of ventrianal shield, only a pair of horizontal incisions can be observed running towards setae R2. Peritrematal dilation near stigmata relatively large. Sternigenital shield undivided, bearing four pairs of smooth and needle-like setae, setae st5 vestigial. Sternal setae st3 situated on level of anterior part of genital opening. Anterior surface of sternigenital shield possessing reticulate ornamentation, posterior surface with irregular pattern. Glands *gv2* with a single opening, surrounded by small adgenital sclerites. Each characters of gnathosoma similar to those of female, but terminal part of fixed digit of chelicerae bifurcate.

Description of protonymph (Fig. 84). Length of idiosoma: 312 μm ; width: 258 μm (n = 1). Podonotal setae j1, z4, s4–5 and r2 elongate, densely pilose, feathered. Setae j3 and z2 similar in shape to former setae, but shorter. Setae j2 shorter than setae j3, barbed. Posteromarginal setae r5 and s6 bristle-like, barbed. Setae j4–6 and z5 smooth and needle-like. Glands *gds1* (po1) situated posteromedial to j2; *gdj4* (po2) positioned below line connecting z4 and j4, equidistantly; *gds4* (po3) in the centre of the triangle s4–z5–s5. Anterior and lateral surface of podonotal shield covered by scales possessing lacy posterior margin, central and posterior surface with reticulate pattern. On opisthonotum, setae J1–2, J4 and Z4 short, barbed. Setae J3, J5 and Z1–3 short, smooth, needle-like. Setae J5 positioned between lateral and central posterodorsal cavities. Setae Z5, S2–5 and Jv5 elongate, densely pilose, feathered. Length of opisthonotal setae and distances between their insertions as in Table 10. Glands *gdj3* (Po3) situated posterolateral to setae J3, other opisthonotal pores not visible. Posterodorsal cavities round, weakly developed, with undulate inner margin. Anterior surface of opisthonotum reticulate to the line J4–Z3–S4, with irregular pits of moderate



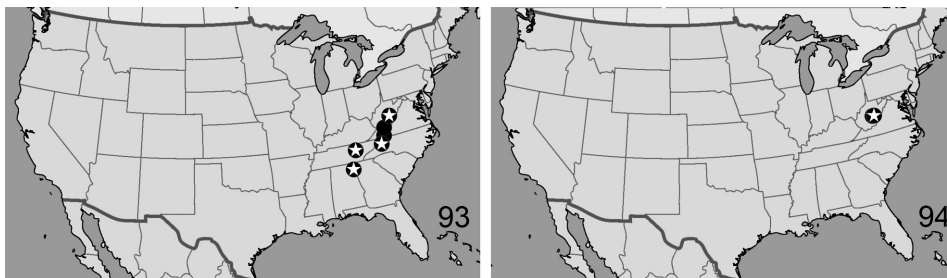
Figs 86–92. 86–87. Occurrences of *Macrozercon* species: 86 = *M. praecipuus* (Sellnick, 1958), 87 = *M. washingtonicus* sp. n. 88–92. Occurrences of *Microzercon* species: 88 = *M. alaskaensis* sp. n. 89 = *M. californicus* (Sellnick, 1958), 90 = *M. luiseae* sp. n., 91 = *M. mahunkai* sp. n., 92 = *M. nudus* sp. n.

size in the crossing points, posterior surface covered by irregular pits. Each characters of gnathosoma similar to those of adults (Fig. 85).

Eymology. The name of the new species refers to the similarity in the cuticular ornamentation of this mite and the pattern of a leopard.

KEY TO THE KNOWN *MICROZERCON* BŁASZAK, 1976 SPECIES

1. Surface of opisthotal shield smooth 2
 - Surface of opisthotal shield with reticulate or foveolate ornamentation 5
2. Central and submarginal opisthotal setae densely pilose 3
 - Central and submarginal opisthotal setae smooth or proximally barbed 4
3. Podonotal setae j2, j3, j6, z2, z3, z4, z5, s1 and s4 smooth and needle-like, gds4 situated lateral to line connecting s4 and s5, *gdS5* lying anterolateral to Jv5, S2 situated anteromedial to S3 ***Microzercon luiseae* sp. n.**
 - Podonotal setae j2, j3, j6, z2, z3, z4, z5, s1 and s4 pilose, gds4 situated medial to line connecting s4 and s5, *gdS5* lying anteromedial to Jv5, S2 situated anterior to S3 *Microzercon opiparus* (Błaszak, 1984) comb. n.
4. Setae z3 short, smooth and needle-like, setae s5 situated on level of z5, *gds4* positioned on line connecting s4 and s5, *gdZ1* lying lateral to Z1, J-setae proximally barbed, glands Po3 absent ***Microzercon alaskaensis* sp. n.**
 - Setae z3 moderately long, pilose, setae s5 situated on level of z6, *gds4* positioned lateral to line connecting s4 and s5, *gdZ1* lying anteromedial



Figs 93–94. Occurrences of *Microzercon* species: 93 = *M. opiparus* (Błaszak, 1984) comb. n., 94 = *M. pardus* sp. n.

- to Z1, J-setae smooth, glands Po3 present, in position *gdJ3*
Microzercon nudus sp. n.
5. Central and submarginal opisthotal setae densely pilose
Microzercon pardus sp. n.
- Most central and submarginal opisthotal setae smooth and needle-like
 6
6. Opisthotal J setal rows situated on an elevated central ridge, setae S5 smooth and needle-like, R5–7 feathered, *gds4* situated lateral to line connecting s4 and s5, *gdS2* on line connecting S2 and S3, Po3 in position *gdJ2*, lateral dorsal cavities weakly developed
Microzercon californicus (Sellnick, 1958)
- Opisthotal without elevated central ridge, setae S5 feathered, R5–7 smooth and needle-like, *gds4* situated medial to line connecting s4 and s5, *gdS2* on line connecting Z1 and S2, Po3 in position *gdJ3*, lateral dorsal cavities well developed
Microzercon mahunkai sp. n.

*

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