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A NEW CAVE PSEUDOSCORPION FROM DALMATIA — *MICROCHTHONIUS TRAGURION* N. SP. (CHTHONIIDAE, PSEUDOSCORPIONES)

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Abstract — A new eyeless pseudoscorpion, *Microchthonius tragurion* n. sp., from a cave in Blizna Donja (near Trogir), from the Jama kod Gomilje Pit, Dalmatia, is described. This new false scorpion differs from all other congeners. There exists a probability that this new taxon is a relict of a tropical fauna incorporating the once northern and tropical area, now representing the subtropical part of the Mediterranean. Morphometric ratios, figures and linear measurements of the new taxon are presented in detail.

Key words: Pseudoscorpiones, Chthoniidae, *Microchthonius*, *M. tragurion* n. sp., caves, karst, Dalmatia, Croatia.

INTRODUCTION

The subterranean domain consists of four main terrestrial habitats (soil, networks of microspaces between rock fragments, networks of small fissures, and caves). Of these, it is the cave habitat that has been the subject of most evolutionary studies on the Balkan Peninsula. Recent studies (Ćurčić et al., 2010a, b, c, d, e, f; 2011a, b, c, d, e, f; 2012a, b, c; 2013) have also been concerned with both edaphic fauna and that inhabiting the network of microspaces within the layer developed between the edaphic habitat and calcareous and non-calcareous bedrock. The faunistic regions or habitats were delimited according to the distribution of presumed old endemic troglobitic taxa and according to edaphobitic endemisms. These provinces presumably correspond to paleogeographic zones of Tertiary or pre-Tertiary isolation. Consequently, studies of cave and edaphic elements have proven to be remarkably important for interpreting Dinaric paleogeography.

Located centrally and to the west of the Balkan Peninsula, the Croatian Adriatic islands lie at the convergence of a large tectonic unit, namely the main mountain system that belongs to the Dinaric massif. The origin of the rich endemic and relict troglobitic fauna of the Dinarides, including arachnids and pseudoscorpions (in particular) has been largely affected by many different factors (Ćurčić, 1988; Savić, 2008).

The Dinaric karst of Croatia, including that of its islands, can be divided into four regions: lowlands, highlands, the Mediterranean Coast, and the islands of the Adriatic Sea. The Mediterranean Coast and Adriatic islands are well known as home to the ma-

jority of the region's invertebrates, particularly cave-dwelling insects, arachnids and other invertebrates that live underground.

In this study, two specimens (one of each sex) of a new species of the genus *Microchthonius* Hadži was found by one of us (TR), carefully dissected and thoroughly analyzed.

Setal designations are as described by Beier (1963).

MATERIALS AND METHODS

We examined material from a sample collected from the Jama kod Gomilje Pit, v. Blizna Donja, nr. Trogir, Dalmatia (Croatia). Both specimens represent a cave-dwelling and relict form.

The aim of this study is to present a description of the mentioned taxon and to discuss its probable origin and interrelationships with its congeners.

SYSTEMATIC PART

CHTHONIIDAE DADAY, 1888

MICROCHTHONIUS HADŽI, 1933

MICROCHTHONIUS TRAGURION B. ĆURČIĆ & RAĐA, NEW SPECIES (Figs. 1 – 14, Table 1)

Etymology — After Tragurion (which is the Greek name for Trogir, once founded by Greek colonists from the Island of Vis (Issa)), Dalmatia.

Material examined — Holotype male and allotype female from the pit in Blizna Donja, nr. Trogir, Dalmatia (Croatia), 10 February 2013, collected by Tonći Rađa.

