

A new species of zerconid mite *Zercon shevtchenkoi* n. sp. (Acari: Mesostigmata: Zerconidae) from Ukraine

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ABSTRACT

A new species of the genus *Zercon* (Acari: Mesostigmata: Zerconidae) *Zercon shevtchenkoi* n. sp. from the island Kryhlyk, Ukraine is described and illustrated. Descriptions and illustrations of the new species based on adults of both sexes, protonymphs and larva are provided.

Keywords mesostigmatic mites; Zerconidae; new species; Ukraine

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Introduction

The mites of the Zerconidae family are free-living predators that can be found in soil microhabitats and also rarely in various merocenoses (e. g. Evans, 1992, Mašán & Fend'a, 2004). These mites can play an important role in the functioning of soil zoocenosis and may be used as bioindicators of changes occurring in the environment under the influence of industrial air pollutions accumulating in the soil (e. g. Seniczak et al., 2002; Kaczmarek, 2000). Zoogeographical distribution of Zerconidae covers the Holarctic area (Petrova, 1977; Sikora, 2014) and a very high level of endemism (over 60 %) indicates the intense processes of their speciation on some of the Holarctic areas (e. g. Korean Peninsula) (Kaczmarek & Marquardt, 2006). Many studies in the family Zerconidae were carried out in Europe (e. g. Błaszak, 1970, 1974, 1985; Athias-Henriot, 1980; Moraza, 1991, 2006; Fend'a, 2002; Kontschan, 2006; Ujvári, 2008, 2009, 2010). So far about 40 species of mites from the family Zerconidae have been found in Ukraine (Balan, 1991a, 1991b, 1991c, 1992a, 1992b, 1994, 1995a, 1995b, 2002, 2016; Ujvári, 2009).

The aim of this paper is to describe *Zercon shevtchenkoi* n. sp. based on a collection from the Kryhlyk Island (Central Ukraine).

Materials and methods

The adults and juveniles of *Zercon shevtchenkoi* n. sp. examined in this study were collected during a scientific expedition in the island Kryhlyk located on the Dnieper River in Cherkasy region in Central Ukraine. This island is part of Kaniv State Nature Reserve. Soil samples were collected from two sites of the older part of the island (about 150 years old) with steppic meadows on intermittently wet floodplains of the Dnieper River basin (*Agrostion vinealis* Sipailova et al. 1985). The first site (49.72541N, 31.54352E) were dominated by

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the sedges *Carex praecox* (20%) and grasses *Poa angustifolia* (10%), *Bromopsis inermis* (5%) and *Hierochloe odorata* (5%). *Potentilla argentea*, *Rumex thyrsoiflorus*, *Calamagrostis epigeios*, *Geranium pusillum*, *Gratiola officinalis*, *Plantago lanceolata*, *Rorippa sylvestris*, *Setaria viridis*, *Stellaria graminea*, *Vicia tetrasperma* were also present, but occurred at low densities. The second site (49.72529N, 31.54426E) were dominated by the perennials *Galium vernum* (60%), the sedges *Carex praecox* (20%) and grass *Poa angustifolia* (15%). Other plant species, occurring at low densities, included *Veronica spicata*, *Coniza canadensis*, *Hierochloe odorata*, *Hylotelephium maximum*, *Hypericum perforatum*, *Rumex thyrsoiflorus*, *Setaria viridis*, *Verbascum lychnitis* and *Xanthoxalis stricta*.

Mites were extracted from the samples using modified Tullgren funnels, and subsequently mounted in the PVA medium for microscopic examination. The drawings were made with the use of Nikon Eclipse Ci microscope with a drawing tube (Nikon Y-IDT), and figures were prepared using Corel X-Draw software, based on the scanned line drawings. Measurements were made using Leica DM3000 microscope with DFC420 camera and Leica Application Suite Version 3.8.0. The terminology of setae follows Lindquist and Evans (1965), with modifications as given by Lindquist and Moraza (1998). The system of notation for dermal glands and lyrifissures follows Johnston and Moraza (1991). Measurements are given in micrometers (μm), values are giving from minimum to maximum (including all individuals) and average value (given in brackets).

