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TOWARDS THE SYSTEMATICS OF THE WATER MITE *WOOLASTOKIA ELONGATA* (SOKOLOW, 1934) (ACARIFORMES: ATURIDAE)

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ABSTRACT — An illustrated description of a water mite species, *Woolastookia elongata* (Sokolow, 1934) from the Far East of Russia is presented. The male and deutonymph are described for the first time. The synonymization of *Woolastookia spatulata* Kim and Chung, 1996, described from South Korea, is proposed.

KEYWORDS — water mites; Hydrachnidia; *Woolastookia*; synonymy; Far East of Russia

INTRODUCTION

The water mite *Woolastookia elongata* was described by I.I. Sokolow in the genus *Axonopsis* Piersig, 1893 on the base of one female, which was collected in Primory Kray in the Tigrovaya River (Sokolow, 1934). The first description of male and deutonymph of this species is provided in present paper. The species *W. spatulata* Kim and Chung, 1996 described from South Korea (Kim and Chung, 1996) is considered a junior synonym of *W. elongata* (Sokolow, 1934).

MATERIALS AND METHODS

Specimens were preserved in modified Koenike's solution and mounted on slides using glycerine jelly. The material is deposited in the collection of the Institute of Biology and Soil Science, Vladivostok. Two paratypes of *W. spatulata* Kim and Chung, 1996 (1 male and 1 female) from Kangnung National University (South Korea) were studied.

Idiosomal setae and lyriform organs terminology follows Tuzovskij (1987): *Fch* – frontales chelicerae, *Fp* – frontales pedipalporum, *Vi* – verticales internae, *Ve* – verticales externae, *Oi* – occipitales internae, *Oe* – occipitales externae, *Hi* – humerales internae, *He* – humerales externae, *Hv* – humerales ventralia, *Sci* – scapulares internae, *Sce* – scapulares externae, *Li* – lumbales internae, *Le* – lumbales externae, *Si* – sacrales internae, *Se* – sacrales externae, *Ci* – caudales internae, *Pi* – praeanales internae, *Pe* – praeanales externae; *i*₁ – *i*₅ – lyriform organs.

Furthermore, the following abbreviations are used: P-1-5, pedipalp segments (trochanter, femur, genu, tibia and tarsus) i.e. P-3 = genu; I-L-1-6, first leg, segments 1-6 (trochanter, basifemur, telofemur, genu, tibia and tarsus) i.e. III-L-4 = genu of third leg; n = number of specimens measured. The length of appendage segments was measured along their dorsal side; all measurements are given in μm .

SYSTEMATIC PART

Woolastookia elongata (Sokolow, 1934)

(Figures 1 – 3)

Axonopsis elongata Sokolow, 1934: 371, figures 79-81; Sokolow, 1940: 406, figures 216 a-c.

Woolastookia elongata (Sokolow, 1934); Cook, 1974: 342; Semenchenko, 2006: 238.

Woolastookia spatulata Kim and Chung, 1996: 154, figure 11. syn. nov.

Material. Russia, Primory Kray: 1 female, Khasansky District, "Kedrovaya Pad National Nature Biosphere Reserve", the Kedrovaya River, N 43°06.056'; E 131°33.310', 25 Nov. 1993, leg. T.M. Tiunova; 1 female, Terneysky District, the Serebryanka River, near Artemovo, N 45°06.624'; E 136°31.837', 24 Sept. 2008, leg. K.A. Semenchenko, D.A. Sidorov; 1 male, 2 females, Anuchinsky District, 10 km from Vinogradovka, the Arsenyevka River, N 43°48.261'; E 132°56.407', 13 Sept. 2008, leg. K.A. Semenchenko, D.A. Sidorov; 1 male, 2 deutonymphs, Anuchinsky District, the Arsenyevka River, near Stogovaya hill, N 43°40.315'; E 133°00.937', 15 Sept. 2008, leg. K.A. Semenchenko, D.A. Sidorov; Russia, Sakhalin Province: 11 males, 12 females, Dolinsky District, unnamed spring, the Izvitaya River basin, N 47°17.365'; E 143°53.069', 27 Sept. 2008, leg. K.A. Semenchenko. Paratypes of *Woolastookia spatulata* – South Korea: 1 male, 1 female, spring on the Ullung Island, N 37°3'; E 130°5', 20 Sept. 1995, leg. I.H. Kim, K.S. Chung.

