

## TWO NEW PSEUDOSCORPIONS FROM THE UN ADMINISTERED PROVINCE OF KOSOVO AND CROATIA

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**Abstract** — Two new epigeal pseudoscorpion species belonging to the family Chthoniidae - *Chthonius (Ephippiochthonius) metohicus* n. sp. and *Chthonius (Ephippiochthonius) civitatisveti* n. sp. from the UN Administered Province of Kosovo and Southern Croatia, respectively, are described. The newly erected taxa are endemic to each of the areas studied. Their taxonomic relationship with their phenetically close congeners *Chthonius (Ephippiochthonius) bidentatus* Beier, 1939, *Chthonius (Ephippiochthonius) kemza* Ćurčić, Lee et Makarov, 1993 and *Chthonius (Ephippiochthonius) tetrachelatus* (Preysslner, 1790) and comparative morphological traits are described.

**Key words:** Pseudoscorpions, Chthoniidae, *Chthonius (Ephippiochthonius)* Beier, new species, endemism, Balkan Peninsula

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### INTRODUCTION

Only four species of *Chthonius* C. L. Koch, 1843 (subgenus *Ephippiochthonius* Beier, 1930) (Chthoniidae) are presently known from Serbia. Among these one should mention *Chthonius (Ephippiochthonius) bidentatus* Beier, 1939 (endemic to the Petnička Pećina Cave in Serbia), *Chthonius (Ephippiochthonius) kemza* Ćurčić, Lee and Makarov, 1993 (from a cave in eastern Serbia), *Chthonius (Ephippiochthonius) microtuberculatus* Hadži, 1937 (distributed in southern Serbia, Republic of Macedonia and Bulgaria) and *Chthonius (Ephippiochthonius) tetrachelatus* (Preysslner, 1790) which is widely distributed all over the world.

In the present study we present the results of the examination of material from two samples

of pseudoscorpions (collected by T. R.). The first sample from near Istok in the UN Administered Province of Kosovo contained a new taxon - *Chthonius (Ephippiochthonius) metohicus* n. sp. The second sample, collected from under stones near Cavtat, Croatia, consisted of a previously undescribed species - *Chthonius (Ephippiochthonius) civitatisveti* n. sp. To complete the study of these *Ephippiochthonius* species, the material of *Chthonius (Ephippiochthonius) bidentatus*, *C. (E.) kemza*, and *C. (E.) tetrachelatus* were restudied in order to define their precise taxonomic rank.

The new species described in this paper are endemic forms, inhabiting epigeal habitats in the central and southern parts of the Balkan Peninsula.

## SYSTEMATIC PART

CHTHONIIDAE DADAY, 1888

CHTHONIUS C. L. KOCH, 1843

CHTHONIUS (EPHIPPIOCHTHONIUS)  
METOHICUS ČURČIĆ, NEW SPECIES

(Figs. 1-15; Table 1)

*Etymology* — After its *terra typica*, the UN Administered Province of Kosovo.

*Material examined* — Holotype male, from under stones, near Istok (UN Administered Province of Kosovo), 14 August 2006, collected by Tonći Rađa; paratype male, and allotype female, same collecting data as in holotype male.

