

First records of zerconid mites (Acari: Mesostigmata: Zerconidae) from Albania, with description of three new species

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Abstract. Elaborating a material collected from different regions of Albania, eleven species of the genus *Zercon* (Zerconidae) were identified, three of them, *Z. albanicus* sp. nov., *Z. cavatus* sp. nov. and *Z. elongatus* sp. nov., proved to be new to science. Short description of male and deutonymph of *Z. villosus* and morphological notes on *Z. spatulatus* are also provided. New occurrences of each species are depicted on maps as well.

INTRODUCTION

Zerconid mites occur in soil and leaf-litter of woodlands, grasslands and among mosses and lichens. They are oligophagous predators but their biology is scarcely known. Highest diversity of Zerconidae is experienced in the temperate climatic zone and a great number of species occur in the Mediterranean; e.g. 69 species are known from Turkey (Urhan, 2008, 2009, 2010).

Faunistical and taxonomical studies on Balkan Peninsula started in the middle of the last century. Willmann (1941) published the first notes on Zerconidae from Balkanic caves. In the following decades, Bulgaria became the focus of Zerconidae studies; Balogh (1961) described *Zercon bulgaricus* Balogh, 1961 from the country, Koyumdjieva (1986) listed six, and later three more (Koyumdjieva, 1993) species, and in last years Błaszak & Polańska (1998) described further two species, *Zercon villosus* Błaszak & Polańska, 1998 and *Zercon serenoides* Błaszak & Polańska, 1998, from Rila Mts. Meanwhile Košir (1974) reported two species, *Zercon primus* Košir, 1974 and *Zercon plumatopilus* Athias-Henriot, 1961, from the alpine zone of present Macedonia (Solunska Glava), and *Carpathozercon tuberculatus* (Košir, 1974) from present-day Slovenia. Recently the whole Balkan Peninsula was targeted by Hungarian researchers in the framework of a National R&D Programme entitled "The origin and genesis of fauna of the Carpathian Basin:

diversity, biogeographical hotspots and nature conservation significance". Several expeditions have been organized by the researchers of the Hungarian Natural History Museum resulted in a rich „Berlese” sample material. Elaborating the material collected, Kontschán (2006) described *Zercon kosovina* Kontschán, 2006 from Kosovo, and listed two other species from the country. Apart from this latter study Ujvári (2008, 2010) investigated the fauna of Croatia, describing *Zercon kontschani* Ujvári, 2008 from Papuk Mts. and further four species new to science, and furthermore reported 16 species new to the fauna of the country.

Several soil-inhabiting groups, e.g. oribatid mites (Mahunka & Mahunka-Papp, 2008), turtle mites (Kontschán 2003) and springtails (Kontschán *et al.*, 2003; Traser & Kontschán 2004) have already been elaborated from the material collected during the Albanian expeditions (Fehér *et al.*, 2004), however zerconid mites of the country have not been studied so far.

MATERIAL AND METHODS

Mites were extracted using Berlese funnels, then cleared with lactic acid, and mounted in glycerine. Preparations were examined using a light microscope; drawings were made with the aid of a drawing tube. Scanning micrographs were taken in the Hungarian Natural History Museum, Budapest with a HITACHI SN 2600 scanning

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electron microscope; specimens investigated were spotter coated by golden-palladium. Mites are stored in 70% ethanol, in the Collection of Soil Zoology of Hungarian Natural History Museum. The terminology of setae follows Lindquist & Evans (1965), with modifications for the caudal region as given by Lindquist & Moraza (1998). The system of notation for dermal glands and lyrifissures follows Johnston & Moraza (1991). All measurements including scale bars of the figures are given in micrometers. Abbreviations used: LD: László Dányi, ZE: Zoltán Eröss, ZF: Zoltán Fehér, DM: Dávid Murányi, AH: András Hunyadi, JK: Jenő Kontschán.

RESULTS

Zercon albanicus sp. nov.

(Figs 1–4, 25, 27)

Material examined. Holotype: female: E-2278: Albania, Periferi Dibrë, Mali i Korabit, north-eastern slope of Maja e Korabit (snow smelt feeded bog), from moss, 2300 m a.s.l., N41° 47.948' E20°33.251', 27.06.2007., leg. LD, ZE, ZF, DM, AH. Paratypes: 4 females, 2 males and 2 deutonymphs, locality and date same as that of the holotype. 1 female, 1 deutonymph: E-2266: Albania, Periferi Dibrë, Mali i Korabit, ca. 5.5 km east of Radomirë southern slope, over Fushë Korabit (opened brook, cave and rocks), from moss, 1905 m a.s.l., N41°49.121' E20°32.240', 27.06.2007., leg. LD, ZE, ZF, DM, AH. 4 females, 3 males: E-2269: Albania, Periferi Dibrë, Mali i Korabit, Maja e Korabit peak region (grassland) 2751 m a.s.l., N41°47.601' E20°32.634', 27.06.2007., leg. LD, ZE, ZF, DM, AH. 6 females, 1 male, 1 deutonymph: E-2280: Albania, Periferi Dibrë, Mali i Korabit, northeastern slope of Maja e Korabit (torrent and wet meadow), from moss, 2300 m a.s.l., N41°48.143' E20°33.285', 27.06.2007., leg. LD, ZE, ZF, DM, AH. 5 females: E-2281: Albania, Periferi Tiranë, 7 km south of the Tiranë junction along the Klos-Elbasan road (beech forest) dry-rotten wood, 1370 m a.s.l., N41°19.895' E20°08.454', 30.06.2007., leg. LD, ZE, ZF, DM, AH. 33 females, 1 male: E-2290:

Albania, Periferi Tiranë, 7 km south of the Tiranë junction along the Klos-Elbasan road (beech forest), leaf litter, 1370 m a.s.l., N41°19.895' E20°08.454', 30.06.2007., leg. LD, ZE, ZF, DM, AH. 2 females: E-2291: Albania, Periferi Mat, 3 km north of Qafa e Shtyllës, on the Klos-Elbasan road, 1.3 km north of the conj. to Tiranë, (limestone rocks), leaf-litter, 1500 m a.s.l., N41° 22.270' E20°05.126', 30.06.2007., leg. LD, ZE, ZF, DM, AH. 1 female: E-2295: Albania, Periferi Elbasan, north of Cerunjë, 26 km from the Elbasan junction on the road to Qafa e Shtyllës (beech forest, pond), soil, 1200 m a.s.l., N41°15.109' E20°05.801', 30.06.2007., leg. LD, ZE, ZF, DM, AH.

Diagnosis. Anterior margin of ventroanal shield with two pairs of setae. Dorsal cavities weakly developed. Opisthonotal J-setae short, smooth or finely pilose. Setae Z4-5 and S3-5 long, distally pilose, with hyaline sheaths. Glands dgJ4 (Po3) situated posteromedially to setae Z4. Posterior surface of opisthonotum smooth.

Description. Female. Length of idiosoma: holotype 450 µm (440-475 µm in paratypes), width: holotype 345 µm (335-350 µm in paratypes).

Dorsum (Fig. 1). Podonotum with 20 pairs of setae. Setae j1 serrate, central podonotal setae needle-like, smooth or very finely barbed, s5 apically pilose, marginal setae barbed. Gland openings gdj2 (po1) situated below the line connecting j3 and s1, gdj4 (po2) on line connecting j4 and z4, gds4 (po3) medially to the line connecting s4 and s5. Surface of the shield covered by irregular, tile-like pattern.

Opisthonotum with 21 pairs of setae. J-setae short, smooth or finely pilose. Setae Z1-3 and S2 similar in shape and length to J-setae. Z4-5 and S3-5 elongated, distally pilose, bearing hyaline sheaths, each reaching beyond the margin of idiosoma. Marginal setae decreasing in length posteriorly, the anterior two pairs barbed, posterior ones smooth, pointed. Number of marginal setae often varies (6-8). Length of setae and distance between setal insertions as in table 1. Gland openings gdz6 (Po1) situated anterolaterally to Z1, gdZ2 (Po2)

on the line connecting Z2 and S3 equidistantly, gdJ4 (Po3) posteromedially to setae Z4, gdS5 (Po4) on the line connecting S5 and JV5. Marginal serration shallow and obtuse. Anterior half of opisthonotum covered by tile-like ornamentation, posterior surface smooth. Dorsal cavities uniform, weakly developed, saddle-like, with undulate margins.

Venter (Fig. 2). Chaetotaxy, adenotaxy, poroidotaxy and shape of ventral shields typical for the genus. Sternal shield 72 µm long, 70 µm wide at level of setae st2, covered by reticulate pattern, its posterior margin concave. Peritremal setae r1 often delicately barbed, r3 distally pilose, with hyaline sheath. Peritremes slightly bent. Peritremal shield ornamented by some longitudinal fissures. Glands gv2 with 4–5 openings on large adgenital platelets. Anterior margin of ventroanal shield with two pair of setae. Postanal seta distally serrate. Setae JV5 distally pilose. Anal valves with eanal setae. Ventroanal shield covered by squamous ornamentation.