Zercon shevtchenkoi n. sp. (Figures 1–4)

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Diagnosis

Adult female: All podonotal setae with single or a few apically burrs (except the setae s1 which is needle-shaped). Setae J1-J3 and Z1-Z2 short and needle-shaped with a single barb at the end. Setae J3 never reach to the insertion of the setae J4 (they end in the middle of the distance between J3-J4). Setae J4-J5, Z3-Z4 and S2-S5 barbed with apically broadening hyaline sheath. Setae J4 do not reach beyond the insertion of the setae J5. Setae J5 never protrude beyond the edge of the opisthonotum and their length does not exceed 65 μm. Setae Z5 barbed with delicate hyaline sheath at the end, their length does not exceed 70 μm. Setae Z3 do not reach to the insertion of the setae Z4. Setae Z5 and JV5 distant from each other. Pore gdJ4 (Po3) located on the line connecting setae Z3 and J5 and at the level of the insertion of setae J4.

Table 1 Range of length of opisthonotal setae in *Zercon shevtchenkoi* n. sp., and range of longitudinal distance between their insertions (in micrometers; F – female, M – male, PN – protonymph; average values are given in brackets).

	F (n=11)	M (n=2)	PN (n=2)		F (n=11)	M (n=2)	PN (n=2)		F (n=11)	M (n=2)	PN (n=2)
J1	15-19 (16)	11-15 (13)	5-8 (6)	Z1	14-18 (15)	11-13 (12)	4-5 (5)	S1	29-36 (33)	25-29 (27)	-
J1-J2	45-59 (49)	38-41 (40)	21-27 (24)	Z1-Z2	50-63 (53)	35-44 (42)	25-29 (27)	S1-S2	46-61 (55)	39-48 (43)	-
J2	12-18 (14)	10-12 (11)	5-7 (6)	Z2	13-16 (14)	10-12 (11)	5-8 (6)	S2	27-39 (33)	26-30 (28)	26-27 (26)
J2-J3	34-53 (43)	33-41 (36)	25-34 (29)	Z2-Z3	48-64 (54)	32-43 (36)	21-26 (24)	S2-S3	61-71 (63)	43-51 (47)	32-38 (34)
J3	7-16 (12)	8-10 (9)	4-5 (5)	Z3	35-50 (41)	31-41 (38)	32-38 (34)	S3	43-49 (43)	36-42 (42)	31-36 (34)
J3-J4	32-59 (43)	31-38 (35)	19-29 (24)	Z3-Z4	49-62 (53)	41-44 (43)	33-39 (35)	S3-S4	56-70 (61)	45-52 (48)	26-31 (29)
J4	36-48 (42)	9-11 (10)	4-7 (5)	Z4	56-73 (58)	49-58 (54)	47-50 (48)	S4	52-56 (52)	45-52 (48)	36-40 (38)
J4-J5	43-59 (47)	31-38 (33)	26-31 (28)	Z4-Z5	62-85 (76)	54-64 (58)	40-43 (41)	S4-S5	51-68 (55)	36-45 (42)	33-35 (34)
J5	50-66 (57)	10-13 (11)	4-6 (5)	Z5	56-69 (62)	56-60 (58)	50-54 (52)	S5	51-64 (57)	51-56 (54)	43-45 (44)

