

**NEW CAVE-DWELLING SPECIES OF THE GENUS *REMYELLA* JEANNEL
(LEPTODIRINI, LEIODIDAE, COLEOPTERA) FROM SERBIA**

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Abstract — The new leiodid beetle species, *Remyella raskaе* n. sp. and *Remyella javorensis* n. sp. (both from caves in Southwest Serbia, region of Sandžak), are described and diagnosed. Adult genitalia and other taxonomically important characters are illustrated. The new species studied are clearly distinct from their closest congeners. The new forms are of Tertiary or even Pre-Tertiary age and originated during the Alpine Orogeny, which affected vast areas of the Balkan Peninsula, including the Dinarides, their terra typica. The new species represent endemic relicts inhabiting Southwest Serbia. Thorough analysis indicates that the new *Remyella* taxa originated in the proto-Balkan region; their present distributions correspond to at least a part of their primordial ranges (and habitats).

Key words: Leiodidae, *Remyella*, new species, cave fauna, Serbia

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INTRODUCTION

The genus *Remyella* Jeannel, 1931, comprises one species (*Remyella scaphoides* Jeannel) and five subspecies, which are distributed over a narrow Dinaric area (the Pešter Polje) in Serbia and Montenegro (P e r r e a u , 2000; L ö b l and S m e t a n a , 2004; Ć u r č i ć , 2005). All *Remyella* taxa are endemic and live only in cave habitats (J e a n n e l , 1931, 1934; W i n k l e r , 1933; P r e t n e r , 1968; G i a c h i n o and E t o n t i , 1995). The following *Remyella* subspecies are presently known: *R. scaphoides borensis* Winkler, 1933, inhabiting the Špela Bor Cave (village of Ugao near Tutin, Pešter Polje, Southwest Serbia), the Ledenica Cave (village of Korita near Bijelo Polje, Pešter Polje, Northeast Montenegro), the Špela Hajnit Cave (village of Ugao near Tutin, Pešter Polje, Southwest Serbia), and the Pećina u Vrh Livade Radojeve Cave (village of Korita near Bijelo Polje, Pešter Polje, Northeast Montenegro); *R. scaphoides droveniki* Giachino & Etonti, 1995, from the Pećina u Anin Kapeš Cave, the Pećina ispod Gluare Cave, the Uleva Pećina Cave, and the Uleva

Pećina III Cave (all in the village of Doliće near Sjenica, Pešter Polje, Southwest Serbia); *R. scaphoides hussoni* Jeannel, 1934, inhabiting the Pećina u Hamidovoj Vrtači Cave (village of Doliće near Tutin, Pešter Polje, Southwest Serbia); *R. scaphoides propiformis* Winkler, 1933, from the Špela Maja Hajne Cave and the Kršikuće Cave (both in the village of Ugao near Tutin, Pešter Polje, Southwest Serbia); and *R. scaphoides scaphoides* Jeannel, 1931, inhabiting the Velika Pećina Cave (village of Grgaje near Sjenica, Pešter Polje, Southwest Serbia) (P e r r e a u , 2000; J e a n n e l , 1931, 1934; W i n k l e r , 1933; P r e t n e r , 1968; G i a c h i n o and E t o n t i , 1995; G u é o r g u i e v , 1990).

A field trip organized by the Center for Biospeleology of Southeast Europe (Belgrade) in Southwest Serbia (the region of Sandžak) resulted in the discovery of two new species of the genus *Remyella* Jeannel: *Remyella raskaе* n. sp. and *Remyella javorensis* n. sp. The present study gives descriptions and diagnoses of the new species of the genus *Remyella*. The diagnosis of *Remyella raskaе* n. sp. is

based on thorough analysis of the type series of six males and four females, collected during 2005 in the Pećina na Vrelu Raške Cave near Novi Pazar, Pešter Polje, Southwest Serbia. The diagnosis of *Remyella javorensis* n. sp. is based on thorough analysis of the type series of seven males and 27 females, collected during 2005 in the Baždarska Pećina Cave, village of Ursule, Mt. Javor, near Sjenica, Southwest Serbia.

MATERIAL AND METHODS

The specimens of *Remyella raskae* n. sp. were collected by hand in the Pećina na Vrelu Raške Cave near Novi Pazar, Pešter Polje, Southwest Serbia, while those of *Remyella javorensis* n. sp. were collected (also by hand) in the Baždarska Pećina Cave, village or Ursule, Mt. Javor near Sjenica, Southwest Serbia.