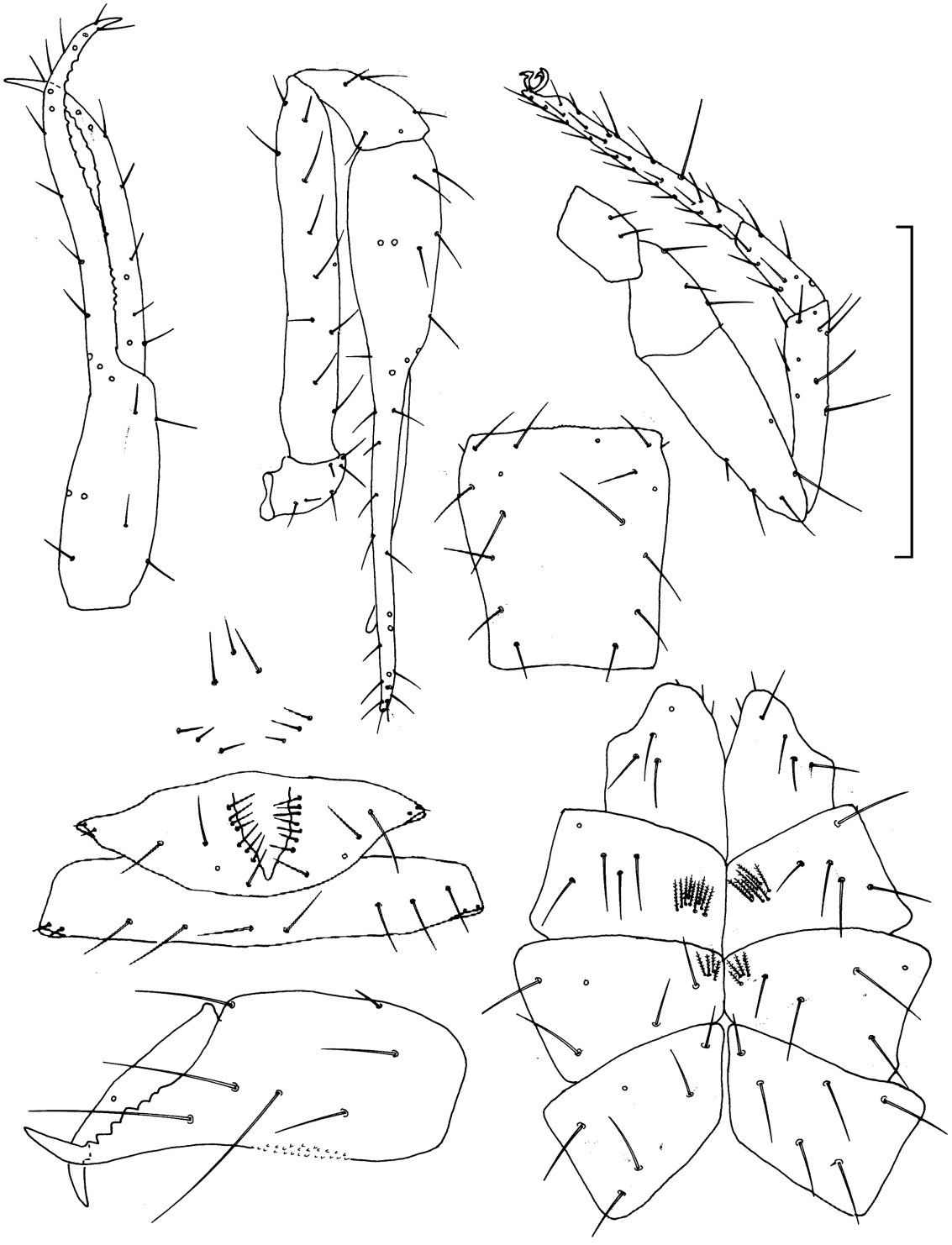
Description — The dorsal side of the carapace reaches its maximum breadth at the level behind the 'ocular' setal row and is in general much longer than wide (Figs. 4 and 11, Table 1). Neither eyes nor eyespots are developed (Figs. 4 and 11). The anterior margin of the carapace is somewhat broader than the posterior, and the carapace resembles a regular trapezium; the tiny serrations are obvious between the anterior median setae. The carapace carries 16 setae and these lie in five rows. Four setae constitute the anterior row, six setae belong to the 'ocular' row, two to the median row, two the intermedian row, and only two setae constitute the posterior series. A single small seta is developed in each preocular recess (Figs. 4 and 11).

The setal formula of abdominal tergites I – X can be expressed as 2 – 2 – 2 – 6 – 6 – 6 – – 6 – 6 – 4 (male) and 2 – 2 – 2 – 4 – 4 – 4 – 4 – 6 – 6 – 6 (female) and is remarkable for the low number of setae on tergites I – III.