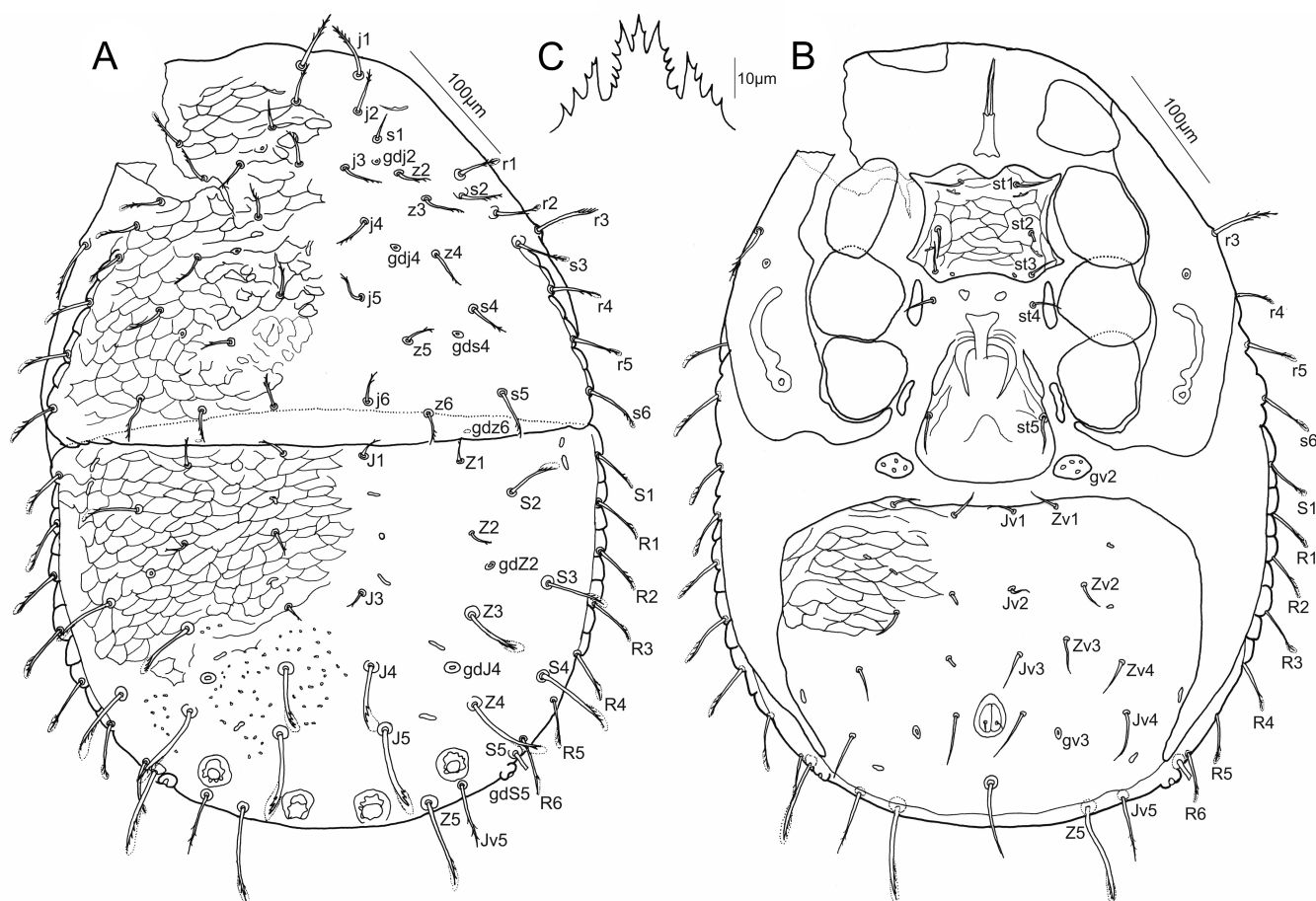


Figure 1 *Zercon shevtchenkoi* n. sp. female A – dorsal view, B – ventral view, C – epistome.

Description

Female (n=11) — Average body length (without gnathosoma) 508 μm (493–536 μm), average body width (at level of setae S1) 380 μm (370–398 μm). Dorsum (Figure 1A) – Podonotal shield with 21 pairs of setae. Setae j1 are the longest in a row “j” and barbed. The other j-setae are of comparable length and barbed apically. Setae s1 short and needle-shaped. The other s-setae and all z-setae longer and barbed with hyaline sheath at the end. All r-setae in row are barbed with hyaline sheath at the end, their length increases to the posterior part of podonotum. The location of pores: gdj2 (po1) is located near central part of the line connecting setae j2 and z2, gdj4 (po2) is located posteriorly the line connecting setae j4 and z4 and gds4 (po3) is located posteriorly the line connecting setae s4 and z5. Opisthonotal shield with 21 pairs of setae. Lengths of setae of opisthonotum and longitudinal distances between the insertions of setae in single rows are given in Table 1. Setae J1–J3 and Z1–Z2 short (not reaching the insertion of the next seta in a row), needle-shaped with a single barb at the end. The other J-setae, setae Z3–Z4 and all S-setae definitely longer and thicker, barbed with hyaline sheath at the end. Setae J4, Z3 and S2–S3 do not reach the insertion of the next seta in a row. Setae J5 and Z5 are of similar length. Setae J5 never protrudes beyond the edge of opisthonotum. Setae Z4 reach to the edge of opisthonotum. The insertions of setae Z5 and Jv5 are not in close proximity. Setae S4 reach the insertion of setae S5. All R-setae barbed with hyaline sheath with comparable lengths.