Description

Deutonymph. Dorsal shield with cellular structure, occupying major portion of dorsum and situated on other shield, submerged under cuticle and having granular structure (Figure 1, a). Setae *Oi* placed on main shield, setae *Oe*, *Hi*, *Sci*, *Li* and *Si* on shield, submerged under cuticle. Setae *Fch* longer and thicker than other dorsal setae. Coxae of legs incorporated into two groups and lying on ventral shields (Figure 1, b). Medial portions of coxae of legs II-IV fused to each other.

Setae *Ve* lying free on soft integument on the level of coxae II. Setae *Hv* situated near medial end

of suture between coxae I and II. Setae *Pi* without glandularia and situated anterior to anal plate, setae *Pe* on posterior margin of coxae IV. Anal plate tapered. Two pairs of genital acetabula lying on two genital plates, each plate with three setae.

Trochanter of pedipalp without setae (Figure 1, c). Pedipalpal femur without ventrodorsal tuber, bearing 1 dorsomedial and 2 dorsodistal setae. Ventral margin of pedipalpal genu concave. Tibia with subequal height along segment, bearing 2 thin ventromedial setae and 1 stout distolateral spine.

Tibia of legs I with 1, tibia of legs III-IV with 2 long swimming setae (Figure 1, d). Claws with well developed plate and three clawlets, medial clawlet longer than interior and exterior ones. Ventral margin of claw blade slightly concave.

Measurements (n=2). Length of body 323-336, width 282-297; length of dorsal shield 252-275, width 177-194; length of pedipalpal segments (P-1-5): 24-27, 32-35, 22-24, 54-55, 15-16; length of leg segments: I-L-1-6 - 24-26, 29-32, 29-32, 30-43, 52-54, 59-62; II-L-1-6 - 24-25, 31-32, 30-35, 40-46, 51-57, 50-65; III-L-1-6 24-27, 30-35, 35-40, 43-54, 56-70, 62-67; IV-L-1-6 - 36-38, 42-43, 42-43, 52-55, 63-65, 65-67.

Male. Body elongated (Figure 2, a). Its posterior margin with small depression. Dorsal shield with eight pairs of setae: *Fp*, *Vi*, *Oi*, *Oe*, *Hi*, *Sci*, *Li* and *Si*. Setae *Se* placed on elongated sclerites, situated laterally of posterior part of dorsal shield. First pair of lyriform organs (*i*₁) placed on dorsal shield, three pairs of lyriform organs (*i*₂-*i*₄) lying free on soft integument along lateral edges of dorsal shield, *i*₅ on small platelets behind genital field. Medial portions of coxae of legs II-IV fused to each other (Figure 2, b). Longitudinal crest located between place of insertion of leg IV and genital field. Genital field with 3 pairs of acetabula. Margins of genital opening with great number of short setae.

Trochanter of pedipalp long, curved medially, with single dorsomedial seta (Figure 2, c). Pedipalpal femur with straight ventral and convex dorsal margin, bearing 5 setae. Genu with 1 short dorsomedial seta and 2 long dorsodistal setae. Tibia long with subequal height along segment, bearing