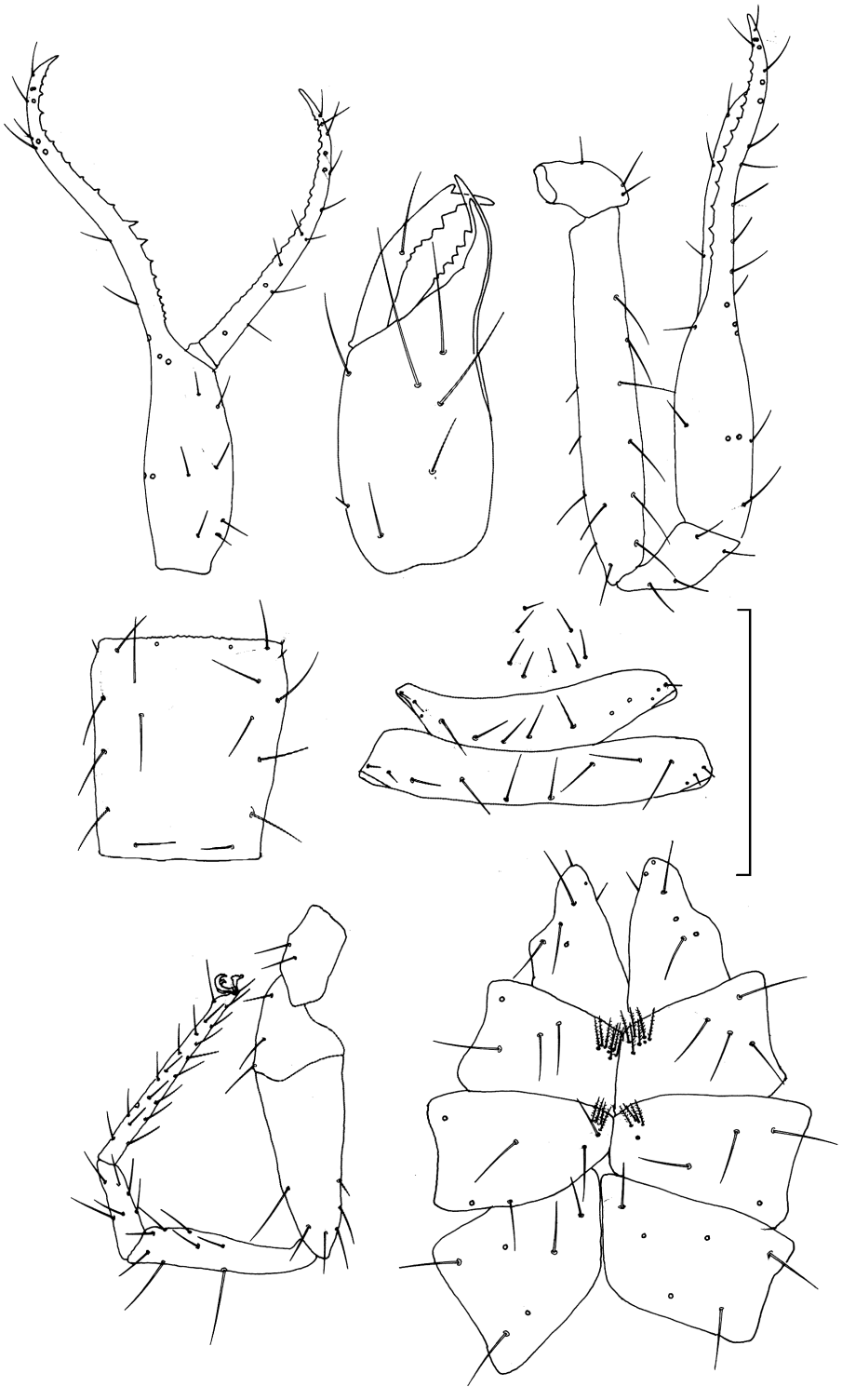
Sternite II of the male has 9 setae arranged in a triangular form (Fig. 5). Sternite III carries 9 setae or 7 posterior and 2 or 3 suprastigmatic setae on either side. Additionally, it has 7 or 8 setae on either side of a V-shaped opening (Fig. 5). The fourth sternite carries 7 posterior setae and 2 microsetae along each of the stigma (Fig. 5). Sternites V – X carry 6 – 6 – 6 – 6 – 6 – 6 posterior setae. Sternite II of the female has 8 setae arranged in a triangular form (Fig. 12). Sternite III carries 8 posterior setae and 3 suprastigmatic setae on either side. The fourth sternite of the female carries 7 posterior setae and 2 or 3 microsetae on each side. Sternites V – X of the female bear 8 – 7 – 8 – 9 – 7 – 7 posterior setae.

The galea of the male is almost invisible (Fig. 6), while in the female it resembles a sclerotic knob (Fig. 9). Immediately below of the movable cheliceral there is an isolated tooth. The other large teeth are contiguous with a row of small teeth that end in the region below the insertion site of the galeal seta (Figs. 6 and 9). On the fixed cheliceral finger, the teeth are larger, particularly the first two, and they extend proximally, diminishing abruptly in size, below those on the movable finger.

The flagellum is nine-bladed, a characteristic of the genus.



Figs. 1 – 7. *Microchthonius tragurion* n. sp., holotype male from the Jama kod Gomilje Pit, village of Blizna Donja, nr. Trogir, Dalmatia, Croatia. 1 – pedipalpal chela, 2 – pedipalp, 3 – leg IV, 4 – carapace, 5 – male genital area, 6 – chelicera, 7 – coxae I – IV. Scale lines = 0.25 mm (Figs. 1, 2, 3, and 4) and 0.50 mm (Figs. 5, 6, and 7).