The pore gdz6 (Po1) is located anteriorly to the insertion of seta Z1. The pore gdZ2 (Po2)

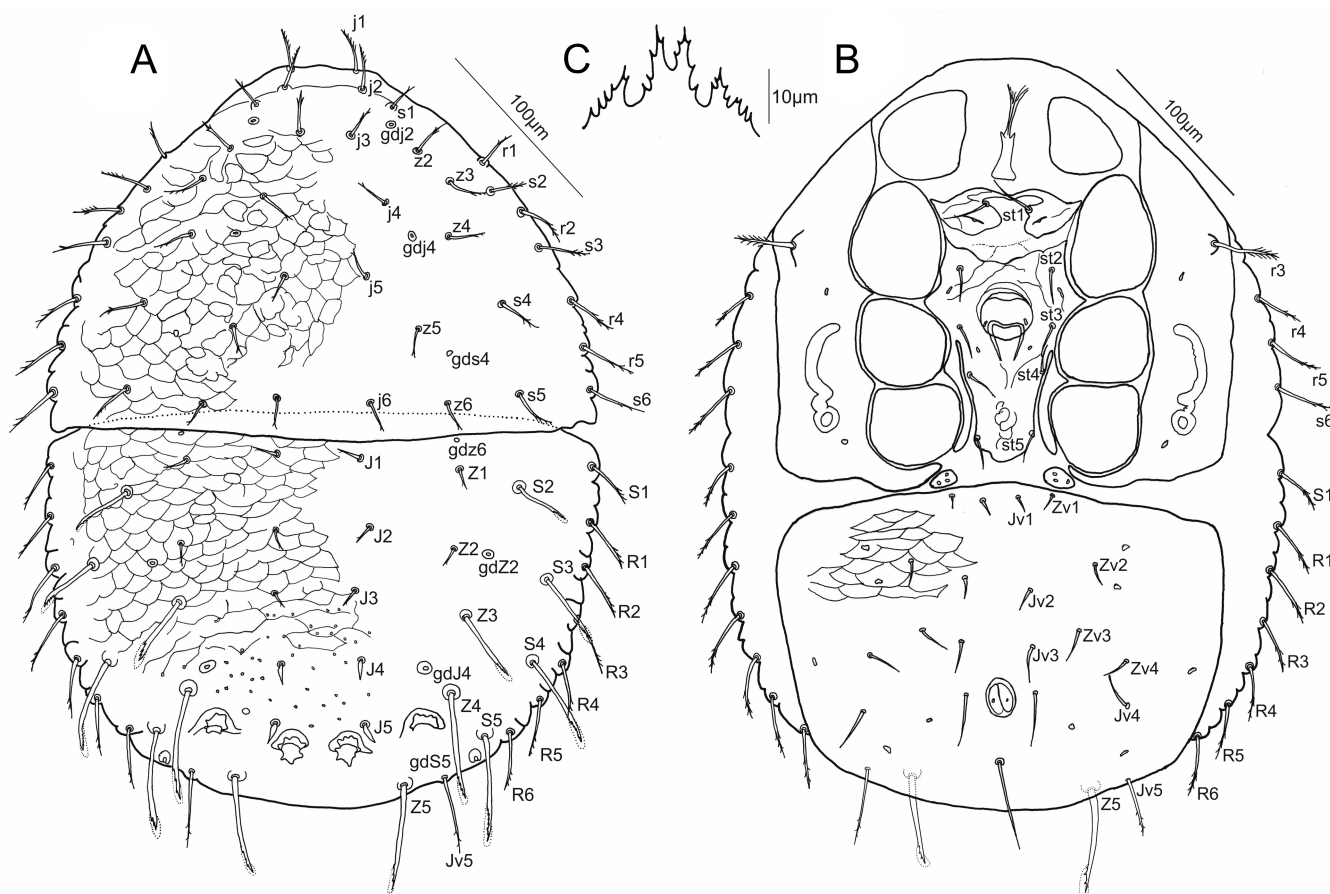


Figure 2 *Zercon shevtchenkoi* n. sp. male A – dorsal view, B – ventral view, C – epistome.

is located on the line connecting setae Z2 and S3. The pore gdJ4 (Po3) is located on the line connecting setae Z3 and J5 and at the level of the insertion of setae J4. The pore gdS5 (Po4) is located near the insertion of setae S5. Podonotum entirely covered with irregular tile-like sculpture. Front and middle parts of opisthonotum covered with irregular tile-like sculpture, which disappears towards the posterior part, where covered with irregular spots. Posterodorsal cavities are star-like shaped with rounded curvings. Sternal shield well sclerotized, regular in shape (70 μm average length and 85 μm average width at the level of setae st_2) with 3 pairs of setae and reticular ornamentation (Figure 1B). Genital shield (106 μm average length and 79 μm average width at the level of setae st_5) has a typical shaped as in the genus *Zercon*. Ventroanal shield (213 μm average length and 284 μm average width at the level of setae ZV2) is bathtub-shaped with 21 setae. Anterior margin of ventroanal shield with two pairs of setae. Sternal and ventroanal setae smooth and needle-like, only seta JV5 barbed at the end. Epistome is typical shape as in the genus (Figure 1C).

Male (n=2) — Average body length (without gnathosoma) 401 μm (388 – 415 μm), average width at level of setae S1 297 μm (295 – 298 μm). Dorsum (Figure 2A) – Podonotal shield with 21 pairs of setae. All setae of podonotum slim with barbs. Setae z5-z6, j4-j6 and s1 have only one tiny barb. Localization of the podonotal pores are the same as in the female. Opisthonotal shield with 21 pairs of setae. Lengths of setae of opisthonotum and longitudinal distances between the insertions of setae in single rows are given in Table 1. Setae J1-J3 and Z1-Z2 short, needle-shaped with a single barb at the end (same as in the female). Setae J4-J5 short

