

## A NEW CAVE PSEUDOSCORPION (PSEUDOSCORPIONES: CHTHONIIDAE): *CHTHONIUS* (*CHTHONIUS*) *LUPINUS* N. SP. FROM BOSNIA-HERZEGOVINA

B. P. M. ĆURČIĆ<sup>1\*</sup>, R. N. DIMITRIJEVIĆ<sup>1</sup>, and NINA B. ĆURČIĆ<sup>2</sup>

<sup>1</sup> Institute of Zoology, Faculty of Biology, University of Belgrade, 11000 Belgrade, Serbia

<sup>2</sup> Geographical Institute "Jovan Cvijić" SASA, 11000 Belgrade, Serbia

**Abstract** — A new cavernicolous pseudoscorpion pertaining to the genus *Chthonius* (*Chthonius*) C. L. Koch, from Herzegovina (Bosnia-Herzegovina) is erected. Its relations with close congeners are briefly discussed. The new species *Chthonius* (*Chthonius*) *lupinus* n. sp. is an endemic form presently known only from its type locality (Vučija pećina Cave, Mt. Leotar, nr. Trebinje, Herzegovina).

**Key words:** Pseudoscorpiones, Chthoniidae, *Chthonius* (*Chthonius*) *lupinus* n. sp., endemism, caves, Bosnia-Herzegovina

UDC 595.47(497.6):591.9

### INTRODUCTION

The low number of known taxa of pseudoscorpions inhabiting Bosnia-Herzegovina can be attributed to several possible reasons. The interest of chelonethologists is possibly focused on other group of arachnids, and their small body size and cryptic way of life, the low densities of specimens, as well as the inaccessible habitats these animals populate impedes the gathering of material necessary for study.

Of the pseudoscorpion species pertaining to the family Chthoniidae which are presently known to inhabit Bosnia-Herzegovina, most are cave-dwellers — troglomorphic or true troglomorphic forms. Bearing in mind the richness of the various types of karst forms (caves, potholes, ponors) and the data for other groups of animals, the above-mentioned reasons may be regarded as responsible for the rather small number of known cavernicolous *Chthonius* species from Bosnia-Herzegovina (Beier, 1939, 1963).

Setal designations follow Beier (1939).