Male (Figs 3). Length of idiosoma: 340–365 µm, width: 253–260 µm.

Chaetotaxy, adenotaxy and poroidotaxy of dorsal shields similar to that of female. Length of setae and distance between setal insertions as in table 1. Sternogenital shield divided by a weakly sclerotized slit between st1-2, bearing five pairs of setae. A single, elongate postgenital sclerite can be found between adgenital platelets.

Deutonymph (Fig. 25). Length of idiosoma: 410–418 µm, width: 295–303 µm.

Chaetotaxy, adenotaxy and poroidotaxy of dorsal shields generally similar to that of adults. On podonotum, setae j1 serrate, s3, s5-6 elongate, distally pilose, z4 apically barbed, other setae smooth. Elongate opisthonotal setae longer in proportion to the body length than in adults. Length of setae and distance between setal insertions as in table 1. Ornamentation of dorsal shields weakly developed, but similar to that of the adults.

Etymology. The name of the new species refers to the country, where it was collected.

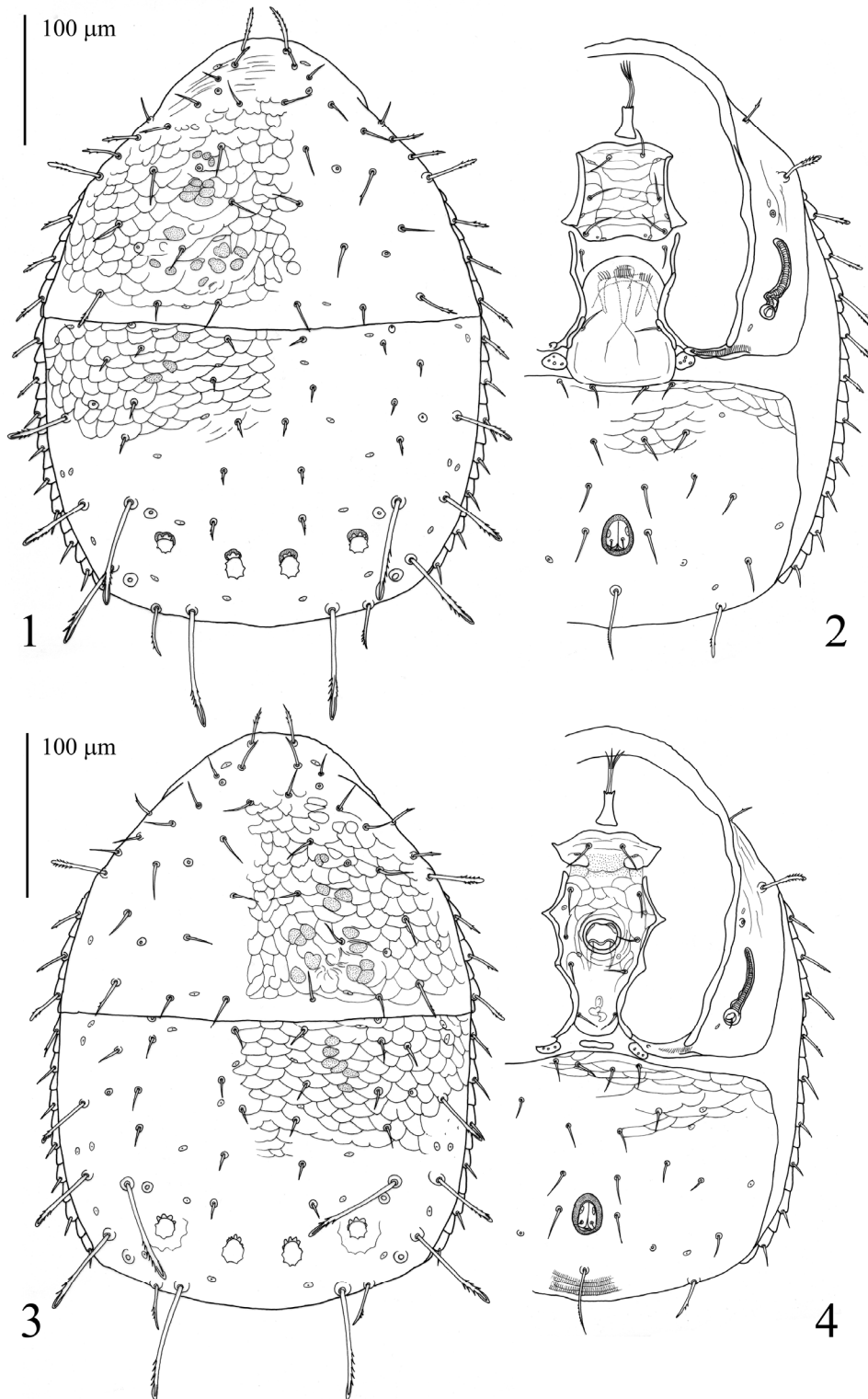
Remarks. *Z. albanicus* sp. nov. belongs to the group of species with a full complement of podonotal and opisthonotal setae, two pairs of setae on anterior margin of ventroanal shield, short J-setae, short and elongate Z1-3, apically pilose Z4-5 and S4-5 setae. The three other species of the group (*Z. csuzdii* Ujvári, 2009, *Z. ponticus* Balan, 1991 and *Z. zelawaiensis* Sellnick, 1944) easily can be distinguished from *Z. albanicus* sp. nov. by the ornamentation of posterior surface of opisthonotum (smooth in *Z. albanicus* sp. nov., covered by small alveolar pits in others), and situation of glands gdJ4 (below the line connecting J5 and Z4 in *Z. albanicus* sp. nov., lying above the former line in *Z. csuzdii* and *Z. ponticus*, lying anteriorly to J5 in *Z. ponticus*). Besides setae S3 spatuliform, reaching beyond the margin of idiosoma, majority of marginal setae smooth, pointed in *Z. albanicus*, similarly to *Z. zelawaiensis* (in which elongate setae pointed, not spatuliform), in the remaining two species, however, S3 pointed, not reaching the margin of idiosoma and majority of the marginal setae are apically pilose. Furthermore, in *Z. zelawaiensis*, setae J5 situated far above the level of dorsal cavities, in others shifted posteriorly, at least to the level of the lateral cavities.

***Zercon cavatus* sp. nov.**

(Figs. 5–8, 27)

Material examined. Holotype: female: E-2281: Albania, Periferi Tiranë, 7 km south of the Tiranë junction along the Klos-Elbasan road (beech forest) dry-rotten wood, 1370 m a.s.l., N41° 19.895' E20°08.454', 30.06.2007., leg. LD, ZE, ZF, DM, AH. Paratypes: 1 female, locality and date same that of the holotype. 1 female: E-2279: Albania, Periferi Tiranë, beech forest along the Klos-Elbasan road, above the reservoir, leaf-litter, 1155 m a.s.l., N41°16.165' E20°05.088', 30.06.2007., leg. LD, ZE, ZF, DM, AH.

Diagnosis. Anterior margin of ventroanal shield with one pair of setae. Dorsal cavities large, strongly sclerotized, with axes converging posteriorly. Opisthonotal setae smooth or finely



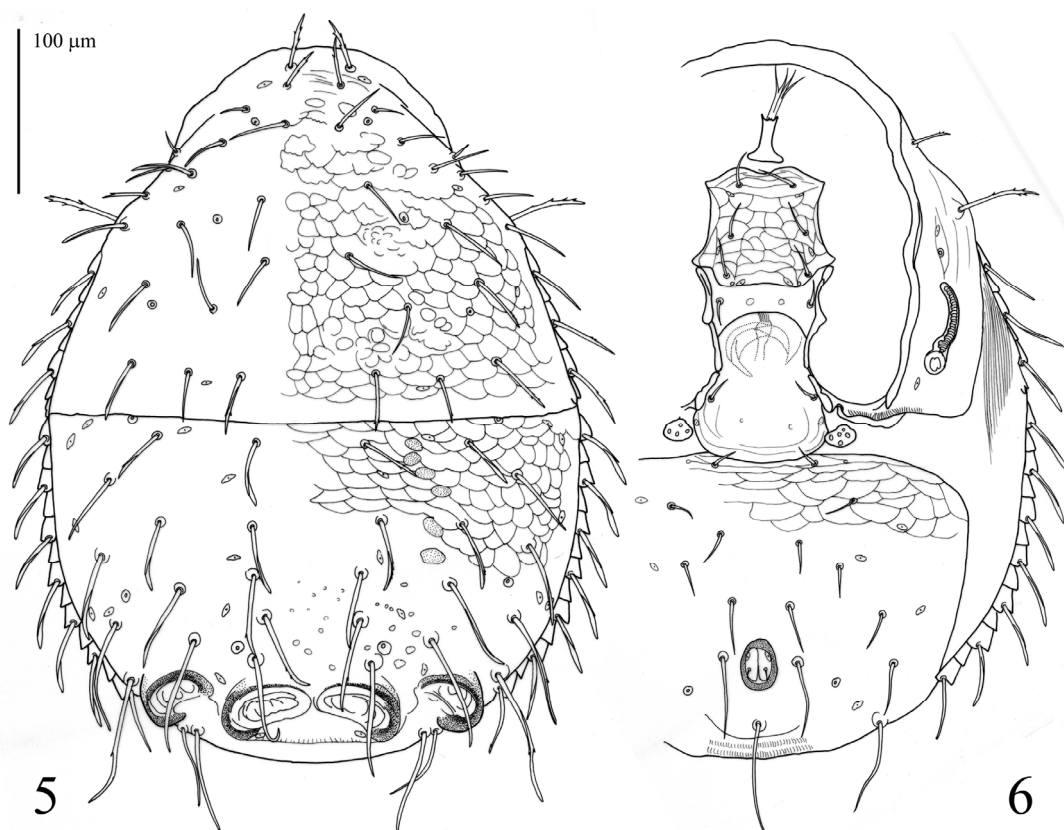
Figures 1–4. *Zercon albanicus* sp. n.: 1 = dorsal view of female, 2 = ventral view of female, 3 = dorsal view of male, 4 = ventral view of male