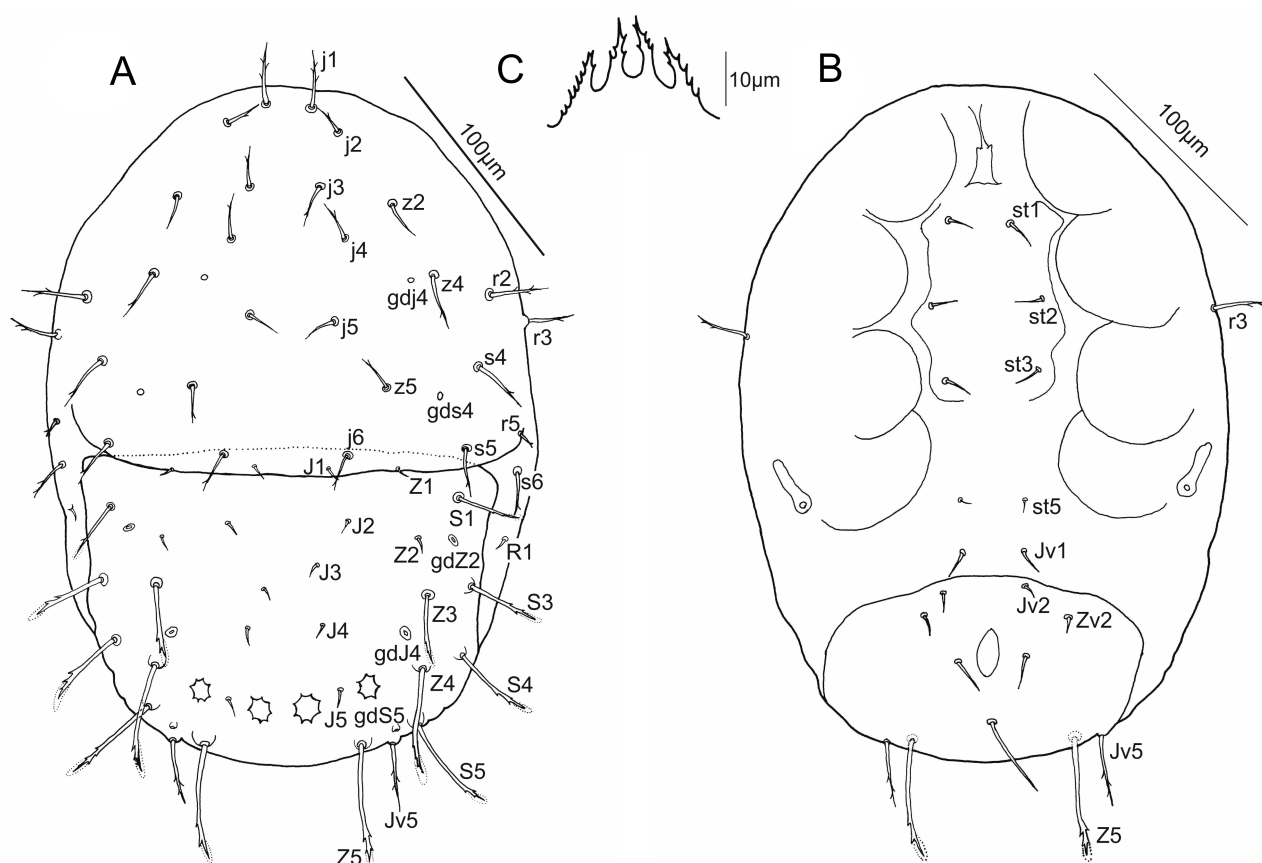


Figure 3 *Zercon shevtchenkoi* n. sp. protonymph A – dorsal view, B – ventral view, C – epistome.

and lanceolate shaped. All S-setae and setae Z3-Z5 thicker, longer, barbed and with hyaline sheath. Setae S2-S3 do not reach the insertion of the next setae. Setae Z3 reach the insertion of the setae Z4. Setae S4 and Z4 extend beyond the insertion of the next seta. The insertions of setae Z5 and JV5 are not in close proximity. Localization of opisthonotal pores are the same as in the female. Dorsal sculpture is the same as in the female. Sternogenital shield (155 μm average long) is divided by a weakly sclerotized slit behind the first pair of sternogenital setae st1 (Figure 2B). Sternogenital shield with five pairs of setae. Ventroanal shield (168 μm average length and 241 μm average width at the level of setae ZV2) is bathtub-shaped with 21 setae. Anterior margin of ventroanal shield with two pairs of setae. All sternal and ventroanal setae are smooth, needle-like, only seta JV5 barbed at the end. Epistome is typical shape as in the genus (Figure 2C).

Protonymph (n=2) — Average body length (without gnathosoma) 288 μm (281-294 μm), average width at level of setae s6 204 μm (196-212 μm). Podonotal shield with 13 pairs of setae. All setae of podonotum are slim with barbs, without hyaline sheath (Figure 3A). Localization of pores gdj4 (po2) and gds4 (po3) is the same as in adults. Pygidial shield with 14 pairs of setae. Lengths of setae of opisthonotum and longitudinal distances between the insertions of setae in single rows are given in Table 1. Setae J1-J5 and Z1-Z2 are short, lanceolate shaped and with one tiny barb. All S-setae and setae Z3-Z5 thicker, longer, barbed with hyaline sheath. Setae S2-S3 do not reach to the insertion of the next seta. Seta Z3 reach to the insertion of the