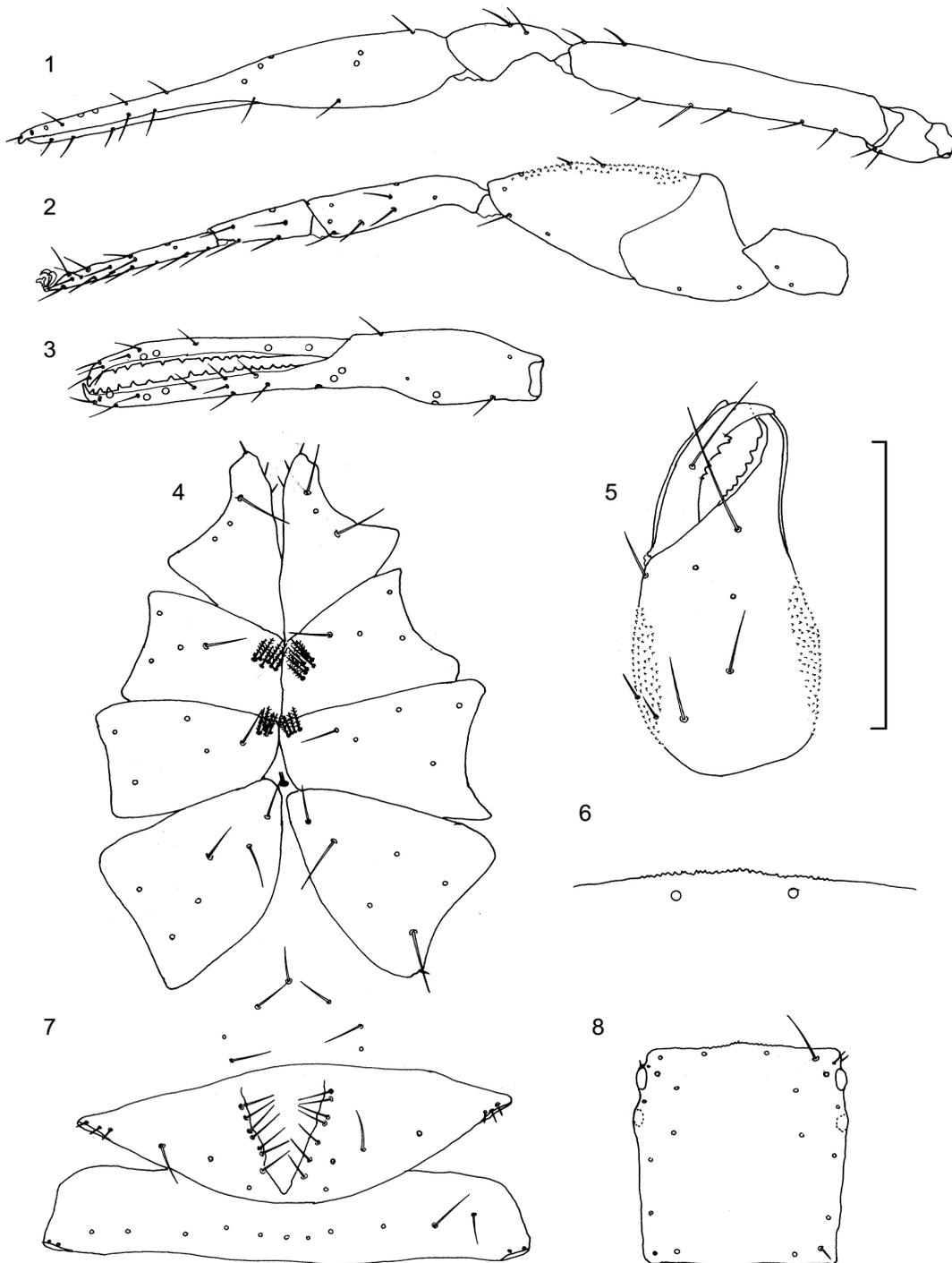
*Description* — The dorsal side of the cephalothorax (carapace) is longer than broad, and its anterior border is wider than the posterior border (Figs. 8 and 13; Table 1). The anterior eyes are distant (with normal lenses) and lie less than a diameter from the anterior carapacial border. The posterior eyes are removed by about the same distance from the anterior eyes, but are small, with reduced and flattened lenses and appear as spots (Figs. 8 and 13). The anterior border is only slightly convex and without a differentiated epistome (Figs. 6 and 13), although there are denticulations, particularly between the two anterior and median setae. However, tiny indentations can be seen on the margin almost up to the lateral anterior setae (Figs. 8 and 13).

The carapace is beset with 20 setae arranged in five rows, four anterior, six ocular, four median, two intermedian and four posterior. In the posterior row, only the two median setae are long and the two lateral setae are short (Figs. 8 and 13). In front of the eyes, one or two small setae are carried in each pre-ocular recess.