Figs. 8 – 14. *Microchthonius tragurion* n. sp., allotype female from the Jama kod Gomilje Pit, village of Blizna Donja, nr. Trogir, Dalmatia, Croatia. 8 – pedipalpal chela, 10 – pedipalp, 11 – carapace, 12 – female genital area, 13 – leg IV, 14 – coxae I – IV. Scale lines = 0.25 mm (Figs. 8, 10, 11, and 13) and 0.50 mm (Figs. 9, 12, and 14).

Table 1. Linear measurements (in millimeters) and morphometric ratios in *Microchthonius tragurion* n. sp., *M. solentanus* Ćurčić & Rađa, *M. elegantissimus* Ćurčić & Rađa, *M. dernisi* Ćurčić & Rađa, *M. rogatus* Beier, and *M. karamani* Hadži. Abbreviations: ♂ = male, ♀ = female, ♀♀ = females, ♀♂ = female, male.

	M. tragurion n. sp.		*M. solentanus*	*M. elegantissimus*	*M. dernisi*	*M. rogatus*	*M. karamani*
Character	♂	♀	♂	♀	♀	♀♀	♀♂
Body							
Length (1)	1.02	1.19	1.19	1.41	1.45	1.70 - 2.00	1.40
Cephalothorax							
Length (2)	0.33	0.42	0.44	0.44	0.53	-	0.425
Breadth (2a)	0.38	0.37	0.35	0.315	0.43	-	0.36
Ratio 2/2a	0.87	1.135	1.26	1.14	1.23	-	1.18
Abdomen							
Length	0.69	0.77	0.75	0.97	0.93	-	1.00
Chelicerae							
Length (3)	0.33	0.35	0.35	0.43	0.41	-	0.36
Breadth (4)	0.13	0.16	0.14	0.17	0.16	-	0.16
Length of movable finger (5)	0.17	0.20	0.18	0.20	0.18	-	-
Ratio 3/5	1.94	1.75	1.94	2.15	2.28	-	-
Ratio 3/4	2.54	2.19	2.50	2.53	2.56	-	2.25
Pedipalps							
Length with coxa (6)	2.26	2.56	2.37	2.77	2.81	-	2.50
Ratio 6/1	2.215	2.15	1.99	1.96	1.94	-	1.79
Length of coxa	0.39	0.42	0.39	0.47	0.38	-	-
Length of trochanter	0.16	0.19	0.12	0.21	0.24	-	0.20
Length of femur (7)	0.62	0.70	0.64	0.75	0.815	0.84	0.75
Breadth of femur (8)	0.09	0.11	0.10	0.10	0.12	0.13	0.09
Ratio 7/8	6.89	6.36	6.40	7.50	6.79	6.50 (6.46)	8.33
Ratio 7/2	1.88	1.67	1.45	1.70	1.54	-	1.76
Length of patella (tibia) (9)	0.22	0.25	0.23	0.26	0.275	0.31	0.28
Breadth of patella (tibia) (10)	0.09		0.09	0.10	0.12	0.13	0.14
Ratio 9/10	2.44	2.78	2.555	2.60	2.29	2.30 (2.38)	2.00
Length of chela (11)	0.87	1.00	0.99	1.08	1.10	1.27	1.08
Breadth of chela (12)	0.13	0.16	0.14	0.17	0.18	0.16	0.165
Ratio 11/12	6.69	6.25	7.07	6.35	6.11	7.80 (7.94)	6.55
Length of chelal palm (13)	0.34	0.41	0.35	0.43	0.46	0.51	0.42
Ratio 13/12	2.615	2.56	2.785	2.93	2.555	3.19	2.55
Length of chelal finger (14)	0.53	0.59	0.60	0.65	0.64	0.71	-
Ratio 14/13	1.56	1.42	1.54	1.51	1.39	1.39	-
Leg IV							
Total length	1.80	1.93	2.14	2.13	2.355	-	2.02
Length of coxa	0.20	0.22	0.23	0.25	0.275	-	0.18
Length of trochanter (15)	0.15	0.19	0.20	0.22	0.22	-	0.15
Breadth of trochanter (16)	0.08	0.10	0.10	0.11	0.12	-	0.115
Ratio 15/16	1.875	1.90	2.00	2.00	1.83	-	1.30
Length of femur + patella (17)	0.51	0.53	0.64	0.53	0.67	-	0.58
Breadth of femur + patella (18)	0.13	0.16	0.17	0.19	0.20	-	0.21
Ratio 17/18	3.92	3.31	3.76	2.80	3.35	-	2.76
Length of tibia (19)	0.33	0.37	0.41	0.41	0.45	-	0.41
Breadth of tibia (20)	0.06	0.07	0.07	0.08	0.09	-	0.05 - 0.08
Ratio 19/20	5.50	5.285	5.86	5.125	5.00	-	5.125 - 8.20
Length of metatarsus (21)	0.17	0.19	0.20	0.22	0.21	-	0.20
Breadth of metatarsus (22)	0.05		0.05	0.05	0.07	-	0.07
Ratio 21/22	3.40	3.80	4.00	4.40	3.00	-	2.86
Length of tarsus (23)	0.44	0.43	0.46	0.50	0.53	-	0.50
Breadth of tarsus (24)	0.04		0.03	0.04	0.04	-	0.045
Ratio 23/24	11.00	10.75	15.33	12.50	13.25	-	1.12
TS ratio - tibia IV	0.47		0.45	0.365	0.38	-	-
TS ratio - metatarsus IV	0.41	0.42	0.35	0.41	0.48	-	-
TS ratio - tarsus IV	0.255	0.26	0.27	0.265	0.21	-	-

