

**A NEW CAVE DIPLOPOD OF THE GENUS *BRACHYDESMUS* HELLER,  
1858 FROM SOUTHWEST SERBIA (DIPLOPODA: POLYDESMIDA: POLYDESMIDAE)**

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**Abstract** – A new cave polydesmid, *Brachydesmus sjenicae* n. sp. is described from Ledena Pećina Cave, in southwest Serbia. The new taxon belongs to the *vermosanus*-group of species. Relationships with congeners are briefly discussed. The distribution map and key is given for all currently known taxa belonging to this group of species.

**Key words:** Diplopoda, *Brachydesmus*, *B. sjenicae*, new species, Serbia.

## INTRODUCTION

One of the largest taxons within the family Polydesmidae is the genus *Brachydesmus* Heller, 1858. This genus includes 13 subgenera with numerous species or subspecies (Attems, 1940; Hoffman, 1980; Mršić, 1988), and has high diversity in epigeic, endogeic and cave habitats on the Balkan Peninsula. However, according to Enghoff and Kime (2011) all subgenera are synonymized under the nominal genus *Brachydesmus*.

During speleological investigation in Ušački Pećinski Cave System interesting polydesmids were collected. After dissection and careful examination, we determined that these specimens are new to science and belong to the genus *Brachydesmus*. This paper provides a description and diagnosis of the new taxa, as well as a brief discussion about the relationship between the closest congeners and their distribution.

In the descriptions of gonopods, we have used the traditional terminology (Attems, 1940).

The type specimens (holotype male, allotype female, paratype female and two paratype juveniles) are deposited in the collection of the Institute of Zoology, Faculty of Biology, University of Belgrade (Belgrade, Serbia).

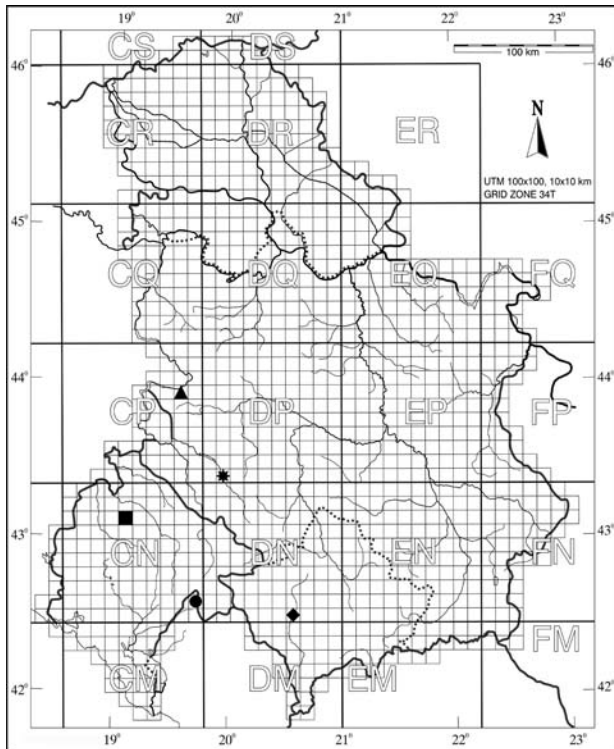
## RESULTS

### TAXONOMY

#### POLYDESMIDAE

*BRACHYDESMUS SJENICAE*  
MAKAROV & ANTIĆ, NEW SPECIES  
(*Figures 1–7, Map 1*)

**Material examined** – Holotype male, allotype female and two paratype juveniles from Ledena Pećina Cave (part of Ušački Pećinski Cave System), Municipality of Sjenica, Pešterska Visoravan Plateau, southwestern Serbia; October 1st, 2012; collected by M. Petković and paratype female (Fig. 1)



**Map 1.** Distribution of representatives of *vermosanus*-group of species. Triangle: *Brachydesmus femoralis* Makarov, 2008, Bezi- mena Pećina Cave, village Šljivovica, Mt. Tara, west Serbia; Star: *Brachydesmus sjenicae* n. sp., Ledena Pećina Cave, Sjenica, south- west Serbia; Square: *Brachydesmus novaki* Mršić, 1988, near Ledena Pećina Cave, Mt. Durmitor, north Montenegro; Circle: *Brachydesmus vermosanus* Attems, 1929, village Vermoša, north Albania; Inverse square: *Brachydesmus jalzici* Mršić, 1988, non- ame Cave near the village Duš, municipality of Klina in Kosovo and Metohija, south Serbia.

from the same cave; May 23, 2012; collected by D. Stojanović.