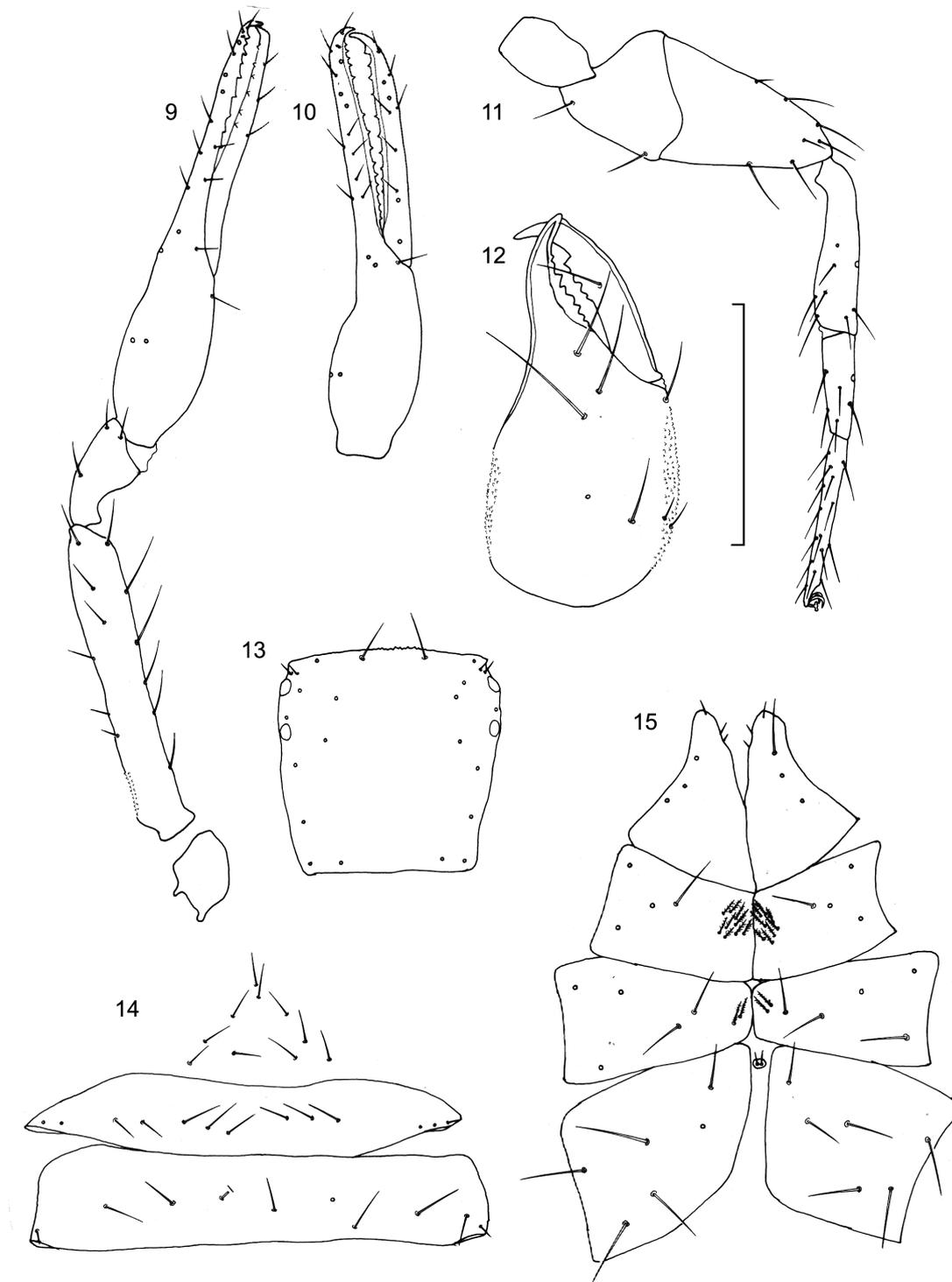
The number of setae carried on the abdominal tergites I-X can be expressed as 4-4-4-4-6-6-6-6-6 (in both sexes). The sternite II of the male carries 5 - 7 setae. The next sternite is deeply grooved in the form of a V and on its interior face carries 14 (7 + 7) setae. In addition, there is a transverse row of seven setae on the posterior border of this sternite (Fig. 7), the median pair of which is placed at the base of a V-shaped opening; anterior to each stigma are three microsetae. Sternite IV has 11 posterior setae and two or three suprastigmatic microsetae on either side (Fig. 7). Sternite V carries 9 - 10 marginal setae, sternite VI - 8 or 9, sternite VII - 8, sternite VIII - 6 or 7, sternite IX - 6, and sternite X - 6 posterior setae. Sternite II of the female has 10 anterior and median setae; sternite III carries nine marginal setae and two or three microsetae along each of the stigma. Sternite IV has seven posterior setae and one or two suprastigmatic microsetae on either side. Sternites V-X carry 7-6-7-6-6-6 posterior setae. The twelfth abdominal segment has two small setae.

The cheliceral spinneret (galea) is represented by a low hyaline tubercle (Fig. 5). There is no isolated tooth distally on the movable finger. The first large tooth is contiguous with a series of smaller teeth which end below the insertion site of the galeal seta (*gl*). On the fixed finger the teeth extend back, diminishing abruptly in size, below those on the movable finger (Fig. 5).