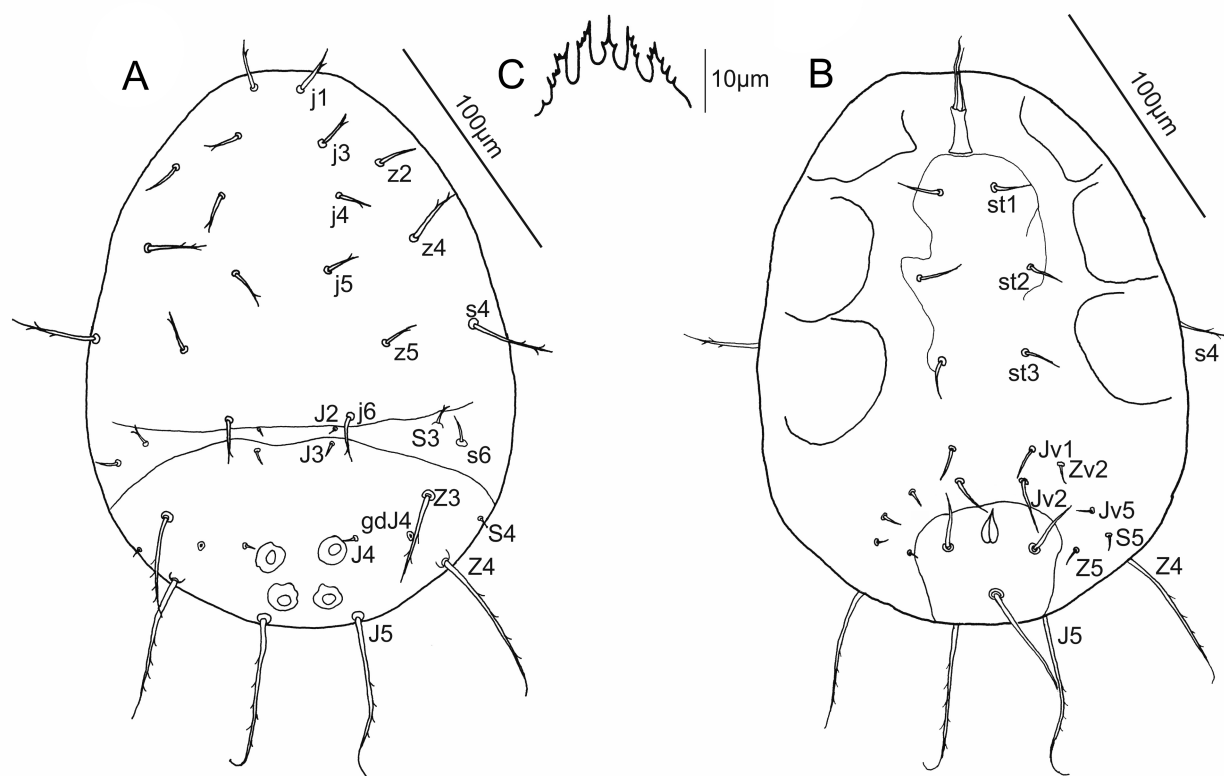


Figure 4 *Zercon shevtchenkoi* n. sp. larva A – dorsal view, B – ventral view, C – epistome.

setae Z4. Setae S4 and Z4 extend beyond the insertion of the next seta. The insertions of setae Z5 and JV5 are not in close proximity (just like as in adults). The pore gdZ2 (Po2) is located slightly posteriorly the line connecting setae Z2 and S2. Localization of pores gdJ4 (Po3) is the same as in adults. The pore gdS5 (Po4) is located anteriorly to the insertion setae JV5. Sternal shield is weakly marked with 3 pairs of setae. Ventroanal shield (78 μm average length and 126 μm average width at the level of setae ZV2) is bathtub-shaped with 9 setae (Figure 3B). Sternal and ventroanal setae are smooth and needle-like, only JV5 barbed at the end. Epistome is typical shape as in the genus (Figure 3C).