### SYSTEMATIC PART

CHTHONIIDAE DADAY, 1888

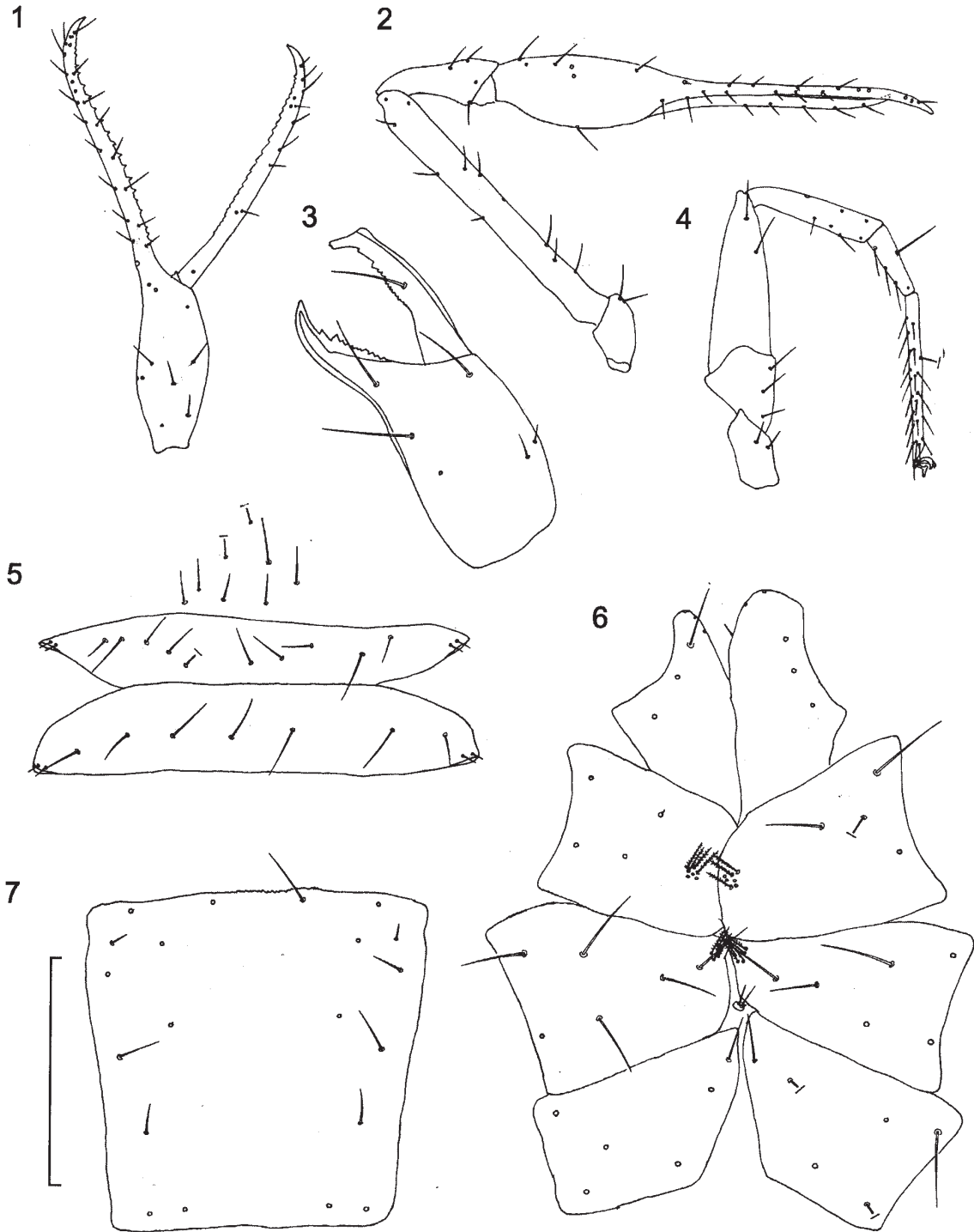
*CHTHONIUS* C. L. KOCH, 1843

*CHTHONIUS* (*CHTHONIUS*) *LUPINUS*  
ĆURČIĆ, DIMITRIJEVIĆ & RAĐA,  
NEW SPECIES

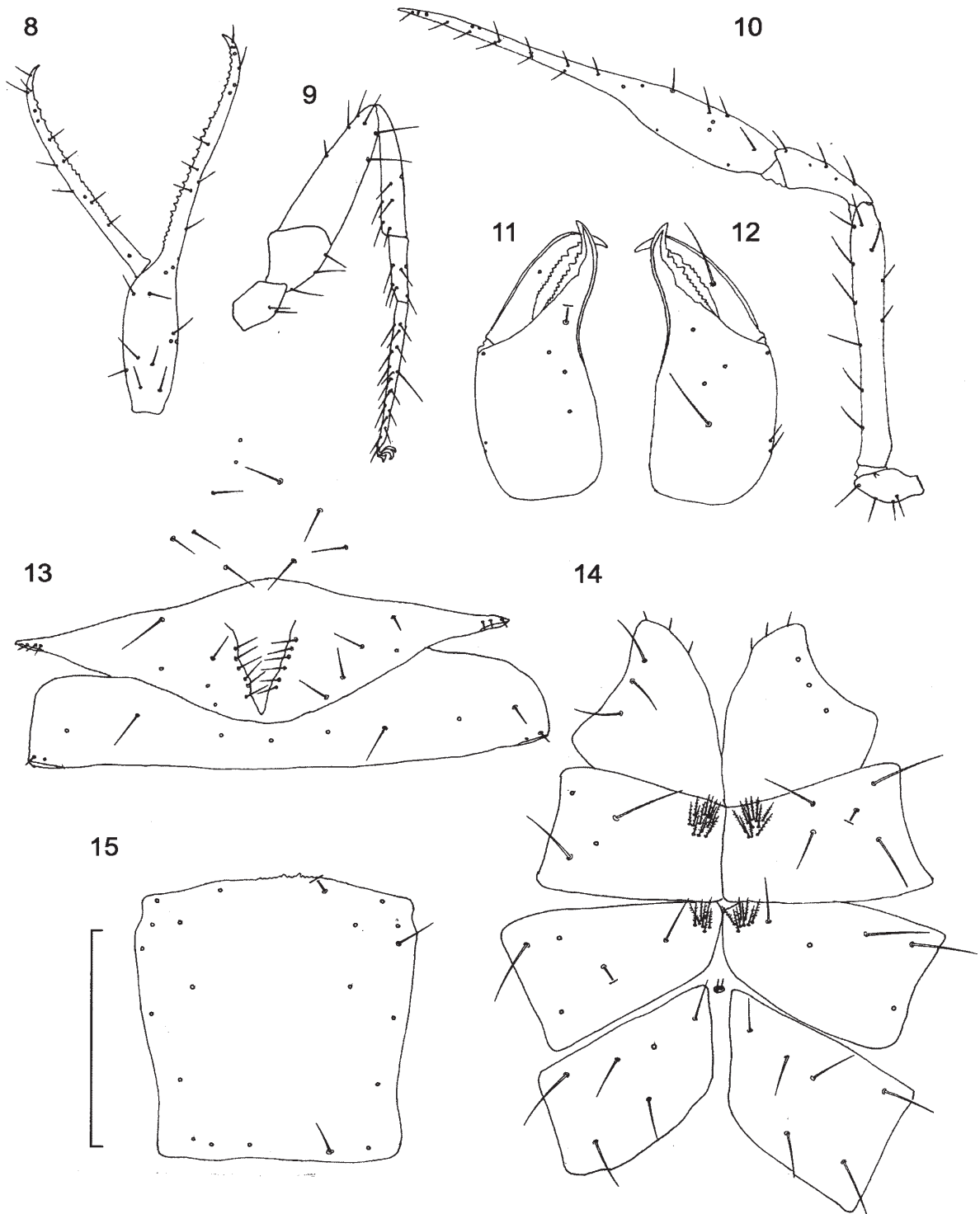
(Figs. 1-14; Table 1)

**Etymology** — The new species is named after its type locality, Vučija pećina Cave (Wolf Cave) (*lupinus* in Latin means of a wolf or wolves).

**Material examined** — Holotype female, from Vučija pećina Cave, Mt. Leotar, nr. Trebinje, Herzegovina, Bosnia-Herzegovina, collected on 16 June 2005. Allotype male, same data as for holotype. Both specimens are deposited in the collection of the Institute of Zoology (IZB), Faculty of Biology, Belgrade, Serbia.



**Figs. 1 - 7.** *Chthonius (Chthonius) lupinus* n. sp., holotype female from Bosnia-Herzegovina. 1 - pedipalpal chela, 2 - pedipalp, 3 - chelicera, 4 - leg IV, 5 - female genital area, 6 - coxal area, 7 - carapace. Scale lines = 0.25 mm (Figs. 3, 5, 6, and - 7) and 0.50 mm (Figs. 1, 2, and 4).



**Figs. 8 - 15.** *Chthonius (Chthonius) lupinus* n. sp., allotype male from Bosnia-Herzegovina. 8 - pedipalpal chela, 9 - leg IV, 10 - pedipalp, 11 - chelicera, 12 - chelicera, 13 - male genital area, 14 - coxal area, 15 - carapace. Scale lines = 0.25 mm (Figs. 11 - 15) and 0.50 mm (Figs. 8 - 10).

**Table 1.** Linear measurements (in millimeters) and morphometric ratios in *Chthonius (Chthonius) lupinus* n. sp., *C. (C.) magnificus* Beier, and *C. (C.) trebinjensis* Beier. Abbreviations: ♀ = female, ♂ = male.

