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САДРЖАЈ

DESCRIPTION OF THE FEMALE OF CAVE-DWELLING PSEUDOSCORPION *NEOBISIUM RAJKODIMITRIJEVICI* ĆURČIĆ, 2006 (NEOBISIIDAE, PSEUDOSCORPIONES) FROM SERBIA

RAJKO N. DIMITRIJEVIĆ*

Abstract. – Description of the female of *Neobisium rajkodimitrijevici* Ćurčić, 2006 from the Rajkova Pećina Cave near Majdanpek, eastern Serbia, is presented, with some details on its morphology and interrelationships with phenetically close species *Neobisium carpaticum* Beier, 1935.

Keywords: *Neobisium rajkodimitrijevici*, Pseudoscorpiones, Rajkova Pećina Cave, Serbia

INTRODUCTION

During the last two decades several new cave-dwelling pseudoscorpion species have been described from Serbia (e.g., Ćurčić and Dimitrijević, 2002, 2004; Ćurčić et al., 2003, 2010, 2011, 2013; Ćurčić and Tomić, 2006). Based on the present knowledge, 36 cavernicolous pseudoscorpion species are known to inhabit Serbia so far (Ćurčić et al., in press). One of these newly erected species is *Neobisium rajkodimitrijevici* Ćurčić, 2006 from the Rajkova Pećina Cave near Majdanpek in eastern Serbia (Ćurčić and Tomić, 2006). The mentioned species was established based on the material which included holotype male and a paratype tritonymph. The pseudoscorpion sample was collected at the type locality on April 13, 1980 by Prof. Dr. Božidar P. M. Ćurčić. During subsequent biospeleological exploration of the Rajkova Pećina Cave undertaken on May 23, 2016 by Prof. Dr. Srećko Ćurčić and Dr. Nikola Vesović, several additional specimens of *N. rajkodimitrijevici* were gathered. Analysis of the collected pseudoscorpion material revealed the presence of one female specimen of *N. rajkodimitrijevici*. The primary aim of this study is to present the description of the external morphology of the female of *N. rajkodimitrijevici*.

* Institute of Zoology, University of Belgrade – Faculty of Biology, Studentski trg 16, 11000 Belgrade, Serbia, e-mail: rajko@bio.bg.ac.rs

MATERIAL AND METHODS

The female of *N. rajkodimitrijevici* was carefully examined, dissected, measured, imaged and mounted on a microscope slide in gum-chloral medium (Swan's fluid). The specimen is deposited in the collection of the Institute of Zoology, University of Belgrade – Faculty of Biology, Belgrade, Serbia (IZB). Setal and trichobothrial designations follow Beier (1963). Terminology for pedipalpal and pedal podomeres was given after Ćurčić (1982).

RESULTS

NEOBISIUM CHAMBERLIN, 1930

NEOBISIUM RAJKODIMITRIJEVICI ĆURČIĆ, 2006 (Figs. 1–7)

Description of female. Carapace longer than broad (Fig. 1; Table 1). Epistome in the form of a low and apically rounded elevation (Fig. 2). Eyes developed on both lateral carapacal sides. No preocular microsetae exist. Total number of carapacal setae 23. Those are grouped in four rows as in the the genera *Neobisium* Chamberlin (Gabbutt, 1965) and *Roncus* L. Koch (Gabbut & Vachon, 1967). Four setae occur in anterior carapacal row, six setae in ocular row, seven setae in intermediate row, whilst six setae exist in posterior row. Carapacal setation can be expressed as: 4+6+7+6=23.

Abdominal tergites smooth, with granulate pleural membranes. Each abdominal tergite with a single row of setae along its posterior margin. Number of setae on abdominal tergites I-X is as follows: 6-8-9-9-9-9-9-9-8-7.

Genital area (Fig. 3). Abdominal sternites carry a slightly higher number of setae than in holotype male. Second abdominal sternite bears seven median setae. Third and fourth abdominal sternites carry 15 and 14 setae, respectively. Three microsetae occur anterior to each stigma on both abdominal sternites III and IV. Number of setae on abdominal sternites V-X is as follows: 14-15-13-13-12-11.

Galea of cheliceral movable finger in the form of a hyaline process. Movable and fixed cheliceral fingers carry eight and 12 teeth, respectively. One seta present on movable cheliceral finger and six setae occur on cheliceral palm (Fig. 4). Chelicera 1.93 times as long as broad (Table 1).