*Etymology* – To emphasize the type locality.

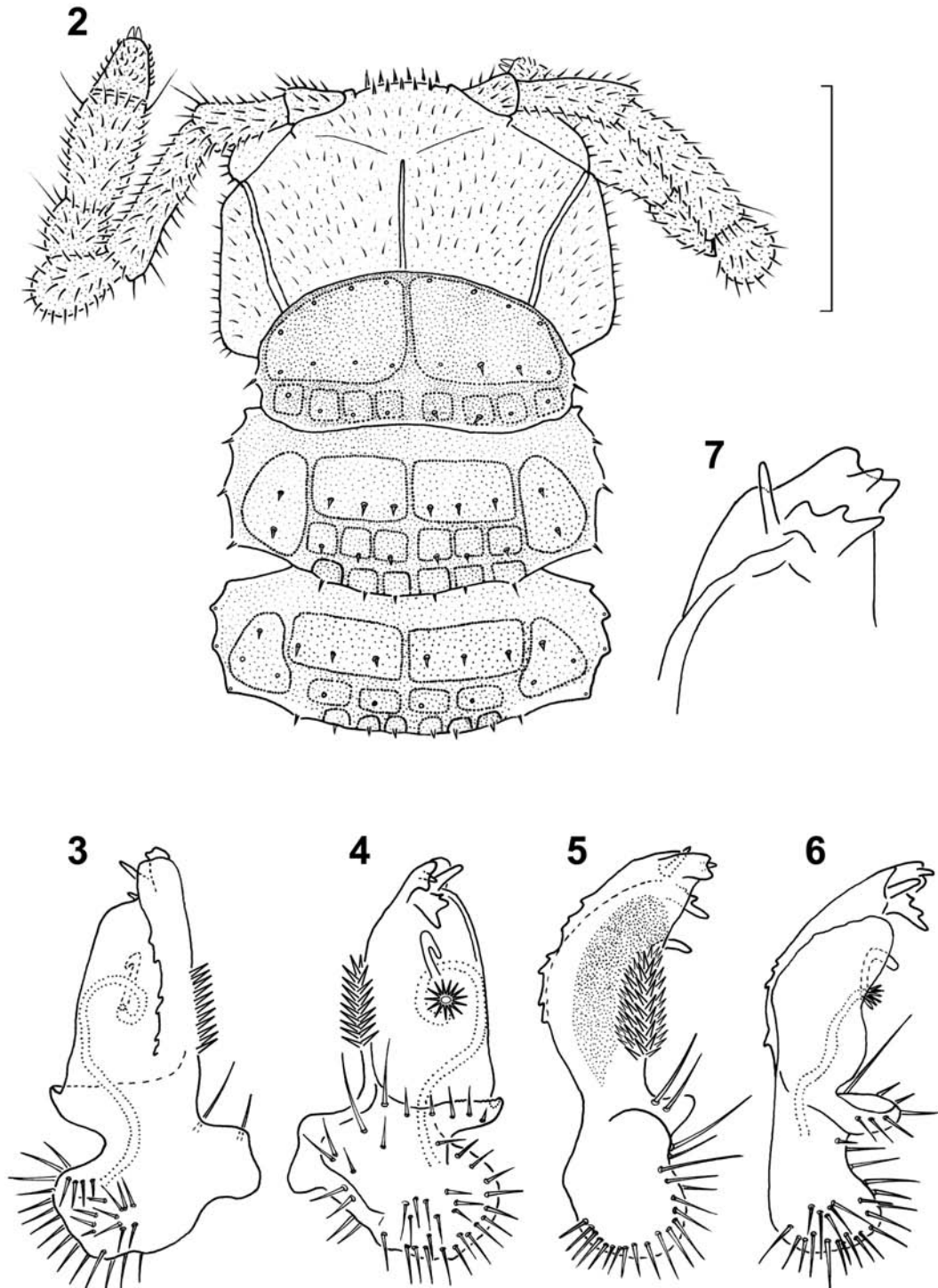
*Diagnosis* – From closely related congeners, *Brachydesmus femoralis* Makarov, 2008 and *B. vermosanus* Attems, 1929, the new species is easily distinguished by the presence of a complex tibiotarsal part. From *B. jalzici* Mršić, 1988, and *B. novaki* Mršić, 1988, the new form clearly differs by its massive and wide femoral process and external femoral field of setae that is arranged subradially.



**Fig. 1.** *Brachydesmus sjenicae* n. sp., paratype female from Ledena Pećina Cave, Sjenica, southwest Serbia (Photo by D. Antić).