pilose, with weakly developed hyaline sheaths. Each opisthotal setae elongated, J1, Z1 and S2 similar in shape to other opisthotal setae, not reaching the following's bases though. Glands dgJ4 (Po3) situated anterolaterally to setae J5. Posterocentral surface of opisthonomum covered by alveolar pits. Marginal serration acuminate.

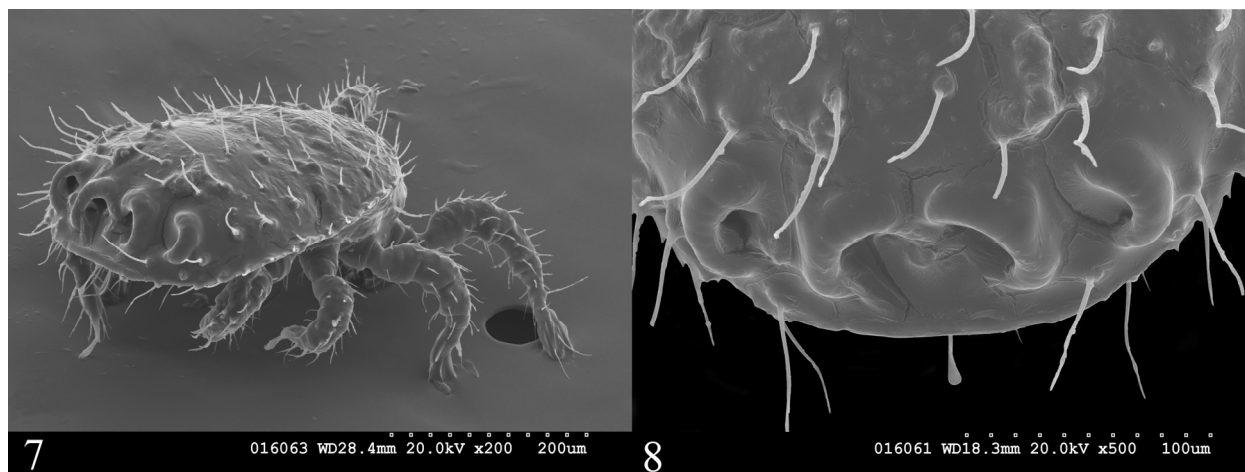
Description. Female. Length of idiosoma: holotype 435 µm (415-440 µm in paratypes), width: holotype 335 µm (330-340 µm in paratypes).

Dorsum (Fig. 5). Podonotum with 20 pairs of setae. Setae j1-2 serrate, central podonotal setae smooth and needle-like, j6, z6, s2-6, r4-5 finely pilose apically, usually with weakly developed hyaline sheaths. Gland openings gdj2 (po1) situated below the line connecting j3 and s1, gdj4 (po2) on line connecting j4 and z4, gds4 (po3) medially to the line connecting s4 and s5, near s4. Surface of the shield covered by tile-like pattern.

Opisthonomum with 21 pairs of setae, each elongate, slightly broadening apically, with an edge running along the setal body. J1, Z1 and S1-2 not reaching bases of the following setae in the series, others reaching beyond bases of the following one. Setae S3-5, Z4-5 and J5 reaching beyond margin of opisthonomum. Length of setae and distance between setal insertions as in table 2. Gland openings gdz6 (Po1) situated anterolaterally to Z1, gdZ2 (Po2) on the line connecting Z2 and S4, near S4, gdJ4 (Po3) anterolaterally to setae J5, gdS5 (Po4) on line connecting S5 and JV5, covered by strongly sclerotized margins of lateral dorsal cavities. Marginal serration acuminate. Anterior surface of opisthonomum covered by tile-like ornamentation, posterocentral surface with a few protuberances. Dorsal cavities strongly sclerotized, considerably large, their lateral margins emerging from the level of dorsum (Figs 7-8). Axes of cavities converging posteriorly. Posterior margin of idiosoma sturdy, well-sclerotized.



Figures 5-6. *Zercan cavatus* sp. n.: 5 = dorsal view of female, 6 = ventral view of female



Figures 7–8. *Zercon cavatus* sp. n.: 7 = posterolateral view of female, 8 = opisthonotal surface with dorsal cavities

Venter (Fig. 6). Chaetotaxy, adenotaxy, poroidotaxy and shape of ventral shields typical for the genus. Sternal shield 71 μm long, 68 μm wide at level of setae st2, covered by reticulate pattern, its posterior margin straight or slightly concave. Both peritremal setae finely pilose apically. Peritremes slightly bent. Peritremal shield ornamented by longitudinal fissures. Glands gv2 with 4–5 openings on large adgenital platelets. Anterior margin of ventroanal shield with one pair of setae. Setae JV3 reaching the basis of adanal setae which long, reaching beyond insertion of postanal seta. Setae JV5 similar in shape to ventral setae, apically tapering. Anal valves with euanal setae. Ventroanal shield covered by squamous ornamentation.

Etymology. The name of the new species refers to the large, cave-like posterodorsal structures.

Remarks. The new species belongs to the group of species with one pair of setae on anterior the margin of ventroanal shield and bearing large, strongly sclerotized dorsal cavities which are equal in size. *Z. cavatus* is unique in the group by the shape of setae (others have long, distally pilose, apically broadening setae on posterolateral surface of opisthonotum) and the appearance of dorsal cavities (extraordinarily large, lobe-like in the new species, significantly smaller in other species of the group).

Zercon elongatus sp. nov.

(Figs 9–12, 27)

Material examined. Holotype: female: E-2278: Albania, Periferi Dibrë, Mali i Korabit, north-eastern slope of Maja e Korabit (snow smelt feeded bog), from moss, 2300 m a.s.l., N41° 47.948' E20°33.251', 27.06.2007., leg. LD, ZE, ZF, DM, AH. Paratype: deutonymph, locality and date same that of the holotype.

Diagnosis. Anterior margin of ventroanal shield with two pairs of setae. Dorsal cavities of general size, circular, with undulate margins. J-setae and marginal setae short, smooth, Z3–5 and S3–5 apically pilose, with hyaline sheaths. Glands dgJ4 (Po3) situated on the line connecting Z3 and Z4. Anterior surface of opisthonotum covered by tile-like ornamentation, posterior surface smooth. Marginal serration shallow and obtuse. Shape of body elongate.

Description. Female. Length of idiosoma: 460 μm, width: 290 μm.

Dorsum (Fig. 9). Podonotum with 20 pairs of setae. Setae j1 serrate, central podonotal setae smooth and needle-like, marginal setae finely pilose apically, with small, rounded hyaline sheaths. Gland openings gdj2 (po1) situated below the line connecting j3 and s1, near s1, gdj4

(po2) on line connecting j4 and z4, gds4 (po3) medially to the line connecting s4 and s5, near s4. Surface of the shield covered by tile-like pattern.

Opisthonotum with 21 pairs of setae. Each J-setae short, smooth and needle-like, similarly to Z1-2 and S1-2, none of them reaching the following bases. Setae S3 three times longer than former, with small hyaline tips. Setae Z3-5 and S4-5 similar in shape and length, apically pilose, with extensive hyaline sheaths (Fig. 12), none of them reaching bases of the following one. Marginal setae short, smooth or finely pilose, pointed. Length of setae and distance between setal insertions as in table 3. Gland openings gdz6 (Po1) situated anterolaterally to Z1, gdZ2 (Po2) above the line connecting Z2 and S3, gdJ4 (Po3) on the line connecting Z3 and Z4, gdS5 (Po4) posteromedially to S5. Marginal serration shallow and obtuse. Anterior surface of opisthonotum covered by tile-like ornamentation, posterior surface smooth. Dorsal cavities of general size, rotund, with undulate margins.