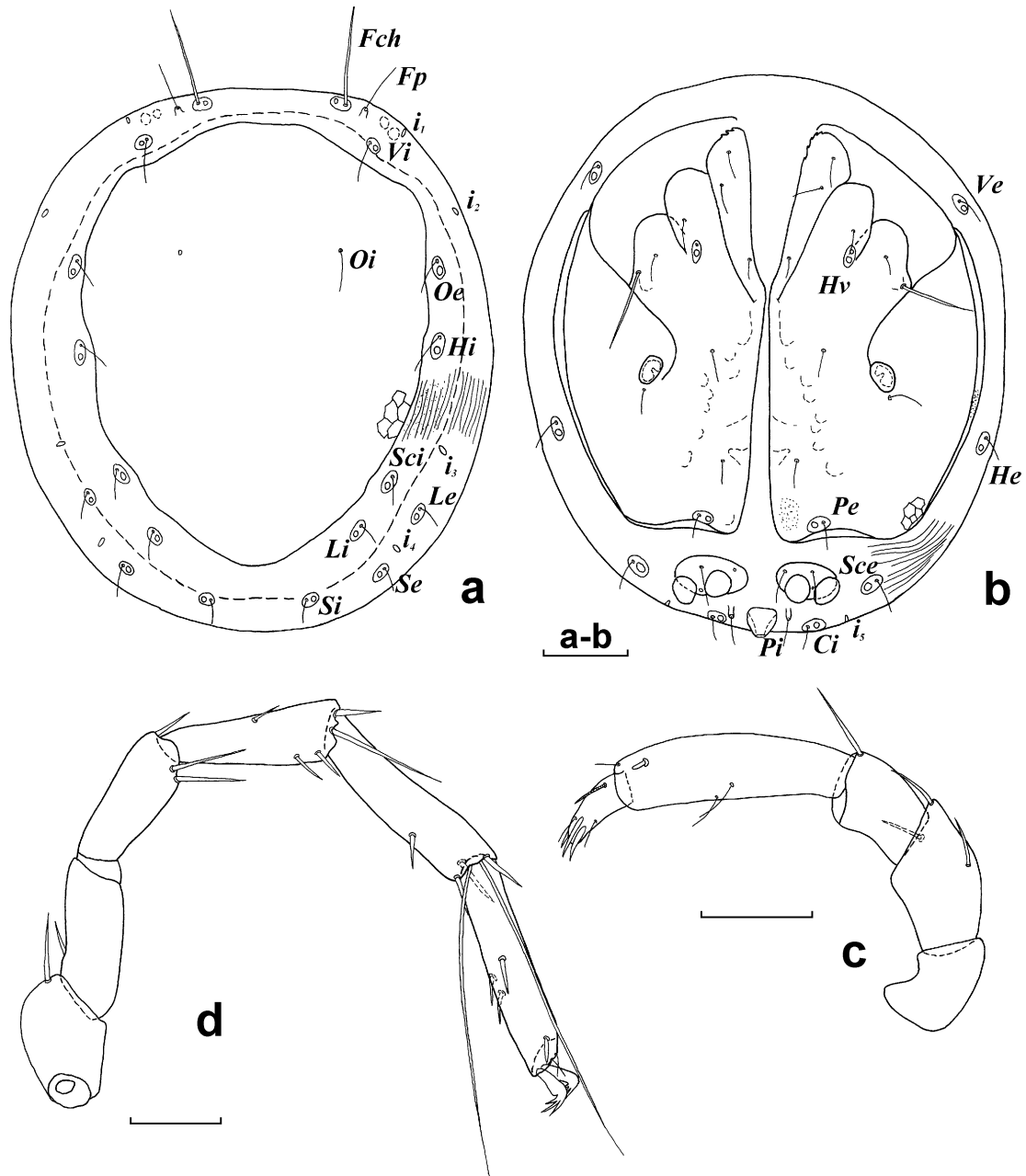


FIGURE 1: *Woolastookia elongata* (Sokolow, 1934), deutonymph: a – idiosoma, dorsal view, b – idiosoma, ventral view, c – pedipalp, d – leg IV. Scale bars = 50 μm for figures a-b; 25 μm for figures c-d.