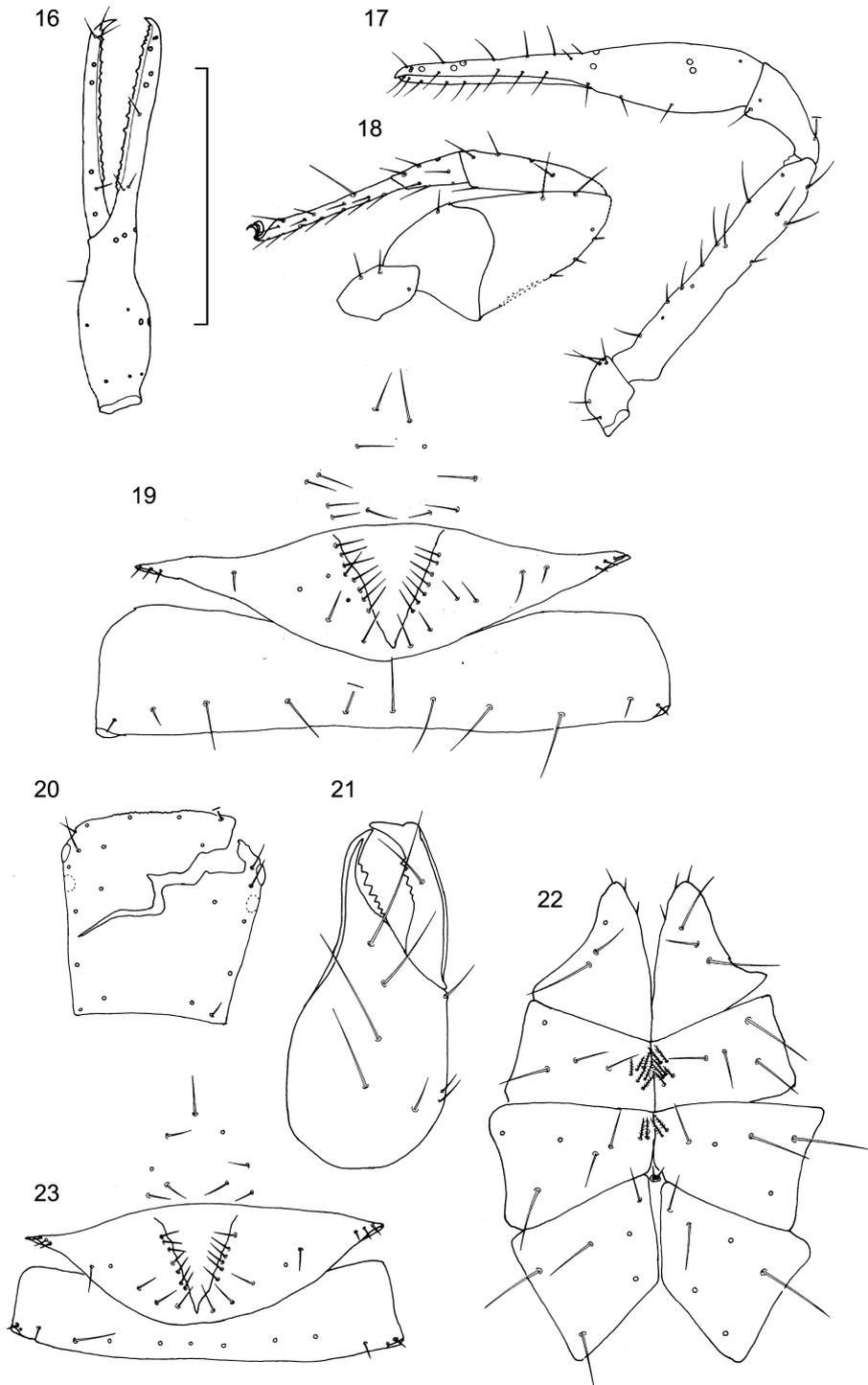
The movable finger carries one large galeal seta (*gl*) and the six setae on the palm of the chelicera: three setae occur on the dorsal row *dt*, *dst* and *db*, one in the intermediate, *it*, and two in the ventral row, *vt* and *vb*. In addition, two small accessory setae are carried slightly exterior to *vb*. The movable finger is larger than the cheliceral breadth and the ratio of the cheliceral length to breadth is 1.95 (female) and 1.83 - 2.06 (male) (Table 1). The chelal flagellum consists of nine blades twice this length, more or less in pairs, distally. The most distal members of the series are curved but all, to some extent, are pinnate on two sides.



**Figs. 1 - 8.** *Chthonius (Ephippiochthonius) metohicus* n. sp., holotype male from Istok. 1 - pedipalp, 2 - leg IV, 3 - pedipalpal chela, 4 - coxae I-IV, 5 - chelicera, 6 - epistomal area, 7 - male genital area, 8 - carapace. Scale lines = 0.25 mm (Figs. 4 - 7) and 0.50 mm (Figs. 1-3, and 8).



**Figs. 9 - 15.** *Chthonius (Ehippochthonius) metohicus* n. sp., allotype male from Istok. 9 - pedipalp, 10 - pedipalpal chela, 11 - leg IV, 12 - chelicera, 13 - carapace, 14 - female genital area, 15 - coxal area. Scale lines = 0.25 mm (Figs. 12, 14, and 15) and 0.50 mm (Figs. 9 - 11, and 13).