Flagellum with eight blades. Two distalmost blades pinnate anteriorly. All other blades smooth and acuminate, diminishing in size from distal to proximal end. Proximalmost blade being the smallest.

Trichobothriotaxy. Four trichobothria on movable pedipalpal chelal finger and eight on fixed pedipalpal chelal finger (Fig. 5). Trichobothria **eb**, **esb**, **ib** and **isb** situated basally on fixed pedipalpal chelal finger. Trichobothria **it**, **et** and **ist** positioned distally on fixed pedipalpal chelal finger. Trichobothria **b** and **sb** proximally on movable pedipalpal chelal finger, while **t** and **st** distally on movable pedipalpal chelal finger (Fig. 5). Trichobothrium **st** closer to **t** than to **sb,** while **sb** closer to **b** than to **st**.

Table 1. Linear measurements (in millimeters) and morphometric ratios in *Neobisium rajkodimitrijevici* Ćurčić, 2006 and *N. carpaticum* Beier, 1935 (Beier, 1963; Ćurčić and Tomić, 2006). Abbreviations: F = female; TS = tactile seta.
Табела 1. Линеарна мерења (у милиметрима) и морфометријска поређења врста *Neobisium rajkodimitrijevici* Ćurčić, 2006 и *N. carpaticum* Beier, 1935 (Beier, 1963; Ćurčić and Tomić, 2006). Скраћенице: F = женка; TS = тактилна чекиња.

	Neobisium rajkodimitrijevici	*N. carpaticum*
Character	F	F
Body		
Length (1)	3.40	2.68-3.59
Carapace		
Length (2)	0.71	0.80-0.91
Breadth (2a)	0.65	0.72-0.90
Ratio 2/2a	1.09	1.01-1.11
Abdomen		
Length	2.69	1.77-2.73
Chelicerae		
Length (3)	0.59	0.58-0.675
Breadth (4)	0.305	0.30-0.395
Length of movable finger (5)	0.40	0.385-0.45
Ratio 3/5	1.475	1.59-1.985
Ratio 3/4	1.93	1.49-1.58
Pedipalps		
Length with coxa (6)	4.43	4.52-5.275
Ratio 6/1	1.30	1.47-1.81
Length of coxa	0.67	0.66-0.72
Length of trochanter	0.57	0.51-0.60
Length of femur (7)	1.14	0.93-1.115
Breadth of femur (8)	0.22	0.24-0.28
Ratio 7/8	5.18	3.875-4.075
Ratio 7/2	1.605	1.02-1.35
Length of patella (tibia) (9)	0.815	0.68-0.80
Breadth of patella (tibia) (10)	0.26	0.29-0.33
Ratio 9/10	3.13	2.35-2.63
Length of chela (11)	1.235	1.74-2.09
Breadth of chela (12)	0.43	0.46-0.57
Ratio 11/12	2.87	3.175-3.78
Length of chelal palm (13)	0.805	0.72-0.80
Ratio 13/12	1.87	1.47-1.565
Length of chelal finger (14)	1.345	0.97-1.20
Ratio 14/13	1.67	1.15-1.42

	Neobisium rajkodimitrijevici	*N. carpaticum*
Character	F	F
Leg IV		
Total length	3.63	3.12-3.715
Length of coxa	0.49	0.42-0.50
Length of trochanter (15)	0.44	0.39-0.47
Breadth of trochanter (16)	0.17	0.18-0.21
Ratio 15/16	2.59	2.00-2.75
Length of femur + patella (17)	1.00	0.83-1.00
Breadth of femur + patella (18)	0.22	0.27-0.33
Ratio 17/18	4.545	2.86-3.45
Length of tibia (19)	0.79	0.69-0.82
Breadth of tibia (20)	0.12	0.13-0.16
Ratio 19/20	6.58	5.125-5.86
Length of metatarsus (21)	0.40	0.33-0.38
Breadth of metatarsus (22)	0.09	0.11-0.13
Ratio 21/22	4.44	2.92-3.125
Length of tarsus (23)	0.51	0.46-0.545
Breadth of tarsus (24)	0.08	0.08-0.10
Ratio 23/24	6.375	5.00-5.875
TS ratio - tibia IV	0.40	0.41-0.49
TS ratio - metatarsus IV	0.15	0.125-0.18
TS ratio - tarsus IV	0.36	0.35-0.43