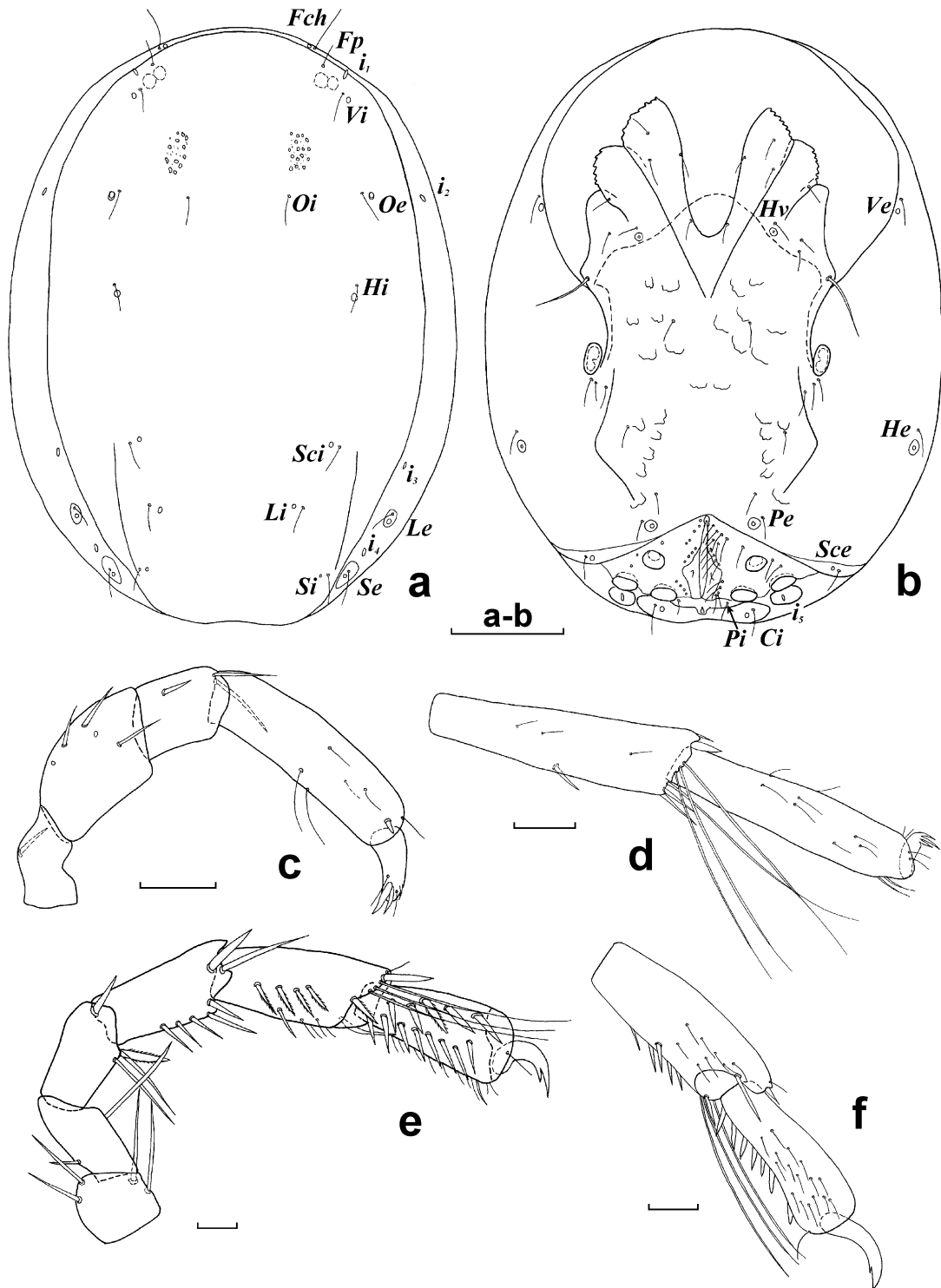


FIGURE 2: *Woolastookia elongata* (Sokolow, 1934), male: a – idiosoma, dorsal view, b – idiosoma, ventral view, c – pedipalp, d – tibia and tarsus of leg III, e – leg IV, f – tibia and tarsus of leg IV. Scale bars = 100 μ m for figures a-b; 25 μ m for figures c-f.