*Description* – Body with 19 segments (including telson) in adults. Measurements: holotype male 9.98 mm long, width of midbody pro- and metazone (somite nine) 0.67 mm and 0.94 mm; allotype female 9.20 mm long, width of midbody pro- and metazone (somite nine) 0.65 mm and 0.91 mm; paratype female 9.69 mm long, width of midbody pro- and metazone (somite nine) 0.74 mm and 1 mm, respectively. Color whitish to pale yellow (Fig. 1).

*Head* (holotype male) (Fig. 2): broader than col- lum, densely covered with minute setae. Occipital suture clear, cheeks almost with straight margins. Three well-developed labral teeth. Labrum with six labral and 10 supralabral setae. Lingual plates with 7-8 setae (1+1 long apical setae). Stipites with 14-18 setae (4+4 apical, 6+7 median and 4+7 basal). Anten- nal length 1.70 mm. Length-to-breadth ratios of anten- nomeres I – VII: 1 (I), 1.92 (II), 2.92 (III), 2 (IV), 1.85 (V), 1.78 (VI), 1.34 (VII), respectively. Anten- nomeres IV – VII with 3, 3, 3-4 and 1 long sensitive setae, respectively. Sensitive seta on antennomere VII C-shaped. Antennomeres V and VI with apical field of numerous, medium-sized bacilliform sensil- lae, present only on dorsal side. Sensillae are situated between long sensitive seta and apical end of anten- nomeres; arranged semicircularly. Antennomere VII with evagination just below the long sensitive seta.



**Figs. 2-7.** *Brachydesmus sjenicae* n. sp., holotype male from Ledena Pećina Cave, Sjenica, southwest Serbia. 2. head with first three body segments – dorsal view; 3. gonopod – oral view; 4. gonopod – caudal view; 5. gonopod – lateral view; 6. gonopod – mesal view; 7. gonopod, apical part of tibiotarsal branch – caudal view from below. Scale lines: 1 mm for Figure 2; 0.25 mm for figures 3, 4, 5 and 6. Figure 7 without scale.

Subapically, antennomere VII with knob-supporting field of few sensitive microsetae. Apical part of antennae with four large cones.

*Collum* (Fig. 2): anterior edge semicircular, posterior one gently concave. There is one caudal incision of both lateral sides. Collum with three rows of setae; setal formula 8+8+8.

*Body segments*: gently broadening until segment VIII, then parallel-sided from segment IX to XVI and from segment XVII rapidly tapering toward the body end. Paraterga well-developed. Metazone II, III, IV, VI, VIII, XI and XIV with three incisions, while metazone V, VII, IX, X, XII, XIII, XV-XVIII with four incisions. Ozopores lateral, clearly visible, placed near caudal corner of paraterga; present on segments with four incisions. Border between pro- and metazone distinct. Surface of prozone gently tuberculated. Posterior edges of metazone dentate. Epiproct subtriangular (in dorsal view), slightly flattened dorsoventrally. Tip of epiproct rounded with four (2+2) long setae; median part of epiproct with pair of long knob-supporting setae placed dorsally. Paraproct semicircular, each with two knob-supporting setae. Hypoproct subtrapezoid, with two long paramedian knob-supporting setae at the top.

*Gonopods* (Figs. 3-7): prefemur covered with numerous setae (Figs. 3-6). Caudal side of femur with strong and wide femoral process, reaching both lateral and mesal side of gonopods (Fig. 4). Femoral-tibiotarsal part is spoon-shaped. External margin of femur with field of numerous and robust setae arranged subradially (Figs. 3-5). Long endomerite is situated above the setal cushion, apically curved and hook-shaped (Fig. 4). Medial dentate lamella is present on the oral side of tibiotarsus (Figs. 3 and 5). Denticles well developed. Apical part of tibial branch bilobed with a small triangular point above (Figs. 4 and 6). Tarsal part is also bilobed, supported with additional short process that is situated below and medially of bilobed part (Figs. 4-7). Long and thin process appears in the subapical part of tibiotarsal branch (Figs. 3-7).

*Distribution* – *B. sjenicae* n. sp. is known only from its type locality; probably an endemic species.