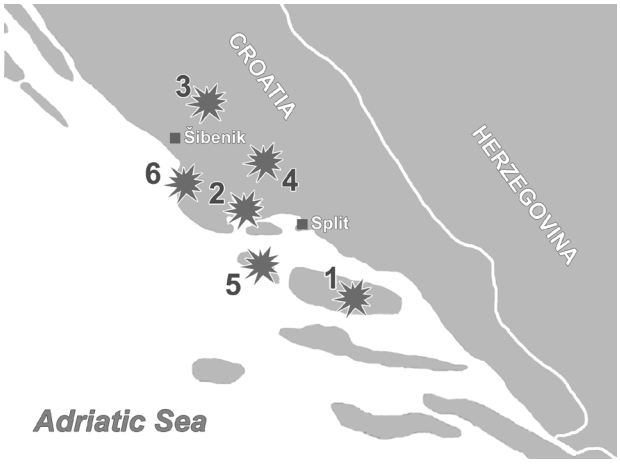


Fig. 15. Distribution of the genus *Microchthonius* Hadži in Dalmatia, Croatia. 1 – *M. rogatus* (Isle of Brač), 2 – *M. karamani* (Sveti Filip i Jakov), 3 – *M. dernisi* (Škarin Samograd Cave, near Drniš), 4 – *M. elegantissimus* (Kladnjice), 5 – *M. solentanus* (Isle of Šolta), 6 – *M. tragurion* (pit near Trogir).

Trichobothriotaxy as in Figs. 1 and 2 (male) and 8 and 10 (female). Both chelal fingers are apically curved inwards. The teeth of the fixed chelal finger (21-22) are triangular, interspaced, and occupy almost the whole length of the finger; on the movable chelal finger, the teeth (17-20) are smaller and merge basally into a dental lamella (Fig. 1).

The pedal coxae have 7 or 9 spines on coxa II and 4 spines on coxa III (Figs. 7 and 14). The intercoxal tubercle is absent (Figs. 7 and 14).

The measurements and morphometric ratios of the different structures as well as the tactile seta ratios are presented in Table 1. The tibia IV, metatarsus IV and tarsus IV each carry a long tactile seta (Figs. 3 and 13).

Remarks — Apart from *M. tragurion* n. sp., five more species of *Microchthonius* have been known up to now: *M. rogatus* (from the Isle of Brač, Croatia), *M. karamani* (from nr. Sveti Filip i Jakov, Dalmatia), *M. dernisi* (from a cave near Drniš, Croatia), *M. elegantissimus* (from nr. Kladnjice, Croatia), and *M. solentanus* (from the Isle of Šolta, Croatia) (Fig. 15) (Ćurčić et al., 2012a, Ćurčić et al., 2013). From all known congeners, the new species is easily distinguished in its minute body size and all other measurements and ratios (Table 1).

Distribution — It is likely that the distinctions of the subterranean *Microchthonius* pseudoscorpions are part of a pre-Miocene area of the tropical Tethys (Ćurčić, 1988). It is therefore probable that the existence of analyzed taxa in the Croatian Dinarides (including islands) presents the old constellation and is therefore in line with contemporary worldwide records (Beier, 1963; Ćurčić, 2008; Ćurčić et al., 2004, 2010a, b, c, d, e, f; 2011a, b, c, d, e, f; 2012a, b, c; 2013; Hadži, 1937).

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