Arch. Biol. Sci., Belgrade, 65 (2), 739-744, 2013 DOI:10.2298/ABS1302739S

THE REVIEW OF THE GENUS *SERBOIULUS* STRASSER, 1962 (DIPLOPODA: JULIDA: JULIDAE), WITH DESCRIPTION OF A NEW SPECIES FROM SERBIA

TATJANA LJ. SEKULIĆ[1], D. Ž. ANTIĆ[1], V. T. TOMIĆ[1], S. B. ĆURČIĆ[1], D. Z. STOJANOVIĆ[2], B. M. MITIĆ[1], S. E. MAKAROV[1], and B. P. M. ĆURČIĆ[1]

[1]*Institute of Zoology, Faculty of Biology, University of Belgrade,* 11000 Belgrade, Serbia
[2]*Department of Biomedical Sciences, State University of Novi Pazar,* 36300 Novi Pazar, Serbia

Abstract – The Balkan millipede genus *Serboiulus* Strasser, 1962, is reviewed, and a new species, *S. kresnik* n. sp, isdescribed. The new species differs from all other congeners in a number of gonopod details. The distribution of the species of *Serboiulus* is mapped and discussed. A new key is provided for all four currently known serboiulid species.

Key words: Balkan Peninsula, Myriapoda, Diplopoda, *Serboiulus*, *S. kresnik* n. sp., Serbia

INTRODUCTION

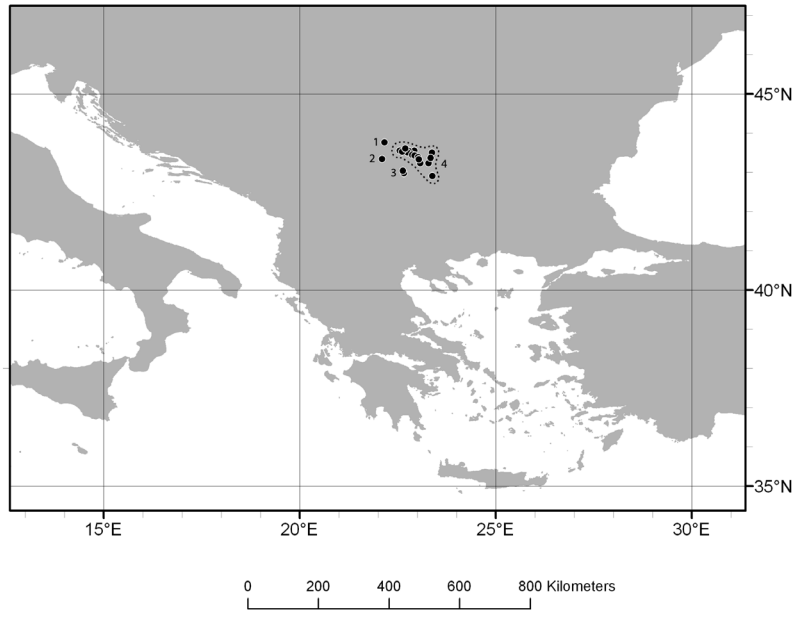
The taxonomic history of *Serboiulus* Strasser, 1962, began with Strasser's (1962) description of *Serboiulus lucifugus* Strasser, 1962, from the Prekonoška Pećina Cave in eastern Serbia. Five years later, Gulička (1967) established a new subgenus with a new species, *Serboiulus* (*Balkaniulus*) *spelaeophilus* Gulička, 1967, from Vodna Pešt Cave (Stara Planina Mountain) in Bulgaria. Strasser (1969) identified *Serboiulus popovi* Strasser, 1969 in the bulk of cave-dwelling julids from several caves in Bulgaria, and pointed out some differences in comparison with *S. spelaeophilus*. However, the same author (Strasser, 1973) reexamined *S. popovi* and compared it with samples from a few caves on Stara Planina Mt, as well as with Gulička's species, concluding that *S. popovi* represents a synonym of *S. spelaeophilus* (consequently synonymizing the subgenus *Balkaniulus* with the nominal genus *Serboiulus*). Further, Strasser (1971) described a new subspecies, *S. lucifugus deelemani* Strasser, 1971, from the Vetrena Dupka Cave in eastern Serbia. Recently, Makarov et al. (2005) reanalyzed the topotypes of the Serbian *Serboiulus* representatives, raising both forms to the species level.