**Figs. 16 - 23.** *Chthonius (Ephippiochthonius) civitatisveti* n. sp., holotype male from Cavtat. 16 - pedipalpal chela, 17 - pedipalp, 18 - leg IV, 19 - male genital area, 20 - carapace, 21 - chelicera, 22 - coxal area, 23 - male genital area (paratype male). Scale lines = 0.25 mm (Figs. 19, and 21 - 23) and 0.50 mm (Figs. 16 - 18, and 20).

The coxae of the pedipalps each carry six setae: three at the anterior end (manducatory process) and three at the posterior border of the trochanteric foramen. The femur is 6.18 (female) and 6.22 - 6.44 (male) times longer than its breadth and 1.48 (female) or 1.365 - 1.53 (male) times longer than the carapace (Table 1). The patella is tulip-like and its distal end is slightly broader than the pedipalpal femur (Fig. 1). The ratio of the tibial length to breadth is 2.08 (female) and 2.10 - 2.20 (male) (Table 1).

Four trichobothria are carried on the movable and eight on the fixed chelal finger (Figs. 1 and 3). Two accessory setae (*ds*) lie immediately in front or at the level of the most distal trichobothrium *et*, while *it* and *est* are only slightly proximal to *t* and *st* on the movable finger, just inside the distal finger third. Two basal trichobothria *isb* and *ib* lie in the middle of the palm, on the dorsal side at its maximum breadth (Figs. 1 and 3). The contour of the chelal palm on the dorsal side is depressed in front of these two trichobothria (otherwise a characteristic of the subgenus *Ephippiochthonius*; Fig. 3). The fixed chelal finger is 1.02 - 1.26 times as long as the chelal palm; the ratio of the pedipalpal length to breadth is 5.00 - 6.42 (Table 1). The teeth of the fixed finger (16 - 18 in the male, 16 in the female) are distributed evenly along its inner length; of these, the distal and median teeth are prominent because of their pointed tips and the remainder, finally now more than small projections proximally (Fig. 3).

The movable finger has a pronounced apodeme. The movable finger has 13 (female) or 12 (male) teeth; the first six or seven of these resemble the distal teeth of the movable finger. Proximally, the teeth decrease in size until the last six are small eruptions at the base of the finger (Fig. 3). In addition, the fixed chelal finger carries an obvious small accessory tooth at the extreme distal end.

The pedal coxa II carries 8-9 (female) and 6-7 (male) spines medially; coxa III has four spines (in both sexes). The intercoxal tubercle carries two small setae.

The measurements of the different podomeres of the leg IV, as well as the tactile seta ratios, are presented in Table 1. Tibia IV, metatarsus IV, and tarsus IV each carry a long tactile seta. The claws are slender, smooth and sickle-shaped.

*Remarks* — From its phenetically close congener, *Chthonius* (*Ephippiochthonius*) *bidentatus*, the new species differs considerably in the shape of the pedipalpal chela, in the presence/absence of heterodentition on the chelal palm (present vs. absent), in the elongation of pedipalpal articles (not elongated vs. elongated), in the number of teeth on chelal fingers (20 isolated and five secondary teeth vs. 16 - 18 interspaced denticles), and in the distribution areas (western Serbia vs. southern Serbia).

*Chthonius* (*Ephippiochthonius*) *metohicus* n. sp. is considerably different from *Chthonius* (*Ephippiochthonius*) *kemza* from Serbia in the number of setae on the posterior carapacial row (4 vs. 2), in the setation of abdominal tergites V-X (6-6-6-6-6-6 vs. 6-6-6-6-6-4), in the number of the fixed (16 - 18 vs. 24) and movable chelal finger (12 - 13 vs. 16 - 18), as well as in the shape of pedipalpal articles and different morphometric ratios and linear measurements of various structures (Table 1).

Finally, from its third congener *Chthonius* (*Ephippiochthonius*) *tetrachelatus* from Serbia, *C. (E.) metohicus* n. sp. is distinct by the number of posterior carapacial setae (18 vs. 20), the setation of sternites V-X (8/9-6-6-6-6-7 vs. 9/10-6/9-7/8-6/7-6-6), pedipalpal chelal length (1.61 - 1.70 mm vs. 2.04 - 2.30 mm), pedipalpal femur length to breadth ratio (4.78 - 5.00 vs. 6.18 - 6.44), form of pedipalpal chela, as well as by a number of morphometric ratios and linear measurements (Table 1).