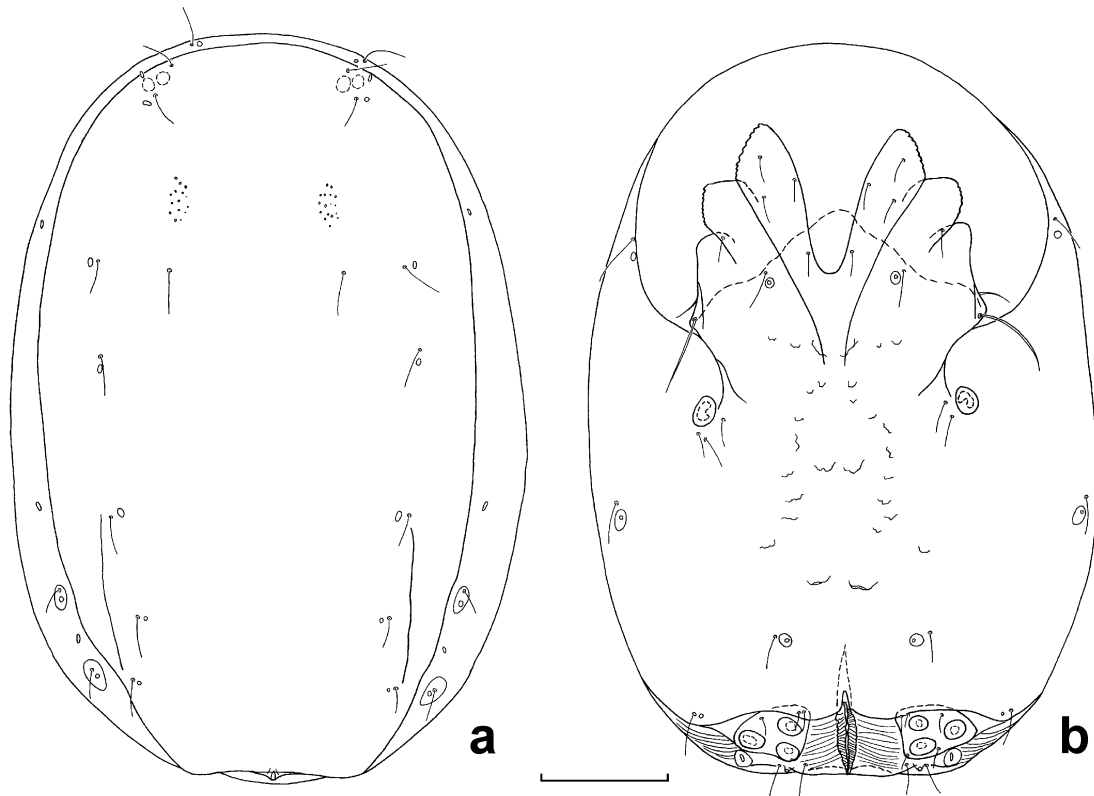


FIGURE 3: *Woolastookia elongata* (Sokolow, 1934), female: a – idiosoma, dorsal view, b – idiosoma, ventral view. Scale bar = 100 μm .

2 thin long ventromedial setae and 1 stout distolateral spine.

Tibia of legs II with 3 swimming setae. Legs III longer than other pairs of leg, their tibia with 4 swimming setae (Figure 2, d). Legs IV thickened, bearing 3 swimming setae on tibia and plenty of stout setae on tarsus (Figure 2, e-f). Claws of legs I-III with 3 clawlets, medial clawlet longer than interior and exterior ones. Claws of legs IV larger than that of other pairs of legs, strongly curved, with 1 short interior and 1 long exterior clawlets.

Measurements (n=3). Length of body 488-521, width 363-396; length of dorsal shield 485-515, width 303-336; length of pedipalpal segments (P-1-5): 35-36, 46-48, 29-32, 78-81, 24-26; length of leg segments: I-L-1-6 - 35-40, 38-40, 54-57, 73-75, 86-92, 92-94; II-L-1-6 - 40-43, 50-54, 57-62, 76-81, 94-96, 92-94; III-L-1-6 40-43, 70-78, 73-76, 94-95, 113-121, 110-113; IV-L-1-6 - 54-67, 58-60, 73-77, 86-94, 108-116, 97-99.