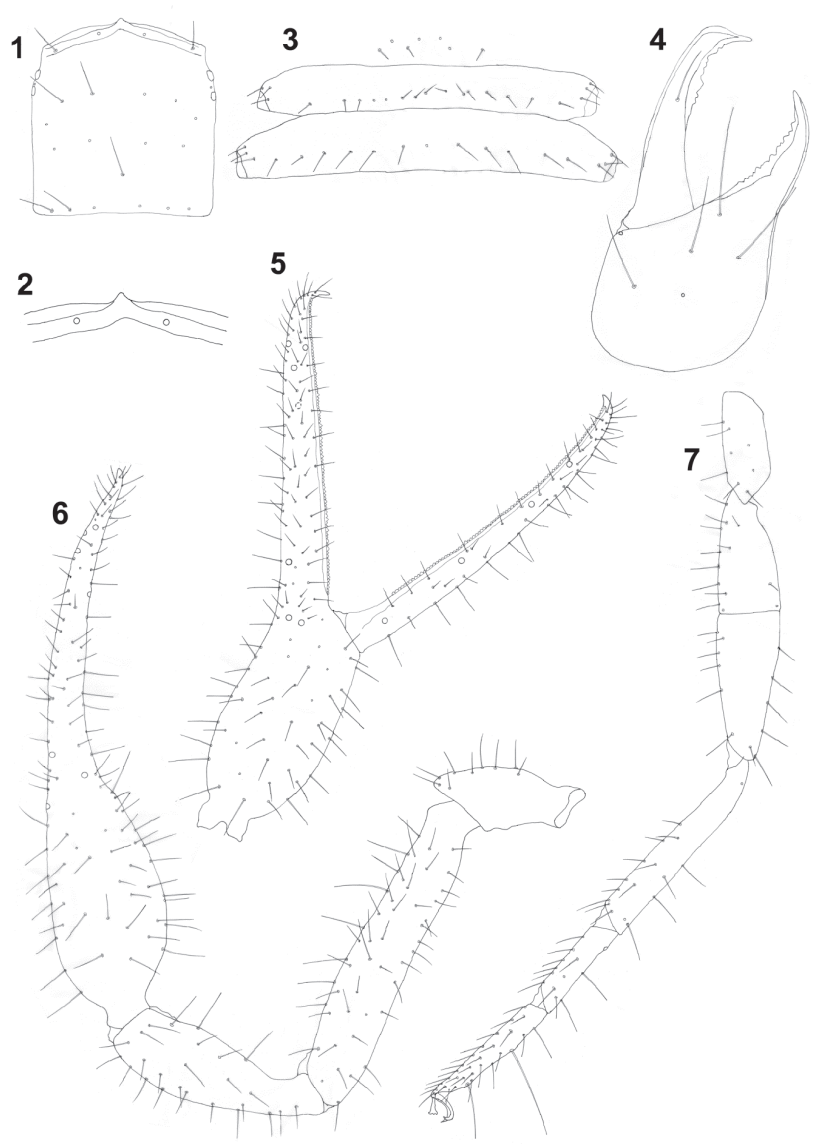
Apex of pedipalpal coxa (manducatory process) with four long setae. Movable pedipalpal finger bears 85 contiguous teeth, whilst 93 teeth of the same disposition present on fixed pedipalpal finger (Fig. 5). Pedipalpal articles smooth and slender (Fig. 6). Pedipalpal femur 5.18 times as long as broad, 1.605 times as long as carapace (Table 1). Pedipalpal chela 2.87 times as long as broad, broader than pedipalpal femur (Table 1).

Articles of leg IV attenuated (Fig. 7). Patella, basitarsus and tarsus of leg IV each carry a single tactile seta. Subterminal tarsal seta furcate, each branch with a few spinules (Fig. 7).

Morphometric ratios, linear measurements (in mm) and images of different body structures of a female of *N. rajkodimitrijevici* are presented in Table 1 and Figs. 1–7, respectively.