During a field trip in eastern Serbia, two of us (DŽA and SBĆ) collected an interesting specimen in one cave. Careful examination showed that it represents a new form belonging to the genus *Serboiulus*. The present paper is an attempt to describe (after more than forty years) a new *Serboiulus* species, as well as to review all members of this genus based both on the available literature data and on material at our disposal, which is lodged at the Institute of Zoology, Faculty of Biology, Belgrade. The description of the new species follows a pattern proposed for typhloiulids by Strasser (1962), and for the genus *Serboiulus* by Makarov et al. (2005).

RESULTS

Taxonomy

Julidae



Map 1. Distribution of the genus *Serboiulus* Strasser, 1962. 1. *Serboiulus kresnik* n. sp.; Gornja Lenovačka Pećina Cave, village Lenovac, near Zaječar, Mt. Tupižnica; 2. *Serboiulus lucifugus* Strasser, 1962; Prekonoška Pećina Cave, village Prekonoga, near Svrljig, Svrljiške Planine Mountains; 3. *Serboiulus deelemani* Strasser, 1972; Vetrena Dupka Cave, village Vlasi, near Pirot; Velika Pećina Cave, village Donja Držina, near Pirot; 4. *Serboiulus spelaeophilus* Gulička, 1967; numerous caves on Mt. Stara Planina and in some caves at the edge of the Pannonian Plain.

SERBOIULUS KRESNIK MAKAROV, N. SP. (Figures 1–9), Map 1.

Material examined – Holotype male and allotype female, Gornja Lenovačka Pećina Cave, village Lenovac, near Zaječar, Mt. Tupižnica, Serbia, 26.06.2012, leg. D. Antić and S. Ćurčić. Paratypes: two males, nine females, same place, data, and collectors.

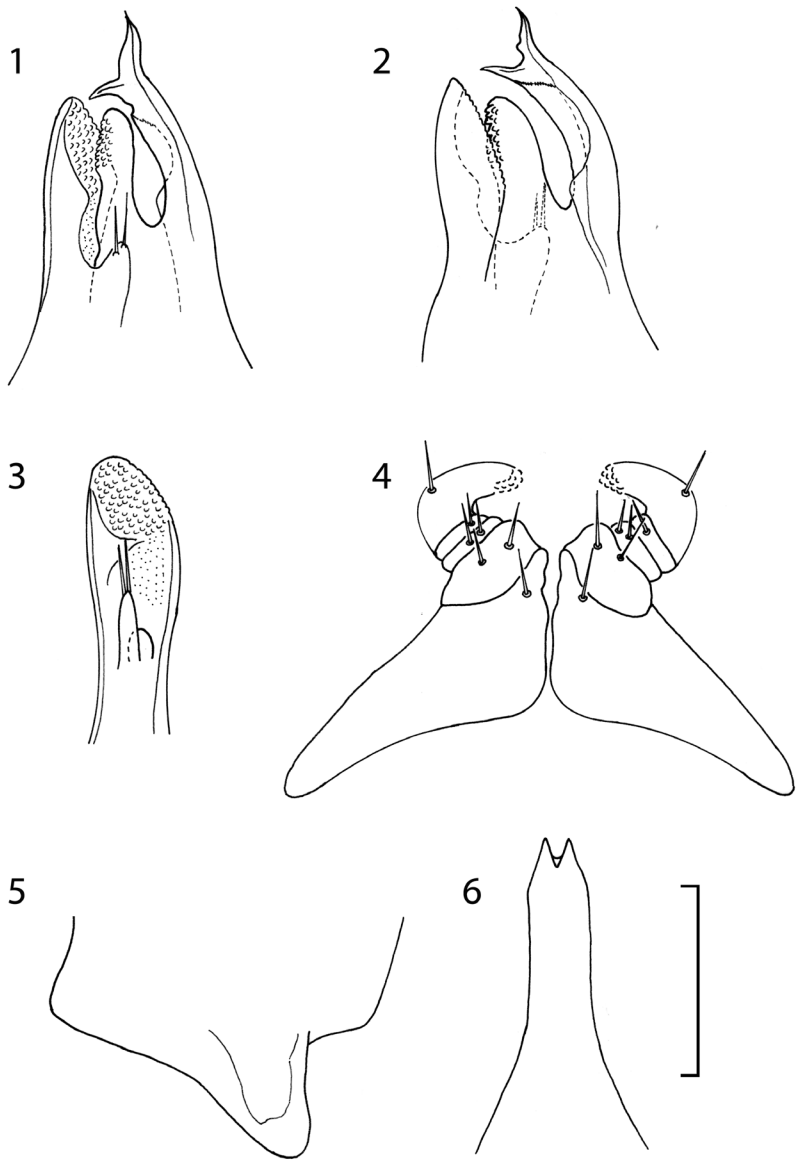
Etymology – In Slav mythology, Kresnik is a god associated with fire, summer solstice, and storms (Vasiljev, 1928).