Venter (Fig. 10). Chaetotaxy, adenotaxy, poroidotaxy and shape of ventral shields typical for the genus. Sternal shield 76 µm long, 63 µm wide at level of setae st2, covered by reticulate pattern, its posterior margin slightly concave. Peritremal setae r3 apically feathered, with hyaline endings. Peritremes slightly bent. Peritremal shield ornamented by small fissures. Glands gv2 with 4-5 openings on conspicuous adgenital platelets. Anterior margin of ventroanal shield with two pairs of setae. Paired ventroanal setae short, smooth and needle-like, postanal seta elongated, with narrow, lanceolate hyaline tip. Anal valves with euanal setae. Ventroanal shield covered by squamous ornamentation.

Deutonymph (Fig. 11). Length of idiosoma: 370 µm, width: 232 µm.

Chaetotaxy, adenotaxy and poroidotaxy generally similar to that of mature stages. Central podonotal setae markedly longer than J-setae, Z1-2, S1-2 and R-setae of opisthonotum. Setae S3 longer in proportion to the body length than in adult stages, similar in shape to Z3-5 and S4-5. Length of setae and distance between setal insertions as in table 3. Dorsal cavities as for the adults, however weakly sclerotized. Ornamenta-

tion of podonotal shield weakly developed, not conspicuous on opisthonotum.

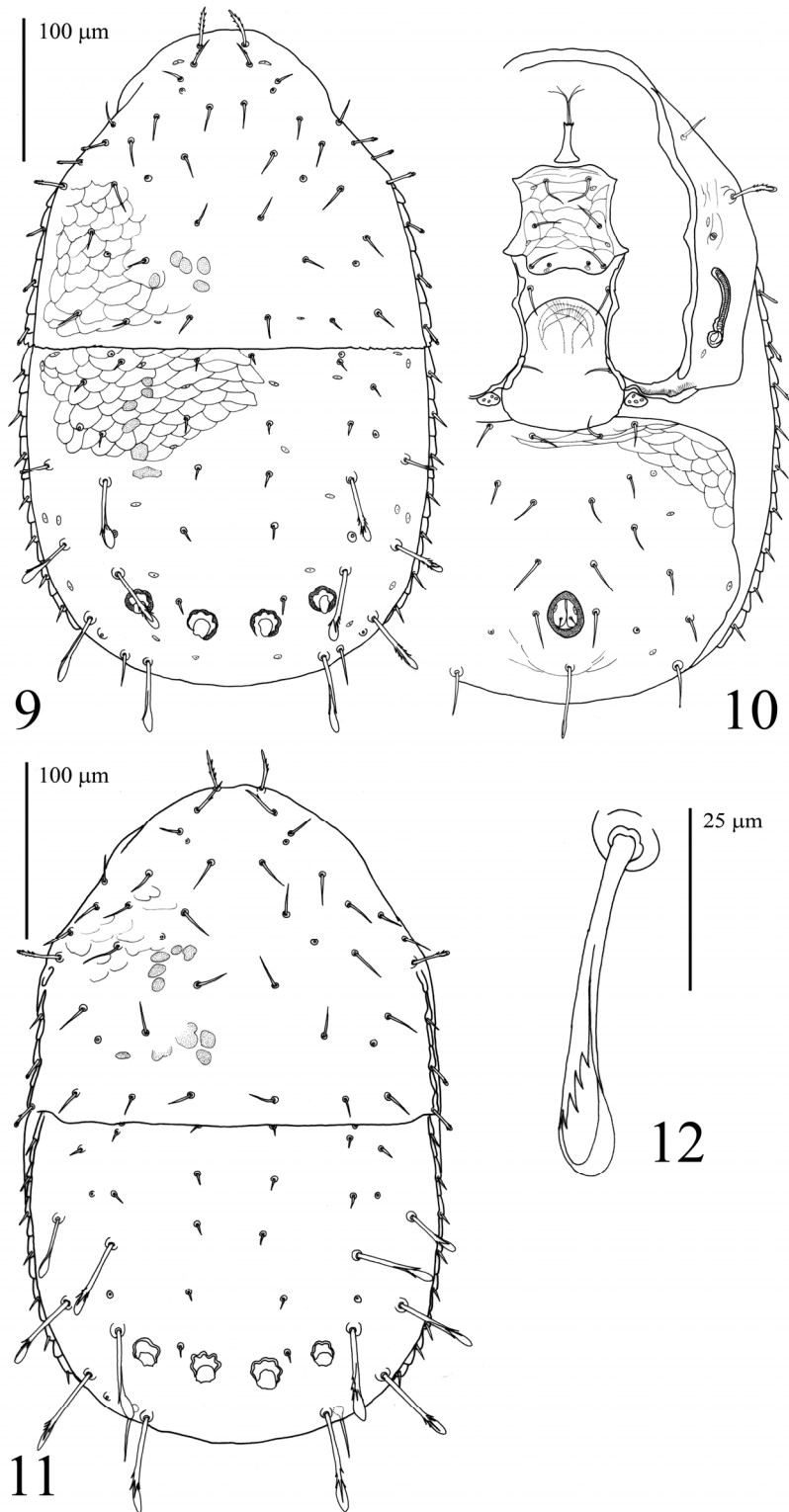
Etymology. The name of the new species refers to its elongate body shape.

Remarks. *Zercon elongatus* sp. nov. belongs to the group of species with a full complement of podonotal and opisthonotal setae, two pairs of setae on the anterior margin of ventroanal shield, short J-setae and short, pointed marginal setae. Within this group, opisthonotum of *Zercon andrei* Sellnick, 1958, *Zercon foveolatus* Halašková, 1969 and *Zercon pinicola* Halašková, 1969 are covered by large alveolar pits, while the posterior surface of opisthonotum smooth in *Zercon berleseii* Sellnick, 1958 and covered by small pits in *Zercon hemimbricatus* Skorupski & Luxton, 1996. The new species is most similar to *Z. hemimbricatus* on the basis of the similar shape of opisthonotal setae (longer setae blunt and do not bear hyaline tips in *Z. berleseii*, while apically pilose and bearing broad hyaline sheaths in *Z. hemimbricatus* and *Z. elongatus*). The two species can be distinguished according to the following features: in *Z. hemimbricatus*, glands gdJ4 is situated on the line connecting J4 and Z4, the posterior surface of opisthonotum is covered by small, distinct pits, dorsal cavities are weakly sclerotized, the shape of idiosoma is oval (480 µm long, 345 µm wide); in *Z. elongatus* sp. nov., the glands gdJ4 are situated on the line connecting Z3 and Z4, the posterior surface of opisthonotum is smooth, dorsal cavities are well-sclerotized, rotund, the shape of idiosoma is oblong (460 µm long, 290 µm wide). Apart from these morphological differences *Z. hemimbricatus* has only been recorded from the British Isles so far.