DISCUSSION

Updated differential diagnosis of *N. rajkodimitrijevici*. *Neobisium rajkodimitrijevici* and its phenetically closest congener *Neobisium carpaticum* Beier, 1935 differ in numerous important aspects, some of them are: carapacal length (0.71 mm *vs*. 080-0.91 mm) and breadth (0.65 mm *vs*. 0.72-0.90 mm), presence/absence of



Figures 1–7. Female of *Neobisium rajkodimitrijevici* Ćurčić, 2006 from the Rajkova Pećina Cave, near Majdanpek, eastern Serbia: 1 – carapace; 2 – epistome; 3 – genital area; 4 – chelicera; 5 – pedipalpal chela; 6 – pedipalp; 7 – leg IV. Scales = 0.50 mm (Figs. 1 and 5–7) and 0.25 mm (Figs. 2–4).

Слике 1–7. Женка врсте *Neobisium rajkodimitrijevici* Ćurčić, 2006 из Рајкове пећине у близини Мајданпека у источној Србији: 1 – карапакс; 2 – епистом; 3 – генитално подручје; 4 – цхелицера; 5 – педипалпална цхела; 6 – педипалпа; 7 – ножица IV. Размера = 0.50 mm (Слике 1 и 5–7) и 0.25 mm (Слике 2–4).

preocular microsetae (absent *vs*. present), ratio of cheliceral length to breadth (1.93 *vs*. 1.49-1.58), ratio of cheliceral length to movable finger length (1.475 *vs*. 1.59-1.985), pedipalpal length (4.43 mm *vs*. 4.52-5.275 mm), ratio of pedipalpal length to body length (1.30 *vs*. 1.47-1.81), ratio of pedipalpal femur length to carapace length (1.605 *vs*. 1.02-1.35), ratio of pedipalpal chelal finger length to pedipalpal chelal palm length (1.67 *vs*. 1.15-1.42), number of teeth on fixed and movable pedipalpal fingers (93 and 85, respectively *vs*. 63-76 and 53-62, respectively), ratio of pedipalpal chela length to breadth (2.87 *vs*. 3.175-3.78), pedipalpal chelal finger length (1.345 mm *vs*. 0.97-1.20 mm), number of setae on abdominal sternite III (15 *vs*. 18-24), ratio of femur + patella IV length to breadth (4.545 *vs*. 2.86-3.45), ratio of tibia IV length to breadth (6.58 *vs*. 5.125-5.86) and ratio of tarsus IV length to breadth (6.375 *vs*. 5.00-5.875) (Beier, 1963; Ćurčić and Tomić, 2006).

Importance of certain morphological characters in *Neobisium*. According to Ćurčić (1977, 1982) and Dimitrijević (2000), characters with high taxonomic value (setation of genital abdominal sternites in adults, pedipalpal trichobothriotaxy, granulation of pedipalps, relative disposition and number of pedal tactile setae) may serve as a reliable mean of distinction of different species and groups of species and may play an important role in determining their taxonomic status within the genus *Neobisium*.

Distribution and ecology. As already stated by Ćurčić and Tomić (2006), *N. rajkodimitrijevici* is a troglophilic species, presently known only from the Rajkova Pećina Cave near Majdanpek, probably of Tertiary origin and endemic to the Carpathian range in Serbia. The female of *N. rajkodimitrijevici* was collected by hand, under stone in dark part of the cave. Further explorations of the caves and deep soil in eastern Serbia close to the Rajkova Pećina Cave may result in establishing new finding places of *N. rajkodimitrijevici*. Additional studies should be conducted in order to ascertain its actual distribution area (range) and to enable a better understanding of the intraspecific variability. The description of the female of *N. rajkodimitrijevici* with the already existing description of the male (Ćurčić & Tomić, 2006) completes our knowledge of the external morphology of the adult stage of this species.

REFERENCES / ЛИТЕРАТУРА

Beier, M. (1963) Ordnung Pseudoscorpionidea (Afterskorpione). Bestimmungsbücher zur Bodenfauna Europas, 1. Akademie Verlag, Berlin, 1–313.

Ćurčić, B. P. M. (1977) Uporedno-morfološka obeležja – njihov značaj i primena u klasifikaciji taksona porodice Neobisiidae (Pseudoscorpiones, Aracahnida). Doktorska disertacija. Prirodno-matematički fakultet, Univerzitet Beogradu, Beograd, 1–186.