*CHTHONIUS (EPHIPPIOCHTHONIUS)*  
*CIVITATISVETI ČURČIĆ & RAĐA, NEW SPECIES*

(Figs. 16 - 23, Table 1)

*Etymology* — After the name Cavtat which is taken from the Latin “Civitas Vetus”, which means “old city”.

**Table 1.** Linear measurements (in millimeters) and morphometric ratios in *Chthonius* (*Ephippiochthonius*) *metohicus* n. sp., *C. (E.) civitatisveti* n. sp., *C. (E.) bidentatus* Beier, *C. (E.) kemza* Ćurčić, Lee & Makarov, and *C. (E.) tetrachelatus* (Preyßler). Abbreviations: ♀ = female, ♂ = male, ♂♂ = males.

Character	<i>C. (E.) metohicus</i>		<i>C. (E.) civitatisveti</i>	<i>C. (E.) bidentatus</i>	<i>C. (E.) kemza</i>	<i>C. (E.) tetrachelatus</i>
	♀	♂♂	♂♂	♂	♂	♂♂
Body						
Length (1)	1.86	1.41	1.39-1.40	1.50	1.67	1.11-1.13
Cephalothorax						
Length (2)	0.46	0.38-0.41	0.39-0.40	-	0.40	0.33-0.35
Breadth (2a)	0.45	0.36-0.39	0.36-0.37	-	0.39	0.34-0.36
Ratio 2/2a	1.02	1.05-1.06	1.08	-	1.03	1.03-1.11
Abdomen						
Length	1.40	1.00-1.03	0.99-1.01	-	1.27	-
Chelicerae						
Length (3)	0.41	0.33	0.315-0.33	-	0.40	0.28
Breadth (4)	0.20	0.15-0.16	0.14-0.15	-	0.16	0.13
Length of movable finger (5)	0.21	0.16-0.18	0.16-0.17	-	0.17	0.14-0.15
Ratio 3/5	1.95	1.83-2.06	1.94-1.97	-	2.35	1.87-2.00
Ratio 3/4	2.05	2.06-2.20	2.20-2.25	-	2.50	2.15
Pedipalps						
Length with coxa (6)	2.30	2.04	1.98-2.00	-	2.125	1.61-1.70
Ratio 6/1	1.24	1.45	1.41-1.44	-	1.27	1.45-1.50
Length of coxa	0.33	0.33-0.34	0.35-0.38	-	0.38	0.21-0.22
Length of trochanter	0.19	0.11-0.16	0.15	-	0.17	0.14-0.15
Length of femur (7)	0.68	0.56-0.58	0.52-0.56	-	0.57	0.43-0.45
Breadth of femur (8)	0.11	0.09	0.08-0.09	-	0.10	0.09
Ratio 7/8	6.18	6.22-6.44	4.00-6.50	-	5.70	4.78-5.00
Ratio 7/2	1.48	1.365-1.53	1.33-1.40	-	1.425	1.23-1.36
Length of patella (tibia) (9)	0.25	0.21-0.22	0.20-0.21	-	0.22	0.18-0.20
Breadth of patella (tibia) (10)	0.12	0.10	0.08-0.09	-	0.12	-
Ratio 9/10	2.08	2.10-2.20	2.33-2.50	-	1.83	-
Length of chela (11)	0.85	0.77-0.80	0.73	0.82	0.785	0.65-0.68
Breadth of chela (12)	0.17	0.12-0.13	0.12-0.13	-	0.16	0.11-0.12
Ratio 11/12	5.00	6.15-6.42	5.615-6.08	-	4.91	5.67-5.91
Length of chelal palm (13)	0.42	0.34-0.37	0.33-0.34	0.31	0.34	0.26-0.28
Ratio 13/12	2.47	2.83-2.85	2.615-2.75	-	2.125	2.33-2.36
Length of chelal finger (14)	0.43	0.43	0.40-0.41	0.50	0.445	0.39-0.40
Ratio 14/13	1.02	1.16-1.26	1.18-1.24	-	1.31	1.43-1.50
Leg IV						
Total length	1.99	1.695-1.715	1.505-1.62	-	1.845	-
Length of coxa	0.26	0.21	0.20-0.21	-	0.315	-
Length of trochanter (15)	0.22	0.16-0.17	0.17-0.18	-	0.18	0.15
Breadth of trochanter (16)	0.11	0.10	0.10-0.12	-	0.10	-
Ratio 15/16	2.00	1.60-1.70	1.50-1.70	-	1.80	-
Length of femur + patella (17)	0.57	0.49-0.50	0.42-0.47	-	0.51	0.19-0.20
Breadth of femur + patella (18)	0.24	0.21-0.22	0.21	-	0.22	-
Ratio 17/18	2.375	2.27-2.33	2.00-2.24	-	2.32	2.05-2.10
Length of tibia (19)	0.38	0.315	0.26-0.285	-	0.31	0.14-0.15