Diagnosis – The new species clearly differs from its congeners by the particularities in the gonopod structure, and especially by the presence of a connection between the mesomerite and the opisthomerite.

Description – Coloration from pale yellow to light brown; without eyes (Figs. 7-8). Body with 53-60 somites + telson (0 – 2 apodous somites). Body length: female 24.54-31.67 mm, male 24.95-28.52 mm. Maximal vertical body diameter (Hmax): female 1.32-1.57 mm; male 1.28-1.45 mm. Head with two occipital setae; surface smooth. Labrum with three median teeth, 4 supralabral and 14 labral setae.

Antennae (holotype male). Length of antennae 2.03 mm, distance between antennal sockets 0.46 mm. Length of antennomeres I – VIII (in mm): 0.15 (I), 0.38 (II), 0.38 (III), 0.33 (IV), 0.36 (V), 0.30 (VI), 0.12 (VII) and 0.01 (VIII). Length/breadth ratio of antennomeres I–VII: 1.00 (I), 2.50 (II), 2.50 (III), 2.20 (IV), 1.70 (V), 1.50 (VI) and 1.00 (VII). Antennomeres V and VI each with a terminal corolla of 20 large bacilliform sensillae; antennomere VII with 28 terminal microsetae arranged circularly.

Gnathochilarium (holotype male). Length 0.88 mm, breadth 0.75 mm. Stipites with three setae each, of which 2+2 are marginal and 1+1 subapical. La-



Figs. 1-6. *Serboiulus kresnik* n. sp., holotype male, from the Gornja Lenovačka Pećina Cave, village Lenovac, near Zaječar, Mt. Tupižnica, Serbia. 1. gonopods – mesal view; 2. gonopods – lateral view; 3. promerite – caudal view; 4. first leg pair – oral view; 5. Distal and marginal tooth of seventh male pleurotergum; 6. penis – caudal view. Scale line = 0.25 mm.

mellae linguales each with four setae arranged in one row. Promentum elongated and deltoid, almost twice as short as lamellae linguales.

Collum. Posterior margin with 15 elongated setae (holotype male); anterior margin slightly rounded.

Metazonite VII with 18 caudal setae (paratype male) (Fig. 9, allotype female); setae five times shorter than vertical diameter of somite VII (paratype male). Surface of metazonite densely striated (48 striae on metazonite VII) (paratype male). Suture between pro- and metazonites clearly visible; ozopores lying

Figs. 7-11. 7. *Serboiulus kresnik* n. sp., paratype male; Gornja Lenovačka Pećina Cave, village Lenovac, near Zaječar, Mt. Tupižnica; 8. *Serboiulus kresnik* n. sp., paratype female; Gornja Lenovačka Pećina Cave, village Lenovac, near Zaječar, Mt. Tupižnica; 9. Somite XV, allotype female, posterior view (scale line = 1 mm); 10. *Serboiulus deelemani* Strasser, 1972, male; Vetrena Dupka Cave, village Vlasi, near Pirot; 11. *Serboiulus lucifugus* Strasser, 1962, female, Prekonoška Pećina Cave, village Prekonoga, near Svrljig, Svrljiške Planine Mountains (Photo by D. Antić).