Ćurčić, B. P. M. (1982) Postembryonic development in the Neobisiidae (Pseudoscorpiones, Arachnida). Monographs, Vol. DXLV, Department of Sciences, No. 56. Serbian Academy of Sciences and Arts, Belgrade, 1–96.

Ćurčić, B. P. M., Ćurčić, S. B., Dimitrijević, R. N., Paunović, M., Karapandža, B., Decu, V., Juberthie, C. (in press) Serbia. In: Juberthie, C., Decu, V. (Eds.): Encyclopaedia Biospeologica, Vol. 4. National Museum of Natural History, Paris.

Ćurčić, B. P. M., Dimitrijević, R. N. (2002) On two new cave relict pseudoscorpions *Roncus svetavodae* n. sp. and *Roncus virovensis* n. sp. (Neobisiidae, Pseudoscorpiones), from southwestern Serbia. Archives of Biological Sciences, Belgrade, 54, 35–42.

Ćurčić, B. P. M., Dimitrijević, R. N. (2004) On a new endemic pseudoscorpion from West Serbia – *Roncus pantici* n. sp. (Neobisiidae, Pseudoscorpiones). Bulletin de l'Académie serbe des sciences et des arts, Classe des sciences mathématiques et naturelles, Sciences naturelles, 42, 319–325.

Ćurčić, B. P. M., Dimitrijević, R. N., Ćurčić, N. B. (2011) *Neobisium borense*, sp. n. (Pseudoscorpiones, Neobisiidae), a new endemic species from East Serbia. Acta zoologica bulgarica, 63(1), 3–6.

Ćurčić, B. P. M., Dimitrijević, R. N., Ćurčić, S. B. (2003) *Neobisium stitkovense* n. sp. (Neobisiidae, Pseudoscorpiones), an endemic cave species from southeastern Serbia. Periodicum biologorum, 195(4), 479–487.

Ćurčić, B. P. M., Dimitrijević, R. N., Makarov, S. E., Ćurčić, S. B., Tomić, V. T., Antić, D. Ž., Ilić, B. S. (2013) *Roncus radgost* n. sp., *R. jarevid* n. sp., and *R. crnobog* n. sp., three new cave-dwellers from eastern Serbia (Neobisiidae, Pseudoscorpiones). Archives of Biological Sciences, Belgrade, 65(2), 751–760.

Ćurčić, B. P. M., Rađa, T., Ćurčić, N. B. (2010) On *Roncus almissae* n. sp., *R. krupanjensis* n. sp. and *R. radji* n. sp., three new pseudoscorpions (Pseudoscorpiones, Neobisiidae) from Croatia and Serbia, respectively. Archives of Biological Sciences, Belgrade, 62(2), 503–513.

Ćurčić, B. P. M., Tomić, V. (2006) *Neobisium rajkodimitrijevici* n. sp. (Neobisiidae, Pseudoscorpiones), a new false scorpion from a cave in eastern Serbia. Archives of Biological Sciences, Belgrade, 58(2), 121–124.

Dimitrijević, R. N. (2000) On some morphological characters in *Neobisium* Chamberlin, 1930 (Neobisiidae, Pseudoscorpiones) and their taxonomic importance. Archives of Biological Sciences, Belgrade, 52(2), 21P–22P.

Gabbut, P. D. (1965) The external morphology of two pseudoscorpions *Neobisium carpenter* and *Neobisium maritimum*. Preedings of the Zoological Society of London, 145, 359–386.

Gabbut, P. D., Vachon, M. (1967) The external morphology and life history of the pseudoscorpion *Roncus lubricus*. Journal of Zoology, London, 153, 476–498.

Рајко Н. Димитријевић

ОПИС ЖЕНКЕ ПЕЋИНСКЕ ВРСТЕ *NEOBISUM RAJKODIMITRIJEVICI* ĆURČIĆ, 2006 (NEOBISIIDAE, PSEUDOSCORPIONES) ИЗ СРБИЈЕ

Р е з и м е

У раду је дат детаљан опис спољашње морфологије женке пећинске врсте *Neobisium rajkodimitrijevici* Ćurčić, 2006 из Рајкове пећине у близини Мајданпека у источној Србији. Укратко су анализирани таксономски међуодноси са сродном врстом *Neobisium carpaticum* Beier, 1935.

Кључне речи: *Neobisium rajkodimitrijevici*, *Pseudoscorpiones*, Рајкова пећина, Србија