Table 1. Continued

Character	<i>C. (E.) metohicus</i>		<i>C. (E.) civitatisveti</i>	<i>C. (E.) bidentatus</i>	<i>C. (E.) kemza</i>	<i>C. (E.) tetrachelatus</i>
	♀	♂♂	♂♂	♂	♂	♂♂
Breadth of tibia (20)	0.09	0.07-0.08	0.07-0.08	-	0.08	-
Ratio 19/20	4.22	3.94-4.50	3.56-3.71	-	3.875	-
Length of metatarsus (21)	0.21	0.18	0.15-0.16	-	0.19	0.14-0.15
Breadth of metatarsus (22)	0.07	0.05-0.06	0.05-0.06	-	0.06	-
Ratio 21/22	3.00	3.00-3.60	2.67-3.00	-	3.17	-
Length of tarsus (23)	0.35	0.34	0.305-0.315	-	0.34	0.25-0.27
Breadth of tarsus (24)	0.04	0.03	0.03	-	0.03	-
Ratio 23/24	8.75	11.33	10.20-10.50	-	11.38	-
TS ratio - tibia IV	0.54	0.48-0.515	0.535-0.54	-	0.51	-
TS ratio - metatarsus IV	0.43	0.34-0.39	0.375-0.40	-	0.33	-
TS ratio - tarsus IV	0.29	0.48	0.29-0.30	-	0.24	-

*Material examined* — Holotype male and paratype male, from under stones, near Cavtat, Croatia; 7 August 2010, collected by Tonći Rađa.

*Description* — The dorsal side of the carapace (cephalothorax) is slightly longer than broad and its anterior border is a little wider than the posterior border (Fig. 20; Table 1). The anterior eyes are distinct and lie less than a diameter from the anterior border. The posterior eyes are removed by about the same distance from the anterior eyes; these are small, with reduced and flattened lenses and are spot-like (Fig. 20). The anterior border is without a differentiated epistome, although there are indentations, particularly the two anterior and median setae; however, such denticulations can be seen on the margin almost up to the lateral and anterior setae (Fig. 20). The carapace is beset with 20 setae, its setal formula being 4-6-4-2-4. In the posterior row two long macrosetae and two short microsetae are present. In front of the eyes, one small seta is carried in each preocular recess.

The number of setae carried on the abdominal tergites I-X is 4-4-4-4-6-6-6-6-6-6. Sternite II of the male carries nine setae. The next sternite is grooved medially in the form of a V and on its interior face carries 13 - 15 (7 + 6 or 7 + 8) setae. In addition, there is a transverse row of 8 - 10 setae on the posterior sternite border, the median pair of which is situated at the base of the V-shaped opening; ante-

rior to each stigma are three microsetae. Sternite IV carries eight or nine posterior setae and one or two suprastigmal microsetae on either side. Sternites V-X carries 8-7-8-7-7-6 and 8-8-7-8-7-7 posterior setae.

The cheliceral galea is represented by a distinct hyaline tubercle (Fig. 21). There is no isolated tooth distally on the movable finger. The first large tooth is contiguous with a series of smaller teeth which end below the insertion site of *gl* (galeal seta). On the fixed finger the teeth extend back, diminishing abruptly in size, below those on the movable finger (Fig. 21).

The movable cheliceral finger carries one large galeal seta and six setae on the palm of the chelicera: three setae occur in the dorsal row (*dt*, *dst* and *db*), one in the intermediate (*it*), and two in the ventral row (*vt* and *vb*). In addition, two small accessory setae are developed exterior to *vb*. The movable cheliceral finger is slightly longer than the cheliceral breadth and the ratio of the cheliceral length to breadth is 2.20 - 2.25 (Table 1). The cheliceral flagellum consists of nine blades, one small blade proximally and eight blades twice its length, more or less in pairs, distally. The distalmost members of the series are curved but all, to some extent, are pinnate on both sides.

The pedipalpal coxae (maxillae) each carry five setae: two at the anterior end (manducatory process)

and three on the posterior border of the trochantic foramen. The pedipalpal femur is 4.00 - 6.50 times longer than its breadth (at its widest part) and 1.33 - 1.40 times longer than carapace (Table 1). The patella is tulip-like and slightly elongated. The ratio of its length to breadth is 2.33 - 2.50 (Table 1).

Four trichobothria are carried on the movable and eight on the fixed chelal finger (Fig. 16). Two accessory setae (*ds*) lie immediately in the front of the trichobothrium *et*, while *it* and *est* are slightly proximate to *t* and *st* on the movable finger. The two basal trichobothria *isb* and *ib* lie in the middle of the palm, on the dorsal side, on its maximum breadth (Figs. 16 and 17).