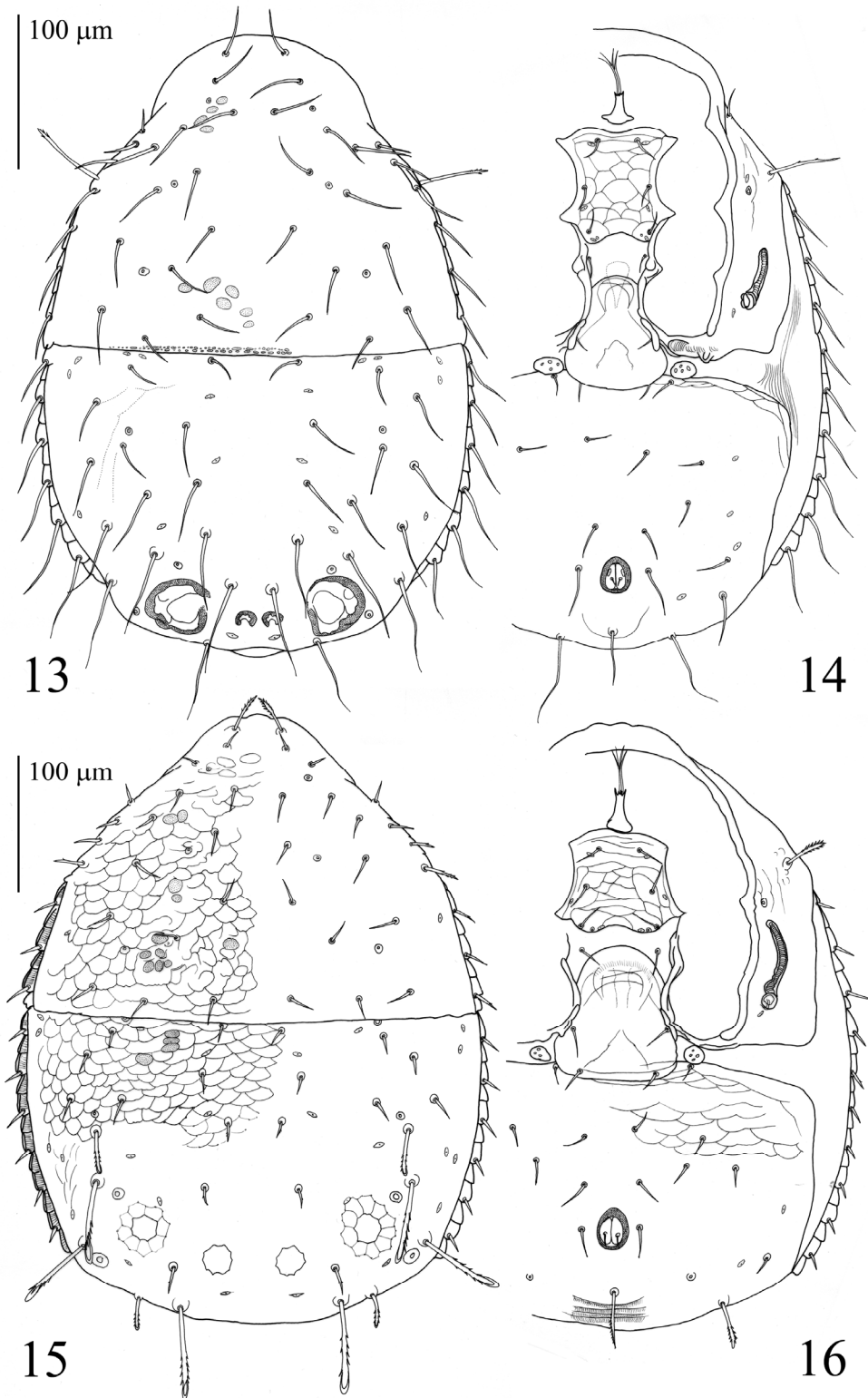
***Zercon bulgaricus* Balogh, 1961**

(Figs 13–14, 27)

Material examined. E-2287: Albania, Periferi Dibrë, 9 km north of Cidhnë along the Çidhën – Fushë-Lurë road (rocks, beech forest and dry grassland), leaf-litter, 1330 m a.s.l., N41°48.896' E20°16.651', 29.06.2007., leg. LD, ZE, ZF, DM, AH. (3 females).



Figures 9–12. *Zercon elongatus* sp. n.: 1 = dorsal view of female, 2 = ventral view of female, 3 = dorsal view of deutonymph, 4 = seta Z3



Figures 13–16. 13 = dorsal view of *Z. bulgaricus*, 14 = ventral view of *Z. bulgaricus*, 15 = dorsal view of *Z. zangherii*, 16 = ventral view of *Z. zangherii*

Remarks. The species is new to the fauna of Albania. A similar species was found in Turkey (Urhan & Ayyildiz 1996), in my opinion, however, it is conspecific with *Zercon bercziki* Ujvári, 2009, which was described from the Crimean Peninsula, Ukraine (Ujvári 2009). Dorsal cavities are equal in size in *Z. bercziki* as well as in the Turkish specimens and both bear alveolar ornamentation posterodorsally, while inner dorsal cavities are significantly smaller and posterodorsal surface is smooth in *Z. bulgaricus*.

Distribution. Bulgaria, Albania (Fig. 28).

***Zercon horsaensis* Mašán & Fend'a, 2004**

(Figs 17–18, 29)

Material examined. E-1854: Albania, 2 km northeast of Leskovik (limestone rocks), 1010 m a.s.l., N40° 09.160' E20°37.180', 03.07. 2003., leg. ZE, JK, DM, ZF. (1 female). E-1871: Albania, Periferi Tepelenë, gorge of a brook, 1 km east of Progonat, along the road from Tepelenë to Progonat, 950 m a.s.l., N40°12'36.8" E19° 57'41.1", 11.10.2004., leg. ZF, JK, DM. (1 female). E-2067: Albania, Periferi Skrapar, Tomor Mts, Ujanik, gorge of the Ujanik stream, N40°37.969' E20°12.969', 965 m a.s.l., 23.08. 2006., leg. ZF, AH, DM. (2 females).

Remarks. The species is new to the fauna of Albania. Specimens collected are similar to *Zercon delicatus* Urhan & Ekiz, 2002 (Turkey) and *Zercon rupestrinus* Błaszak, 1979 (Russia, Tien-Shan Mts) as well, by similar chaetotaxy and poroidotaxy. In *Z. rupestrinus*, posterodorsal surface is smooth, unlike *Z. horsaensis* and *Z. delicatus* which have reticulate-alveolar pattern. While setae J2, Z2 and S2 are pilose distally, setae S3 are spatuliform and reaching beyond the margin of idiosoma in *Z. delicatus*, former setae are smooth, S3 are pointed and not reaching margin of idiosoma in *Z. horsaensis* and the Albanian specimens. However some spatuliform setae are shorter in the Albanian specimens (e.g. Z3 not reaching bases of Z4) than in *Z. ho-*

rsaensis, it can be intraspecific variation which is usual in Zerconidae regarding characters like this.

Distribution. Slovakia, Albania (Fig. 29).

***Zercon plumatopilus* Athias-Henriot, 1961**

(Fig 28)

Material examined. E-2279: Albania, Periferi Tiranë, beech forest along the Klos-Elbasan road, above the reservoir, leaf-litter, 1155 m a.s.l., N41°16.165' E20°05.088', 30.06.2007., leg. LD, ZE, ZF, DM, AH. (2 females). E-1871: Albania, Periferi Tepelenë, gorge of a brook, 1 km east of Progonat, along the road from Tepelenë to Progonat, 950 m a.s.l., N40°12'36.8" E19° 57'41.1", 11.10.2004., leg. ZF, JK, DM. (4 females, 1 deutonymph). E-2067: Albania, Periferi Skrapar, Tomor Mts, Ujanik, gorge of the Ujanik stream, N40°37.969' E20°12.969', 965 m a.s.l., 23.08.2006., leg. ZF, AH, DM. (1 female).

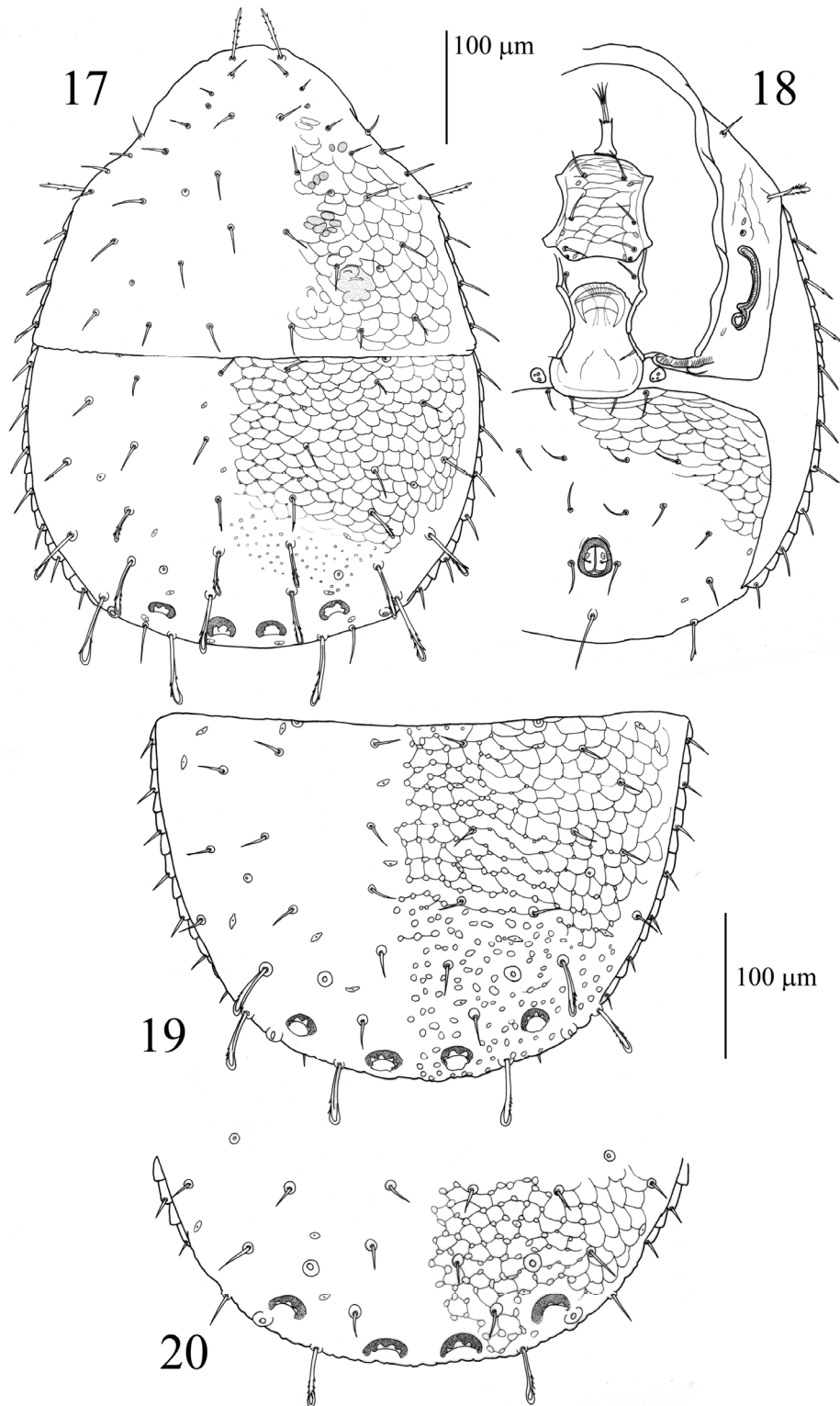
Remarks. The species is new to the fauna of Albania.