## DISCUSSION

Within the prolific and abundant genus *Brachydesmus* there definitely exist numerous groups of closely related species. One of the features typical for at least three groups of species is a setal field on the femoral or tibiotarsal gonopodal parts. According to this character, we distinguished the following groups of species:

- (a) *vermosanus*-group – includes five species, whose probably apomorphic character is the presence of an external femoral field with more or less long setae. Within this group of species there is a divergence into two lines. One line includes two species described by Mršić (1988), *B. jalzici* and *B. novaki*. These species have a comb-like arrangement of setae, long and thin endomerite and one or two strong basal femoral processes. The second line includes three species (*B. vermosanus*, *B. femoralis* and *B. sjenicae* n. sp.) having an external femoral field of setae which is not comb-like, but more or less subradially arranged, and with a massive and wide femoral process that reaches both the lateral and the mesal side of the gonopods. From *B. vermosanus*, the new taxa clearly differ by the presence of medial dentate lamella on the oral side of tibiotarsus (Figs. 3 and 5). The greatest similarity exists between the new species and *B. femoralis*. Both species share some similarities in gonopod structures, such as medial dentate lamella on the oral side of tibiotarsal branch (Figs. 3 and 5), and bilobed apical part of tarsal branch with short process situated below and medially (Figs. 4-7). The main difference between these two species is the presence of a long and thin process subapically on tibiotarsal branch in *B. sjenicae* n. sp. (Figs. 4-7); this process is absent in *B. femoralis*. In addition, there is a difference in the apical part of the tibial branch between these two species. In *B. femoralis* the apical part of tibial branch is trilobed with a small triangu-

lar point below, while the same structure in new taxa is bilobed with small point above (Figs. 4 and 6).

(b) *ljubetensis*-group – includes 10 species (*B. ljubetensis* Attems, 1912; *B. nemilanus* Attems, 1898; *B. polydesmoides* Verhoeff, 1895; *B. spinosus* Attems, 1903; *B. attemsi* Verhoeff, 1895; *B. dadayi* Verhoeff, 1895; *B. hastatus* Strasser, 1966; *B. magnus* Strasser, 1971; *B. avalae* Ćurčić and Makarov, 1997 and *B. pancici* Makarov and Ćurčić, 2004) in which the gonopodal setal field is situated medially on the caudal side in the border between the prefemur and femur (Attems, 1940; Strasser, 1966, 1971; Ćurčić and Makarov, 1997; Makarov et al., 2004). It is interesting that one of these 10 species, *B. hastatus*, shares some similarities with representatives of the *vermosanus*-group. Similarity is reflected in the presence of an external femoral process and a few pointed comb-shaped pins on the femur; however, the absence of endomerite and presence of short setae on the prefemur (a main characteristic of the *ljubetensis*-group) exclude this species from *vermosanus*-group of species.

(c) *jubatus*-group – includes two species, *B. jubatus* Attems, 1907 and *B. furcatus* Lohmander, 1936. The main character of this group is the field of setae situated on the oral side of the tibiotarsal branch, as well as the absence of any similar structure on the femur (Attems, 1940).

Biogeographically, representatives of the *vermosanus*-group are endemic species of the Dinaric Karst region of the Balkan Peninsula (Map 1). All species are known only from their type localities. The northernmost species is *B. femoralis*, from a cave on Tara Mountain, western Serbia, while the southernmost species are *B. jalzici* from a cave near the village Duš, south Serbia, and *B. vermosanus* from Vermoša, northern Albania. The distribution of *B. novaki* and *B. sjenicae* n. sp. are between these borders. The finding of new species confirms the hypothesis that the Balkan Peninsula is a center of genesis and diversifi-

cation of many diplopod groups, including species of the genus *Brachydesmus*.

#### A key to the *vermosanus*-group of species

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

1. External margin of femur with a field of comb-like setae. One or two femoral processes not reaching the lateral and the mesal side of gonopods.....2
  - External margin of femur with field of numerous setae, not comb-like. Massive and wide femoral process reaching both lateral and mesal sides of gonopods.....3
2. With two strong femoral processes and a split endomerite .....*Brachydesmus jalzici* Mršić, 1988
  - Only with external femoral process and a thin and pointed endomerite .....*Brachydesmus novaki* Mršić, 1988
3. Medial dentate lamella on the oral side of tibiotarsus is absent .....*Brachydesmus vermosanus* Attems, 1929
  - Medial dentate lamella on the oral side of tibiotarsus is present.....4
4. Apical part of tibial branch is bilobed with a small triangular point above. Tibiotarsal branch subapically with long and thin process .....*Brachydesmus sjenicae* n. sp
  - Apical part of tibial branch is trilobed with a small triangular point below. Long and thin process on subapical part of tibiotarsal branch is absent .....*Brachydesmus femoralis* Makarov, 2008

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