Character	<i>C. (C.) lupinus</i>		<i>C. (C.) magnificus</i>		<i>C. (C.) trebinjensis</i>
	♀	♂	♀	♂	♀
Body					
Length (1)	2.21	1.895	2.00 - 2.50	1.50 - 2.00	2.50
Cephalothorax					
Length (2)	0.77	0.62	-	-	-
Breadth (2a)	0.72	0.61	-	-	-
Ratio 2/2a	1.07	1.02	-	-	-
Abdomen					
Length	1.44	1.27	-	-	-
Chelicerae					
Length (3)	0.74	0.64	-	-	-
Breadth (4)	0.295	0.26	-	-	-
Length of movable finger (5)	0.40	0.34	-	-	-
Ratio 3/5	1.85	1.88	-	-	-
Ratio 3/4	2.51	2.46	-	-	-
Pedipalps					
Length with coxa (6)	4.735	4.305	-	-	-
Ratio 6/1	2.14	2.27	-	-	-
Length of coxa	2.51	0.48	-	-	-
Length of trochanter	0.35	0.305	-	-	-
Length of femur (7)	1.365	1.27	1.40	-	-
Breadth of femur (8)	0.16	0.14	-	-	-
Ratio 7/8	8.53	9.07	-	-	-
Ratio 7/2	1.77	2.05	-	-	-
Length of patella (tibia) (9)	0.54	0.47	-	-	-
Breadth of patella (tibia) (10)	0.19	0.19	-	-	-
Ratio 9/10	2.84	2.47	-	-	-
Length of chela (11)	1.97	1.78	1.89	1.28	2.19
Breadth of chela (12)	0.34	0.25	0.33	0.18	0.36
Ratio 11/12	5.79	7.12	6.10	7.20	6.10
Length of chelal palm (13)	0.74	0.64	0.57	0.42	0.79
Ratio 13/12	2.18	2.56	1.70	2.30	2.50
Length of chelal finger (14)	1.22	1.14	1.32	0.86	1.40
Ratio 14/13	1.65	1.78	2.32	2.05	1.77
Leg IV					
Total length	3.45	3.305	-	-	-
Length of coxa	0.38	0.34	-	-	-
Length of trochanter (15)	0.34	0.285	-	-	-
Breadth of trochanter (16)	0.17	0.15	-	-	-
Ratio 15/16	2.00	1.90	-	-	-
Length of femur + patella (17)	1.09	0.99	-	-	-
Breadth of femur + patella (18)	0.33	0.26	-	-	-
Ratio 17/18	3.30	3.81	-	-	-
Length of tibia (19)	0.53	0.63	-	-	-

Table 1. Continued

Character	<i>C. (C.) lupinus</i>		<i>C. (C.) magnificus</i>		<i>C. (C.) trebinjensis</i>
	♀	♂	♀	♂	♀
Breadth of tibia (20)	0.13	0.11	-	-	-
Ratio 19/20	4.00	5.73	-	-	-
Length of metatarsus (21)	0.36	0.33	-	-	-
Breadth of metatarsus (22)	0.10	0.09	-	-	-
Ratio 21/22	3.60	3.67	-	-	-
Length of tarsus (23)	0.75	0.73	-	-	-
Breadth of tarsus (24)	0.06	0.05	-	-	-
Ratio 23/24	12.50	14.60	-	-	-
TS ratio - tibia IV	0.47	0.52	-	-	-
TS ratio - metatarsus IV	0.43	0.43	-	-	-
TS ratio - tarsus IV	0.38	0.42	-	-	-

*Description* — The dorsal side of carapace is longer than broad and its anterior border is wider than the posterior border (Figs. 7 and 14, Table 1). Neither eyes nor eyespots are present. The anterior carapacial border is somewhat convex (Figs. 7 and 14, Table 1) and without a clearly differentiated epistome; only between the two anterior and median setae are there denticulations which can be seen on the margin almost up to the lateral anterior setae (Figs. 7 and 14).

The carapace is beset with 20 (female) or 21 (male) setae; these are arranged in five rows: four anterior, six 'ocular', four median, two intermedian, and four or five posterior. In each preocular recess a single small seta is developed.