Distribution. Appenin Peninsula, Balkan Peninsula, Turkey (Fig. 28).

***Zercon serenus* Halašková, 1969**

(Fig 30)

Material examined. E-1853: Albania, southwest of Fushë-Lurë, Liqeni i Vogel (near brook, mixed pine-beech forest), 1710 m a.s.l., N41°47.587' E20°11.733', 28.06.2003., leg. ZE, JK, DM, ZF. (1 female, 1 deutonymph). E-2281: Albania, Periferi Tiranë, 7 km south of the Tiranë junction along the Klos-Elbasan road (beech forest) dry-rotten wood, 1370 m a.s.l., N41° 19.895' E20°08.454', 30.06.2007., leg. LD, ZE, ZF, DM, AH. (2 females). E-2290: Albania, Periferi Tiranë, 7 km south of the Tiranë junction along the Klos-Elbasan road (beech forest), leaf litter, 1370 m a.s.l., N41°19.895' E20°08.454', 30.06.2007., leg. LD, ZE, ZF, DM, AH. (1 male). E-2291: Albania, Periferi Mat, 3 km north of Qafa e Shtyllës, on the Klos-Elbasan road, 1.3 km north



Figures 17–20. 13 = dorsal view of *Z. horsaensis* 14 = ventral view of *Z. horsaensis*, 15 = opisthonorium of *Z. spatulatus*, 16 = caudal part of *Z. spatulatus* collected near Radomirë

of the conj. to Tiranë, (limestone rocks), leaf-litter, 1500 m a.s.l., N41°22.270' E20°05.126', 30.06.2007., leg. LD, ZE, ZF, DM, AH. (3 females, 1 male, 1 deutonymph). E-2287: Albania, Periferi Dibrë, 9 km north of Cidhnë along the Cidhnë – Fushë-Lurë road (rocks, beech forest and dry grassland), leaf-litter, 1330 m a.s.l., N41°48.896' E20°16.651', 29.06.2007., leg. LD, ZE, ZF, DM, AH. (3 females, 2 males).

Remarks. The species is new to the fauna of Albania.

Distribution. Central-Europe, Balkan Peninsula (Fig. 30).

***Zercon spatulatus* C. L. Koch, 1839**

(Figs 19–20, 30)

Material examined. E-1852: Albania, Okol, at the "Waterfall with a basin"(near the brook, limestone rocks, mixed forest), 900 m a.s.l., N42°24.137' E19°45.791', 05.07.2003., leg. ZE, JK, DM, ZF. (20 females, 5 males). E-1853: Albania, southwest of Fushë-Lurë, Liqeni i Vogel (near brook, mixed pine-beech forest), 1710 m a.s.l., N41°47.587' E20°11.733', 28.06.2003., leg. ZE, JK, DM, ZF. (10 females). E-1858: Albania, over Shkëmbi i Qytetit cave, 4 km southwest of Bishnicë, towards Shpelle (limestone and conglomerate rocks), 1140 m a.s.l., N40°55.258' E20°26.946', 01.07.2003., leg. ZE, JK, DM, ZF. (1 female). E-2266: Albania, Periferi Dibrë, Mali i Korabit, ca. 5.5 km east of Radomirë southern slope, over Fushë Korabit (opened brook, cave and rocks), from moss, 1905 m a.s.l., N41°49.121' E20°32.240', 27.06.2007., leg. LD, ZE, ZF, DM, AH. (4 females). E-2273: Albania, Periferi Korçë, 1 km west of Vithkuq, upper gorge of Lumi i Osumit, 1300 m a.s.l., from moss, N40°32.268' E20°34.198, 01.07.2007., leg. LD, ZE, ZF, DM, AH. (1 female, 1 deutonymph). E-2281: Albania, Periferi Tiranë, 7 km south of the Tiranë junction along the Klos-Elbasan road (beech forest) dry-rotten wood, 1370 m a.s.l., N41°19.895' E20°08.454', 30.06.2007., leg. LD, ZE, ZF, DM, AH. (4 females, 1 male). E-2283: Albania, Periferi Dibrë, Mali i Korabit, ca. 6 km

east of Radomirë, southern slope over Fushë Korabit (cave and limestone rocks), from moss, 2010 m a.s.l., N41°48.921' E20°32.691', 28.06.2007., leg. LD, ZE, ZF, DM, AH. (10 females, 7 males, 5 deutonymphs, 5 protonymphs). E-2285: Albania, Periferi Mat, 1 km south of Gurri-Bardhë along the Klos-Elbasan road (secondary forest), from moss, 800 m a.s.l., N41°26.759' E20°04.489', 30.06.2007., leg. LD, ZE, ZF, DM, AH. (2 females). E-2287: Albania, Periferi Dibrë, 9 km north of Cidhnë along the Cidhnë – Fushë-Lurë road (rocks, beech forest and dry grassland), leaf-litter, 1330 m a.s.l., N41°48.896' E20°16.651', 29.06.2007., leg. LD, ZE, ZF, DM, AH. (1 female).

Remarks. The species is new to the fauna of Albania. Shape of setae Z4 and S5 is characteristically spatuliform in *Z. spatulatus*, however on specimens collected near Radomirë the shape of former setae is similar to anterior opisthotal setae, smooth and pointed (Fig. 20). This morphological variant was hitherto unknown, and a question arises if the specimens belong to a currently unknown taxon. Regarding other morphological features no differences can be found between the two types collected in Albania, and these characters are insufficient for the establishment of a new taxon, hence I identified those with smooth, pointed and needle-like Z4 and S5 as *Z. spatulatus*.

Distribution. Central Europe, Balkan Peninsula (Fig. 30).

***Zercon vacuus* C. L. Koch, 1839**

(Fig 29)

Material examined. E-2264: Albania, Periferi Mat, 6 km south of Gurri i Bardhë along the Klos-Elbasan road, gorge of Lumi i Guisës, 1025 m a.s.l., dry-rotten wood, N41°25.839' E20°05.518', 30.06.2007., leg. LD, ZE, ZF, DM, AH. (2 females). E-2279: Albania, Periferi Tiranë, beech forest along the Klos-Elbasan road, above the reservoir, leaf-litter, 1155 m a.s.l., N41°16.165' E20°05.088', 30.06.2007., leg. LD, ZE, ZF, DM, AH. (7 females, 2 males, 1 deutonymph). E-2292:

Albania, Periferi Dibrë, Krej-Lurë, southwest of the village (pasture), leaf-litter, 1010 m a.s.l., N41°49.934' E20°10.513', 29.06.2007., leg. LD, ZE, ZF, DM, AH. (32 females, 1 male). E-2291: Albania, Periferi Mat, 3 km north of Qafa e Shtyllës, on the Klos-Elbasan road, 1.3 km north of the conj. to Tiranë, (limestone rocks), leaf-litter, 1500 m a.s.l., N41°22.270' E20°05.126', 30.06.2007., leg. LD, ZE, ZF, DM, AH. (3 females, 1 male). E-2294: Albania, Periferi Kukës, 2 km north of Topojan along the Kukës-Novosejë road (gorge of a stream) 900m, N41° 59.200' E20°31.715', 24.06.2007., leg. LD, ZE, ZF, DM, AH. (1 female). E-2285: Albania, Periferi Mat, 1 km south of Gurri i Bardhë along the Klos-Elbasan road (secondary forest), from moss, 800 m a.s.l., N41°26.759' E20°04.489', 30.06.2007., leg. LD, ZE, ZF, DM, AH. (1 female).

Remarks. The species is new to the fauna of Albania.

Distribution. Central Europe, Balkan Peninsula (Fig. 29).

***Zercon villosus* Błaszak & Polańska, 1998**

(Figs 21–24, 26, 29)

Material examined. E-2282: Albania, Periferi Dibrë, Mali i Korabit, northern slope of Maja e Korabit (cave), from moss, 2530 m a.s.l., N41° 47.823' E20°32.722', 27.06.2007., leg. LD, ZE, ZF, DM, AH. (2 females, 2 males, 1 deutonymph).

Remarks. The species is new to the fauna of Albania. Albanian female (Figs 21–22) specimens differ from the Bulgarian ones by lacking of hyaline sheaths of some opisthonotal setae. Although both males and deutonymphs were found as well by Błaszak & Polańska (1998), in the original description of the species neither of these were described nor illustrated.

Male (Figs 23–24). Length of idiosoma: 382 µm, width: 253 µm.