Larva (n=1) — length 114 μm , width at level of setae s6 86 μm . Podonotal shield with 9 pairs of setae. Setae z2 smooth and needle-shaped. Setae z4 and s4 barbed (Figure 4A). Other setae of podonotum slim with a single barb and without hyaline sheath. Setae s6 smooth, needle-shaped and located outside podonotal shield. Pygidial shield with 6 pairs of setae. Setae J2 (5-6 μm) needle-shaped and located outside opisthonotal shield. Setae J3 and J4 (4-5 μm) needle-shaped. Setae J5 very long (63-67 μm) needle-shaped and with barbs. Setae S3 (8-11 μm) needle-shaped and located outside opisthonotal shield. Setae Z3 (38-41 μm) and Z4 (58-62 μm) needle-shaped and with barbs. All of the opisthonotal setae without hyaline sheath. All ventral setae smooth and needle-like. Ventroanal shield 57 μm long and 57 μm wide (at the level of adanal setae) (Figure 4B). Epistome is typical shape as in the genus (Figure 4C).

Type material — one holotype female and 11 paratypes (10 females, 2 males, 2 protonymphs

and one larva) were collected from the island Kryhlyk located on the Dnieper River in Cherkasy region in Central Ukraine, 7 August 2017 (Coll. Faleńczyk-Koziróg K.). The holotype (female) and 6 paratypes (4 females 1 male and 1 protonymph) are deposited in the University Museum of Bergen (Norway) and 9 paratypes are deposited in the Department of Evolutionary Biology, Kazimierz Wielki University in Bydgoszcz (Poland).

Etymology

The new species is dedicated to the Ukrainian poet Taras Hryhorowycz Shevchenko (1814-1861) whose grave is located in Kaniev.

Remarks

Zercon shevtchenkoi n. sp. is similar to *Z. karadaghiensis* Balan, 1992 (Balan, 1992a; Ujvári, 2009) and to *Z. tauricus* Balan, 1991 (Balan, 1991b) from the Crimean Peninsula, and to *Z. wisniewskii* Błaszak and Skorupski, 1992 from central Russia (Błaszak & Skorupski, 1992). All those species differ from each other in the localization of pore gdJ4 (Po3) and in the length and character of some setae. In *Zercon shevtchenkoi* n. sp., the pore gdJ4 (Po3) is located on the line connecting setae Z3 and J5 and at the level of the insertion of setae J4. In *Z. karadaghiensis* it is located on the line connecting setae J4 and Z4, in *Z. tauricus* it is located in the triangle defined by the lines connecting setae J3, Z4 and J4 and in *Z. wisniewskii* it is located anteriorly to the line connecting setae Z4 and J5 and posteriorly to the insertion of setae J5. In *Z. wisniewskii* and *Z. karadaghiensis*, setae J3 reach to the insertion of setae J4, while in *Z. shevtchenkoi* n. sp. they ends in the middle of the distance between J3-J4. In *Z. karadaghiensis* these setae are barbed with hyaline sheath and in *Z. shevtchenkoi* n. sp. they are needle-shaped with one barb and without hyaline sheath. In *Z. wisniewskii* setae J5 and Z5 are almost twice as long as in the new species. In *Z. wisniewskii* setae Z3 can reach to the insertion of setae Z4, while in *Z. shevtchenkoi* n. sp. they do not. In *Z. karadaghiensis* setae J1-J2 and Z1-Z2 are smooth and needle-shaped, in new species they have one barb at the end. Most setae on podonotum in *Z. karadaghiensis* are smooth and needle-shaped, in *Z. shevtchenkoi* n. sp. they are barbed at the end. The insertion of setae Z5 and JV5 in *Z. wisniewskii* and *Z. tauricus* are located close to each other, in *Z. shevtchenkoi* n. sp. they are not in close proximity. In *Z. tauricus* setae J4-J5 and Z5 are plumose with hyaline sheath at the end, in new species they are barbed with hyaline sheath at the end. The insertion of setae Z1 and S2 in *Z. tauricus* are located at the same level, in *Z. shevtchenkoi* n. sp. the insertion of setae S2 is located much posteriorly than the insertion of setae Z1. *Zercon tauricus* also has the different character of podonotal setae: j1, z2-z4, s4-5 are plumose, z5-z6 are smooth and needle-shaped, in *Z. shevtchenkoi* n. sp. they are barbed at the end. In *Z. tauricus* the posterior edges of the cavities are connected by protuberances, in *Z. shevtchenkoi* n. sp. the cavities are not connected.

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