Female. Position of setae on dorsal shield similar to that of male (Figure 3, a). Anal opening situated behind dorsal shield. Structure of legs coxae similar to that of male (Figure 3, b). In contrast to male no longitudinal crest located between place of insertion of leg IV and genital field. Genital plates triangular, each with 3 acetabula, occupying about half of its surface, and 4-5 short thin setae. Leg IV unmodified, bearing claws with 3 clawlets.

Measurements (n=3). Length of body 548-587, width 396-422; length of dorsal shield 554-568, width 343-363; length of pedipalpal segments (P-1-5): 35-40, 50-54, 31-33, 81-83, 24-25; length of leg segments: I-L-1-6 - 37-40, 43-51, 34-49, 70-73, 78-84, 78-81; II-L-1-6 - 43-45, 43-57, 51-54, 67-76, 86-87, 83-86; III-L-1-6 43-47, 62-73, 67-70, 83-86, 100-108, 84-94; IV-L-1-6 - 67-70, 68-72, 67-70, 84-86, 97-99, 92-94.

DISCUSSION

As was indicated in the original description of *W. spatulata* Kim and Chung, 1996, this species differs from *W. elongata* Sokolow, 1934 in the females' body length, which is more elongated in *W. elongata* (Kim and Chung, 1996). Females of *W. elongata* have 620 μm length and 390 μm width of body (ratio length/width = 1.58) according to the original description (Sokolow, 1934), whereas the female's body of *W. spatulata* is 572 μm in length and 390 μm in width (ratio length/width = 1.46). For those females collected from the Far East of Russia, the relevant ratio is 1.36-1.44. A comparison of paratypes of *W. spatulata* with *W. elongata* indicated that no morphological differences could be detected between these species for both sexes; therefore, *W. spatulata* is considered a junior synonym of *W. elongata*.

We compared our data on *W. elongata* and the paratypes of *W. spatulata* from South Korea with the description of *W. concava* Kim and Chung, 1996 (Kim and Chung, 1996). This comparison revealed that the only diagnostic differences between *W. spatulata* (synonymized above with *W. elongata*) and *W. concava* proposed by the authors (i.e., the length of leg IV and the different shape of the tarsus of this leg which is concave ventrally) may be not suitable for species discrimination for the following reasons. The lengths of the posterior segments in leg IV are almost equal (see table 1). If the fourth leg of *W. elongata* is placed in slightly lateral position on a slide, its tarsus seems to be narrower and concave ventrally (see figure 2, f). Therefore, *W. concava* Kim and Chung, 1996 may be considered a junior synonym of *W. elongata*. This statement is corroborated by the facts that *W. spatulata* and *W. concava* were recorded from the same location, and their

females are indistinguishable according to their descriptions (Kim and Chung, 1996).

W. elongata is similar to the Western Palaearctic species *W. rotundifrons* (Viets, 1922) and *W. minuta* Pestic, Gerecke and Smit, 2010. It differs from *W. rotundifrons* in the following characters (character states of *W. rotundifrons* are indicated in parentheses from Pestic *et al.*, 2010): ventral margin of P-2 is nearly straight (strongly concave); IV-L-5 and IV-L-6 of male are stout - ratio length/height IV-L-5 2.26-2.75, IV-L-6 2.07-2.26 (these segments are slender - ratio length/height IV-L-5 3.2, IV-L-6 3.1). In contrast to *W. minuta* known from type localities on Balkan Peninsula *W. elongata* has more elongated body exceeding 450 μm and more developed longitudinal crest between place of insertion of leg IV and genital field in males.

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TABLE 1: Lengths of males' leg segments.

Species	<i>W. concava</i>	<i>W. spatulata</i>	<i>W. elongata</i>
IV-L-4	70	75	86–94
IV-L-5	91	103	108–116
IV-L-6	78	83	97–99
Reference	Kim and Chung, 1996	Kim and Chung, 1996	present study

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