Chaetotaxy, poroidotaxy and ornamentation of dorsal shields generally similar to that of the female (see: Błaszak & Polańska 1998). Central podonotal setae, however, smooth and needle-like, and lateral dorsal cavities are smaller than medial ones, which is undetectable in female. Marginal serration even more acuminate than in female. Sternogenital shield well-sclerotized, with five pairs of setae. Peritremes straight. A single, oval postgenital sclerite can be found between adgenital platelets.

Deutonymph (Fig. 26). Length of idiosoma: 393 µm, width: 263 µm.

Chaetotaxy, poroidotaxy and ornamentation of dorsal shields generally similar to that of the adults. J-setae and marginal setae shorter, S-setae longer in proportion to the body-length than in adults. J-setae barbed, none of them reaching bases of the following one in the series. S2 reaching beyond the margin of idiosoma.

Distribution. Bulgaria, Albania (Fig. 29).

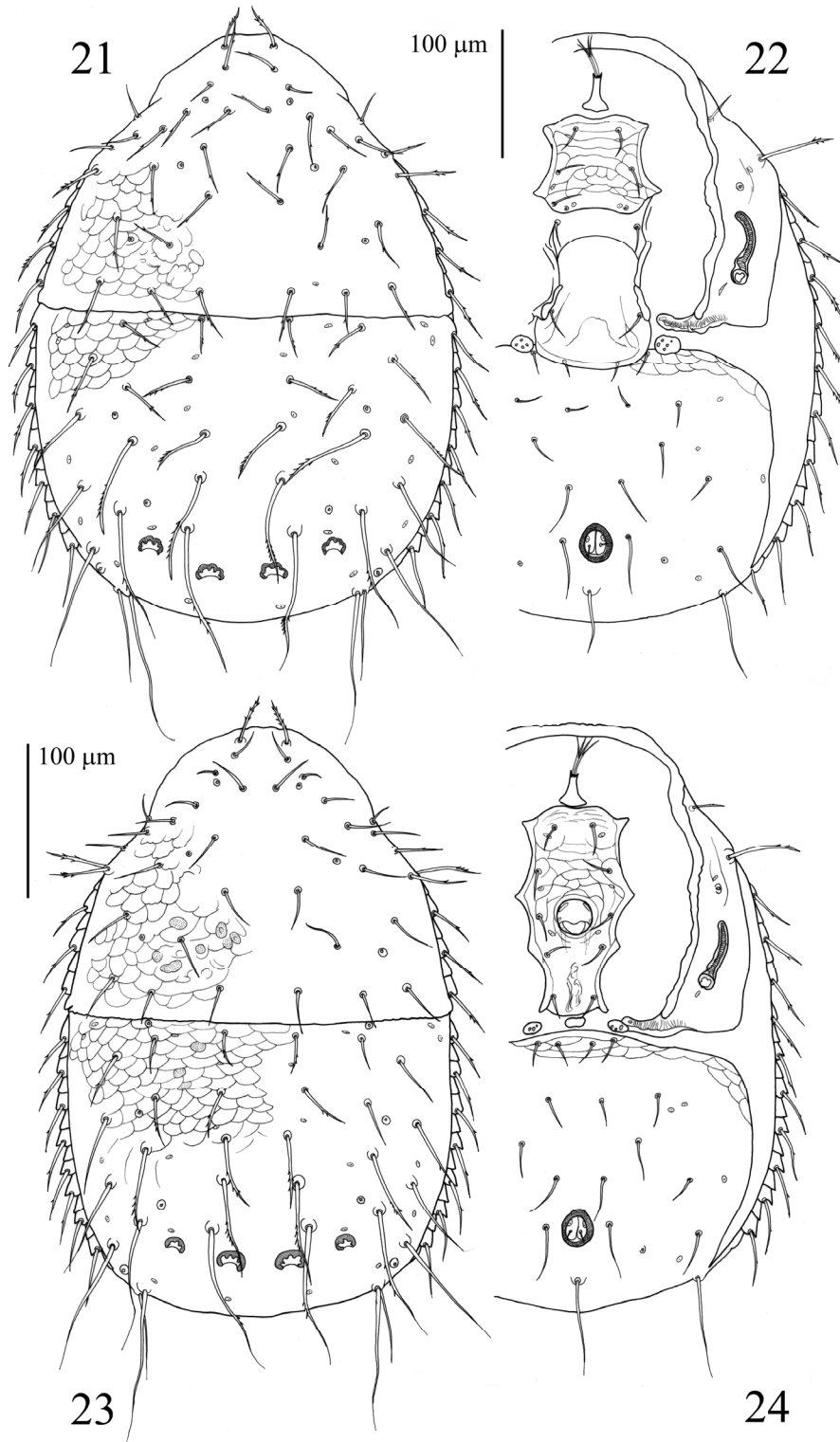
***Zercon zangherii* Sellnick, 1944**

(Figs 15–16, 28)

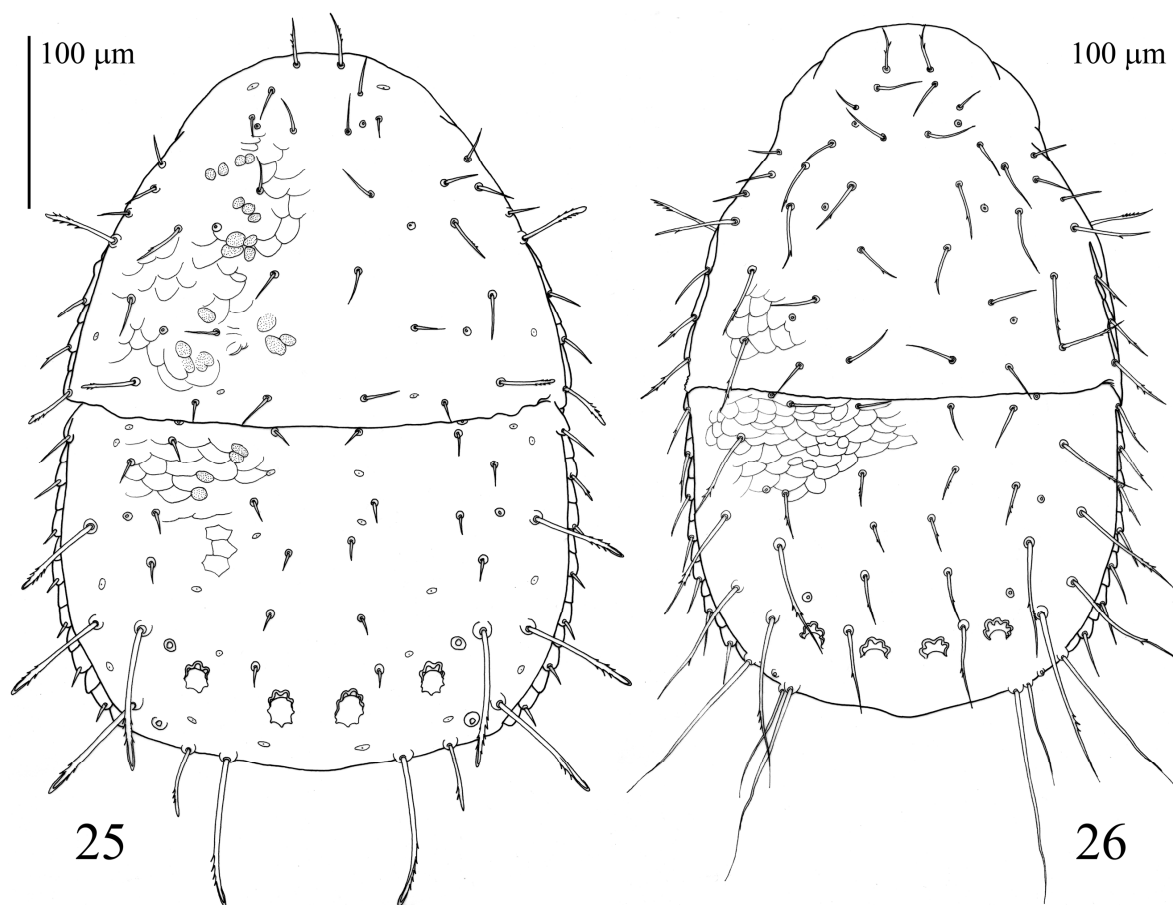
Material examined. E-2266: Albania, Periferi Dibrë, Mali i Korabit, ca. 5.5 km east of Radomirë southern slope, over Fushë Korabit (opened brook, cave and rocks), from moss, 1905 m a.s.l., N41°49.121' E20°32.240', 27.06.2007., leg. LD, ZE, ZF, DM, AH. (3 females, 1 male, 1 deutonymph). E-2279: Albania, Periferi Tiranë, beech forest along the Klos-Elbasan road, above the reservoir, leaf-litter, 1155 m a.s.l., N41°16.165' E20°05.088', 30.06.2007., leg. LD, ZE, ZF, DM, AH. (1 deutonymph). E-2282: Albania, Periferi Dibrë, Mali i Korabit, northern slope of Maja e Korabit (cave), from moss, 2530 m a.s.l., N41° 47.823' E20°32.722', 27.06.2007., leg. LD, ZE, ZF, DM, AH. (9 females, 1 male).