The contour of the chelal palm on the dorsal side is depressed in front of these two trichobothria (characteristic of the subgenus *Ephippiochthonius*; Fig. 16). The fixed chelal finger is 1.18 - 1.24 times as long as the chelal palm. The ratio of the pedipalpal chela length to breadth is 5.615 - 6.08 (Table 1). The teeth of the fixed finger (17) are distributed evenly along its inner length; of these the distal and median teeth are prominent because of their pointed tips and the remainder, finally no more than small projections proximally (Fig. 16). The movable finger has a pronounced apodeme. This finger has 14 or 15 teeth; the first six or seven of these resemble the distal teeth of the fixed finger. Proximally, the teeth decrease in size until the last ones are small eruptions at the base of the finger (Fig. 16). The fixed chelal finger carries an obvious small accessory tooth at the extreme distal end. Only one small tooth is developed distal to *ds*.

The pedal coxa II carries five or six spines medially; coxa III has two spines (Fig. 22). The intercoxal tubercle carries two small setae.

The linear measurements and morphometric ratios (including these of leg IV), as well as the tactile setae ratios, are presented in Table 1. Tibia IV, metatarsus IV and tarsus IV each carry a long tactile seta (Fig. 18). The claws are smooth, sickle-shaped and slender.

*Remarks* — *Chthonius* (*Ephippiochthonius*) *civitatiseveti* n. sp. differs from *Chthonius* (*Ephippiochthonius*) *bidentatus* in the number of carapacial setae (20 vs. 18), in the chelal palm length to breadth ratio (2.615 - 2.75 vs. < 2), presence/absence of heterodontition (absent vs. present), number of teeth on the fixed chelal finger (17 vs. 20), number of spines on coxa II (5 - 6 vs. 7 - 8) and coxa III (2 vs. 4), in the form of the pedipalpal chela (Fig. 16; Beier, 1939: Fig. 25), body length (1.39 - 1.40 mm vs. 1.50 mm), pedipalpal chelal finger length (0.40 - 0.41 mm vs. 0.50 mm), as well as in their geographic distribution (Croatia vs. Serbia).

The new species is easily distinguished from the phenetically similar *Chthonius* (*Ephippiochthonius*) *kemza* in the number of carapacial setae on sternite X (6 vs. 4), number of teeth on the fixed (17 vs. 24) and movable chelal finger (14 - 15 vs. 16 - 18), in the number of spines on coxa III (2 vs. 5 - 6), body length (1.39 - 1.40 mm vs. 1.67 mm), cheliceral length to the length of the movable finger ratio (1.94 - 1.97 vs. 2.35), pedipalpal patella length to breadth ratio (2.33 - 2.50 vs. 1.83), leg IV length (1.505 - 1.62 mm vs. 1.845 mm), tarsus IV length to breadth ratio (10.20 - 10.50 vs. 11.38), form of pedipalpal articles, as well as in different morphometric ratios and linear measurements (Table 1).

Compared with *Chthonius* (*Ephippiochthonius*) *tetrachelatus*, the new species differ in body length (1.11 - 1.13 mm vs. 1.39 - 1.40 mm), pedipalpal length (1.61 - 1.70 mm vs. 1.98 - 2.00 mm), chelal finger length to breadth ratio (1.43 - 1.50 vs. 1.18 - 1.24), number of teeth on the fixed (18 - 20 vs. 17) and movable chelal finger (11 - 12 vs. 14 - 15), number of spines on coxa II (8 - 10 vs. 5 - 6) and coxa III (4 vs. 2), as well as in the form of podomeres, morphometric ratios and linear measurements (Table 1).

It is pertinent to know that the two new species, *C. (E.) metohicus* n. sp. and *C. (E.) civitatiseveti* n. sp. differ by the pedipalpal patella length to breadth ratio (2.10 - 2.20 vs. 2.33 - 2.50), pedipalpal chela length to breadth ratio (6.15 - 6.42 vs. 5.615 - 6.08), leg IV length (1.695 - 1.715 mm vs. 1.505 - 1.62 mm),

tibia IV length to breadth ratio (3.94 - 4.50 vs. 3.56 - 3.71), number of spines on coxa II (6 - 9 vs. 5 - 6) and on coxa III (4 vs. 2), morphometric ratios and linear measurements, and by the specific distribution area (Serbia vs. Croatia).

*Distribution* — *C. (E.) metohicus* n. sp. is an epigeal form inhabiting the UN Administered Province of Kosovo, while *C. (E.) civitatisveti* n. sp. inhabits soil and leaf litter in southern Croatia.

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