Fig. 12. *Serboiulus spelaeophilus* Gulička, 1967, topotype male, Vodna Pešt Cave, Dolni Lom, Distr. Montana, Mt. Stara Planina, Bulgaria (Photo by V. Tomić).

in sutures. Surface of prozonites smooth. Male pleurotergum VII with distinct, long, subtriangular, distal and marginal tooth, slightly curved caudally (Fig. 5).

Telson densely setose; epiproct long, thorn-like, slightly curved downwards with 12 setae (3+3 lateral and 3+3 dorsomedial). Paraproct densely setose, setae arranged irregularly. Hypoproct lenticular with 7 long setae.

Length of midbody legs 1.36 mm. Adhesive pads present on anterior legs. First pair of legs in males hook-shaped (Fig. 4). Coxa, postfemur and tibiotarsus each with one oral seta. Prefemur and femur each with two oral setae. Tips of hooks tuberculated on their inner side. Penis behind second leg-pairs, with straight lateral margins, converging in the basal third, while the two-thirds are almost parallel; with two short apical lobes (Fig. 6).

Gonopods. Hmax/gonopod length ratio 2. Promerite and mesomerite shorter than opisthomerite (Fig. 2). Promerite straight, spatulated, with an apically tuberculated cavity to accommodate anterodistal protuberance of the tuberculate mesomerite (Fig. 3). Flagellum absent. Parabasal internal lobe subtriangular, with two long setae; parabasal external lobe short, subovoid (Figs. 2-3). Mesomerite shorter than promerite, straight, cephalic side apically tuberculated; basal half fused with opisthomerite. Opisthomerite long, curved orally, with well-developed subtriangular velum, terminating apically in the solenomerite. Apical part of solenomerite is pointed and curved laterally (Figs. 1-2). Laterally, opisthomerite has a well-developed lamella, with finely serrated outer margin, starting at the base of velum.

DISCUSSION

The genus *Serboiulus* includes blind, but more or less pigmented cavernicolous millipedes occurring in a restricted area of the Balkan Peninsula. Earlier, Strasser (1962) explained that the main division within typhloiulids *sensu lato* was made according to the presence or absence of a flagellum. There are two genera without flagella: *Trogloiulus* Manfredi, 1931 and *Serboiulus*. It is probable that the genus *Buchneria* Verhoeff, 1941 (with its stunted flagellum) represents a transitional condition. Furthermore, Strasser (1962) pointed out that another division had been made according to the presence of coxal pieces on the gonopods, the shape of the promerite and mesomerite and the presence/absence of intermediate lamellae. The structure and presence of lamellae is characteristic for the genus *Typhloiulus sensu stricto.* He also shared the opinion that the intermediate lamellae may be considered a vestige of an ancient and primitive coherence existing once between the opisthomerite and the mesomerite. Enghoff (1987) explained that the mesomerite in higher julids is developed as an independent branch, and that consequently a meso-opisthomeral complex is a plesiomorphic condition in relation to the 'mesomeritization' in higher julids. In the new species, the mesomerite is clearly connected with the opisthomerite and only its apical half is an independent branch. In virtually all other *Serboiulus* species, the mesomerite is deeply divided from the opisthomerite in the form of a free

branch. At present, it is difficult to explain the meso-opisthomerite complex in new species and its phylogenetic relations in closely-related taxa, especially in light of the opinion that typhloiulids actually belong to the large tribe Leptoiulini (Mauriès et al., 1997). It is important to note as well that Makarov et al (2005) found that most of the body structures used before are actually not valid in the discrimination of at least the *Serboiulus* species; however, gonopod form is the most important character on which distinction of species can be based. The description of the new species strongly supports such an opinion.