The number of setae carried on the abdominal tergites I - X can be expressed as 4-4-4-4-6-6-6-6-6-4. The sternite II of the female has eight setae, the next sternite carries 10 setae and two suprastigmal microsetae on either side, and sternite IV has seven posterior setae and two small setae on either side. Sternites V - X carry 8-7-7-7-6-7 setae. The anal papilla has two pairs of small setae.

Sternite II of the male has 10 setae. The next sternite is deeply grooved medially in the form of a V and on its interior face carries 12 (6 + 6) setae. In

addition, there is a transverse row of 10 setae on the posterior border of this sternite, the median pair of which are placed at the base of the V-shaped opening; anterior to each stigma there are two microsetae. Sternite IV has eight posterior setae and two suprastigmatic microsetae on either side. Sternites V - X carry 5-7-6-6-6-6 setae. The pleural membranes are granulostriate.

The galea is represented by a developed hyaline tubercle (female, Fig. 3) which is inconspicuous in the male (Figs. 10 and 11). There is a small isolated tooth distally on the movable finger (Figs. 3, 10 and 11). The first large tooth is contiguous with a series of smaller teeth which end immediately below the interior side of the galeal seta. On the fixed finger, the teeth extend back, diminishing in size, below those on the movable finger (Figs. 3, 10 and 11).

The movable cheliceral finger carries one large galeal seta and four or five setae on the palm of the chelicera. In addition, two small accessory setae are carried exterior to *vb*. The movable finger is longer than the cheliceral breadth, and the cheliceral length-to-breadth ratio is 1.85-1.88 (Table 1). The cheliceral flagellum consists of 11 blades, one small blade proximally and ten blades twice this length more or less in pairs. The most distal members of the series are curved but all are pinnate on two sides.

The coxae of the pedipalps each carry 5 setae: 2 at the anterior and 3 on the posterior border of the trochantic foramen. The femur is 8.53-9.07 times longer than its breadth and 1.77-2.05 times longer than the carapace (Table 1). Pedipalpal articles are elongated, the patella is tulip-like and at its distal end is slightly broader than the pedipalpal femur breadth (Figs. 2 and 9). The ratio of the patellar length to breadth is 2.47-2.84 (Table 1).

Four trichobothria are carried on the movable and eight on the fixed chelal finger (Figs. 1, 2, 7 and 9). The fixed chelal finger is 1.14-1.22 times as long as the chelal palm; the ratio of the pedipalpal chelal length-to-breadth ratio is 5.79-7.12 (Table 1). The teeth of the fixed finger (21 in the male and 27 in the female) are distributed evenly along its inner length; of these the distal-most teeth are somewhat less prominent, and the proximal-most teeth resemble small projections (Figs. 1 and 7). The movable finger has 25 (female) and 23 (male) teeth. The first distal teeth resemble the distal teeth of the movable finger. Centrally and proximally the teeth are more close-set and slightly inclined backwards until the last six are small eruptions at the base of the finger (Figs. 1, 2, 7 and 9).

The pedal coxae carry 3, 4/5, 5/6 and 6 setae. Coxa II carries 7 (female) or 11-13 (male) spines medially; coxa III has 4-5 (female) and 7-8 spines (male). The intercoxal tubercle carries two small setae (Figs. 6 and 13).

The measurements of the different podomeres 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. The claws are slender, sickle-shaped and smooth.

Morphometric ratios and linear measurements of different body structures are presented in Table 1.

*Remarks* — From its phenetically close congener (*Chthonius (Chthonius) magnificus* Beier, 1938), the new species is easily distinguished by the number

of setae constituting the posterior carapacial row (2 vs. 4-5), by the number of total carapacial setae (18 vs. 20-21), by the number of setae on tergites I - IV (2-2-4-4 vs. 4-4-4-4), by the chelal palm length-to-breadth ratio (1.70 vs. 2.18 in female and 2.30 vs. 2.56 in male), by the chelal length-to-breadth ratio (6.10 vs. 5.79 in female and 7.20 vs. 7.12 in male), in the form of pedipalpal articles, and in a number of morphometric ratios and linear measurements (Table 1).