Remarks. The species is new to the fauna of Albania.

Distribution. Italy, Albania (Fig. 28).



Figures 21–24. *Zircon villosus*: 1 = dorsal view of female, 2 = ventral view of female, 3 = dorsal view of male, 4 = ventral view of male



Figures 25–26. 25 = *Z. albanicus* sp. n., dorsal view of deutonymph, 26 = *Z. villosus* sp. n., dorsal view of deutonymph

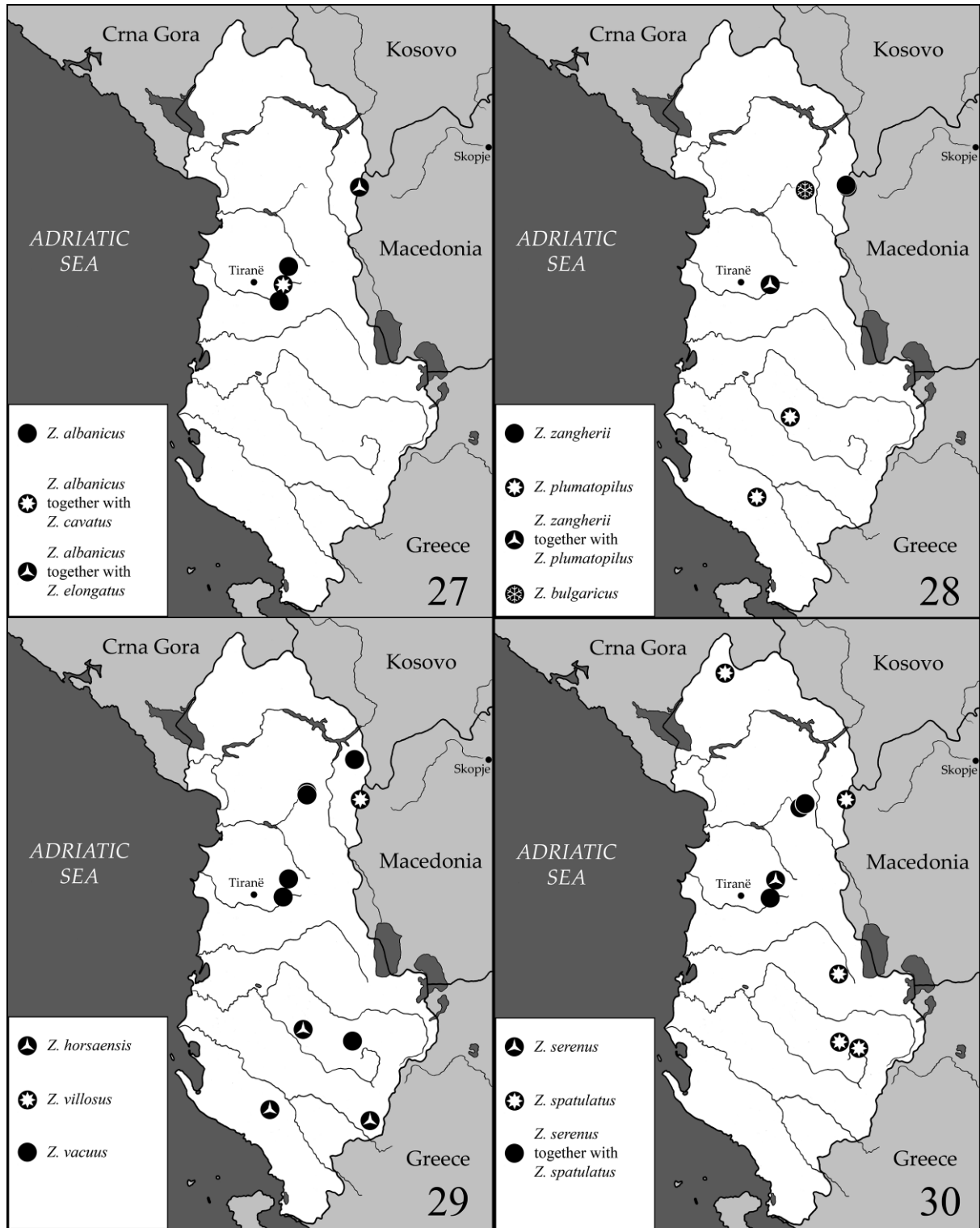
DISCUSSION

Altogether 11 species have been recorded from Albania, three of them, *Z. serenus*, *Z. spatulatus* and *Z. vacuus*, are known from several Central-European localities and apparently are prevalent in mountain woodlands (800–1500 m a.s.l.) of the northern and western part of the Balkan Peninsula as well. These species show a wide, Illyric distribution type and have presumably dispersed from the Balkan Peninsula to Central Europe. Earlier studies showed (Mahunka 1991, Mahunka & Mahunka-Papp 2004, 2007) that many Balkanic species migrated northward after the last glacial period, spreading through two different south-north migration routes as branches of a „pincers”: an Illyric and a Dacian route. *Z. serenus* and *Z. spatulatus* probably migrated through the western route up to the south western parts of Germany, and so are lacking in Transylvania, while *Z. vacuus* might have spread through both

paths, and prevalent in both the Illyric and Moesian regions with an eastern distribution border running alongside the Black Sea.

Z. bulgaricus, *Z. plumatopilus*, *Z. villosus* and *Z. zangherii* are typical Mediterranean species. While *Z. bulgaricus* and *Z. villosus* are only known from the Rila and Rhodope Mts (Bulgaria), *Z. zangherii* shows an Adriatic-Mediterranean distribution with its first data on the Eastern Adriatic coast. *Z. plumatopilus* possesses a wide East-Mediterranean area, stretching from the Adriatic to the Anatolian region.

There are only a few data on *Z. horsaensis*, it was known from the southern part of Slovakia so far and the presence of the species in Albania proves that the intermittent area is quite scarcely known. As I remarked above, the Albanian specimens are somewhat different from the Slovakian ones, and closely related to the Anatolian *Z. deli-*



Figures 27–30. Occurrences of *Zercon* species collected in Albania

catus as well. The similarity in the morphological characters indicates that *Z. horsasensis* is probably also a Mediterranean species and might have migrated through the Illyric route, however it has not yet been reported from the western region of the Carpathian Basin.

One of the new species, *Z. cavatus* sp. nov. shares some characters (for example strongly sclerotized, enlarged dorsal cavities) with a group of species distributed in the Mediterranean area (e.g. *Z. plumatopilus*) and may inhabit similar habitats in other regions of the Balkan Peninsula (and perhaps beyond it, towards Anatolia or the Apennin Peninsula as well).

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Table 1. Length of opisthonotal setae and longitudinal distance between their insertions in *Zercon albanicus* sp. n. (values in μm)

	♀	♂	DN		♀	♂	DN		♀	♂	DN
J1	12	12	11	Z1	9	14	14	S1	23	18	24
J1-J2	35	32	42	Z1-Z2	45	31	45	S1-S2	53	39	41
J2	11	11	13	Z2	12	13	12	S2	11	14	14
J2-J3	35	22	31	Z2-Z3	28	23	28	S2-S3	52	38	42
J3	12	10	12	Z3	13	12	13	S3	46	35	55
J3-J4	39	28	41	Z3-Z4	47	34	40	S3-S4	64	46	60
J4	11	10	10	Z4	80	62	82	S4	55	43	66
J4-J5	39	28	32	Z4-Z5	97	72	88	S4-S5	54	38	49
J5	14	10	11	Z5	87	68	86	S5	69	58	72

Table 2. Length of opisthonotal setae and longitudinal distance between their insertions in *Zercon cavatus* sp. n. (values in μm)

	♀		♀		♀
J1	38	Z1	35	S1	38
J1-J2	49	Z1-Z2	50	S1-S2	46
J2	43	Z2	42	S2	45
J2-J3	32	Z2-Z3	40	S2-S3	45
J3	48	Z3	56	S3	52
J3-J4	27	Z3-Z4	34	S3-S4	44
J4	55	Z4	70	S4	68
J4-J5	26	Z4-Z5	56	S4-S5	35
J5	70	Z5	63	S5	81

Table 3. Length of opisthonotal setae and longitudinal distance between their insertions in *Zercon elongatus* sp. n. (values in μm)

	♀	DN		♀	DN		♀	DN
J1	8	6	Z1	8	6	S1	11	10
J1-J2	46	29	Z1-Z2	48	34	S1-S2	41	28
J2	9	7	Z2	9	7	S2	9	8
J2-J3	36	30	Z2-Z3	36	30	S2-S3	59	42
J3	10	7	Z3	47	45	S3	21	33
J3-J4	41	38	Z3-Z4	64	45	S3-S4	58	49
J4	9	6	Z4	49	51	S4	38	49
J4-J5	50	31	Z4-Z5	64	51	S4-S5	53	41
J5	11	6	Z5	52	55	S5	48	50