The new species is distributed on Mt. Tupižnica in eastern Serbia. *S. lucifugus* (Fig. 11) is described in a cave on the Svrljiške Planine mountains, and *S. deelemani* (Fig. 10) is distributed in two caves on Mt. Vlaška Planina, both in southeastern Serbia. A much wider distribution is that of *S. spelaeophilus* (Map 1; Fig. 12) in numerous caves in Bulgaria, so that Vagalinski and Stoev (2007) assigned this species as an endemic of Mt. Stara Planina and the Danubian Plain. Biogeographically, the genus *Serboiulus* represents a Carpathian and Balkan element, endemic to the Balkan Peninsula, whose evolution is probably correlated with geotectonic events in the Carpatho-Balkan area in the past.

A key to the species of Serboiulus

This key is based on the structure of gonopods in adult males:

1) Promerite apically with lateral lobe, solenomerite apically covered with numerous hairs ...*Serboiulus spelaeophilus* Gulička, 1967 (Fig. 12)
- Promerite spatulated without lateral lobe, solenomerite apically without hairs 2

2) Mesomerite straight, its basal half fusioned with opisthomerite ...*Serboiulus kresnik n. sp.* (Figs. 7-8)
- Mesomerite curved orally, basally divided from opisthomerite in the form of independent branch...3

3) Mesomerite longer than promerite, strongly curved orally, with a massive lateral lobe; apical free part of solenomerite short .....*Serboiulus deelemani* Strasser, 1971 (Fig. 10)

- Mesomerite never longer than promerite, gently curved orally, without a lateral lobe; apical free part of solenomerite long .....*Serboiulus lucifugus* Strasser, 1962 (Fig. 11)

Acknowledgments - This work was supported by the Serbian Ministry of Education, Science and Technology (Grant 173038). We are grateful to Dr. Pavel Stoev and Boyan Vagalinski (Sofia, Bulgaria) for sending us topotypes of *Serboiulus spelaeophilus.*

REFERENCES

Enghoff, H. (1987). Revision of *Nepalmatoiulus* Mauriès 1983 – a Southeast Asiatic genus of millipedes (Diplopoda: Julida: Julidae). *Cour. Forsch.-Inst. Senckenberg* **93**, 241-331.

Gulička, J. (1967). Neue Höhlen-Diplopoden aus Bulgarien. *Ann. Zool. Bot.* Bratislava **42**, 1-5.

Makarov, S.E., Mitić, B.M., Tomić, V.T. and *B. D. Dudić* (2005). Revision of the genus *Serboiulus* Strasser, 1962 (Diplopoda, Julidae). *Archives of Biological Science,* Belgrade **57 (1)**, 47-52.

Mauriès, J.P., Golovatch, S.I. and *P. Stoev* (1997). The millipedes of Albania: recent data, new taxa; systematical, nomenclatural and faunistical review (Myriapoda, Diplopoda). *Zoosystema* **19**, 255-292.

Strasser, K. (1962). Die Typhloiulini (Diplopoda Symphylognatha). *Atti dei Museo Civico di Storia Naturale* **23**, 1-77.

Strasser, K. (1969). Über Diplopoden Bulgariens II. *Annales Zoologici*, Warszawa **27**, 325-328.

Strasser, K. (1971). Über Diplopoden Jugoslawiens. *Senckenberg. biol.* **52**, 313-345.

Strasser, K. (1973). Über Diplopoden Bulgariens III. *Annales Zoologici*, Warszawa **30**, 411-468.

Vagalinski, B., and P. Stoev (2007). An annotated catalogue of the millipede order Julida (Diplopoda) in Bulgaria. *Historia naturalis bulgarica* **18**, 35-63.

Vasiljev, S. (1928). Slovenska mitologija. Srbobran, 1-62.