The new species and *Chthonius (Chthonius) trebinjensis* Beier, 1938 differ clearly in the setation of the posterior carapacial border (4-5 long setae vs. 2 long and 2 short setae), in the presence/absence of teeth on movable chelal finger (present vs. absent), in the form of pedipalpal articles, as well as in many morphometric ratios and linear measurements (Table 1).

*Distribution* — Bosnia-Herzegovina and possibly Croatia, in caves.

The present study offers further proof of the great age and different origin of cave inhabitants. These species and genera represent the last vestiges of an old fauna that found shelter in the underground domain of the area studied and the adjoining regions. It is apparent that the specific aspects of geomorphological and climatic events in the Balkans, together with the peculiarities of the historical development of the fauna there, have caused the Balkan Peninsula to become the main center of dispersion and colonization of species and groups of species, i.e. the main source for revitalization and genesis of biodiversity not just in the Mediterranean region, but throughout all of Southeast Europe (Beier, 1939, 1963; Ćurčić 1972, 1988, 2004; Ćurčić and Decu, 2008; Ćurčić et al., 2011; Hadži 1937).

*Acknowledgment* — The financial support, in the form of travelling expenses, from the Serbian Ministry of Science and Technological Development, is gratefully acknowledged (Grant No. 173038).

## REFERENCES

- Beier, M. (1939). Die Höhlenpseudoscorpione der Balkanhalbinseln. *Studien aus dem Gebiete der allgemeinen Karstforschung der wissenschaftlichen Höhlenkunde der Eiszeitforschung und den Nachbargebieten*, Brünn, **4**, 83 pp.
- Beier, M. (1963). Ordnung Pseudoscorpionidea (Afterskorpione). In : *Bestimmungsbücher zur Bodenfauna Europas*, Vol. 1. - Akademie Verlag, Berlin, 313 pp.
- Ćurčić, B. P. M. (1972). Nouveaux Pseudoscorpions cavernicoles de la Serbie et de la Macédoine. *Acta Mus. Mac. Sc. Nat. Skopje* **12**, 141-161.
- Ćurčić, B. P. M. (1988). *Cave-Dwelling Pseudoscorpions of the Dinaric Karst*. - Acad. Sci. Art. Slov., Cl. IV, Hist. Nat., Opera **26**, Inst. Biol. Ioannis Hadži, 8, Ljubljana, 192 pp.
- Ćurčić, B. P. M., Dimitrijević, R. N., and A. Legakis (2004). *The Pseudoscorpions of Serbia, Montenegro, and the Republic of Macedonia*. Monographs, 8. - Institute of Zoology – Faculty of Biology – University of Belgrade, Hellenic Zoological Society, Committee for Karst and Speleology – Serbian Academy of Sciences and Arts, Institute of Nature Conservation of the Republic of Serbia, Belgrade-Athens, 400 pp.
- Ćurčić, B. P. M., and V. Decu (2008). Cave-dwelling invertebrates in Serbia. In: *Advances in Arachnology and Developmental Biology. Papers dedicated to Prof. Dr. Božidar Ćurčić*. (Eds. S. E. Makarov, and R. N. Dimitrijević), 7 - 34. *Monographs*, **12**. Inst. Zool., Belgrade; BAS, Sofia; Fac. Life Sci., Vienna; SASA, Belgrade & UNESCO MAB Committee, Serbia. Vienna — Belgrade — Sofia.
- Ćurčić, B. P. M., Dimitrijević, R. N., Makarov, S. E., Milinčić, M., Pecelj, M., and T. Rađa (2011a) Two new pseudoscorpions from the UN Administered Province of Kosovo and Croatia. *Arch. Biol. Sci., Belgrade*, **63** (1), 235 - 244.
- Ćurčić, B. P. M., Ćurčić, S. B., Ćurčić, N. B., and B. S. Ilić (2011b) *Chthonius (Globochthonius) medeonis* n.sp., a new cave false scorpion from Montenegro. *Arch. Biol. Sci., Belgrade*, **63** (1), 245 - 250.
- Hadži, J. (1937) Pseudoskorpioniden aus Südserbien. *Glas. Srpskog Nauč. Dr. Skopje*, **18**, 13-38.