The type specimens were analyzed in laboratories of the Department of Conservation Biology, Vegetation- and Landscape Ecology, Faculty of Life Sciences, University of Vienna; they were dissected, thoroughly studied, and illustrated. Dry examples were stuck on both paper and plastic labels, and male and female genital structures were fixed in Canada balsam.

All taxonomically important morphological characters were studied for comparison. Binocular stereomicroscopes of the Wild M3C and Nikon SMZ-U types were used here, along with a Nikon Coolpix 4500 digital camera with a special monitor attached.

RESULTS AND DISCUSSION

LEIODIDAE FLEMING, 1821

REMYELLA JEANNEL, 1931

REMYELLA RASKAE S. ĆURČIĆ & B. ĆURČIĆ, NEW SPECIES (Figs. 1-2)

Etymology. – After the Raška River (Southwest Serbia), which runs through the investigated cave habitat.

Material examined. – Holotype male, from the Pećina na Vrelu Raške Cave near Novi Pazar, Pešter

Polje, Southwest Serbia, 23.8.2005, leg. S. Ćurčić; five paratype males and four paratype females, same data as holotype, leg. S. Ćurčić and B. Ćurčić. The type specimens are deposited in the collection of the Center for Biospeleology of Southeast Europe, Belgrade, Serbia (CBSEE-06/18-27).

Diagnosis. – The new species clearly differs from all its congeners. There are two species morphologically most similar to it, all from underground habitats in Southwest Serbia and Northeast Montenegro. However, there are numerous distinctions between the three analyzed species, and they are presented below. Thus, *Remyella raskae* n. sp. clearly differs from both *R. scaphoides* and *R. javorensis* n. sp. in body size (4.21 mm vs. 4.60-5.50 mm vs. 4.75 mm); integument color (pale, yellowish-brown vs. pale, yellowish vs. darker, reddish-brown); the head width/length ratio (0.81 vs. 0.63-0.78 vs. 0.81); the head/pronotum width ratio in males (1.04 vs. 0.88-1.10 vs. 0.98); the antennae/elytra length ratio (1.81 vs. 1.98-2.26 vs. 1.66); the antennae/body length ratio (1.22 vs. 1.15-1.31 vs. 1.10); length of antennomeres I and II (equally long vs. antennomere II somewhat longer than antennomere I vs. antennomere II somewhat shorter than antennomere I); form of antennomere II (narrow vs. narrow vs. widened distally); length of antennomere VIII (shorter than antennomeres VII and IX vs. of the same length as antennomeres VII and IX vs. shorter than antennomeres VII and IX); the width/length ratio of pronotum in males and females (0.74; 0.75 vs. 0.73-0.91; 0.80-0.96 vs. 0.74; 0.77); pronotal maximum width (slightly below level of its half-way point vs. in the fore half vs. at level of its half-way point); the elytral width/length ratio in males and females (0.41; 0.42 vs. 0.34-0.45; 0.39-0.47 vs. 0.42; 0.45); the elytral length/height ratio in males and females (3.24; 3.16 vs. 3.23-4.27; 2.86-3.90 vs. 3.17; 2.89); form and setation of the apical part of male abdominal sternite IX (urite) (rounded and less setose vs. flattened/rounded and more setose vs. rounded and more setose); shape of spiculum of the eighth ventrite in females (onion-shaped vs. ginkgo leaf-shaped vs. ginkgo leaf-shaped); form of the median lobe (widened below apex, strongly narrowing apically in lateral view, its apex not dragged, and its lateral sides slightly concave apically vs. widened



Figs. 1-2. *Remyella raskaе* n. sp., from the Pećina na Vrelu Raške Cave, near Novi Pazar, SW Serbia. 1 - holotype male; 2 - aedeagus, holotype male. Scales = 1.00 mm (Fig. 1) and 0.10 mm (Fig. 2).

below apex/with sub-parallel sides, strongly/gradually narrowing apically in lateral view, its apex sub-acute and dragged, and its lateral sides mostly straight apically vs. widened below apex, strongly narrowing apically in lateral view, its apex not dragged, and its lateral sides slightly concave apically); length of the median lobe (not reaching level of proximal dorsal parameral seta vs. mostly reaching level of proximal dorsal parameral seta vs. reaching level of proximal dorsal parameral seta); distribution of the parameral setae (all setae equidistant vs. ventral parameral seta situated mostly at level between two dorsal setae/closer to preapical dorsal seta, rarely closer to proximal dorsal seta vs. all setae equidistant); form of the inner sac (with well-sclerotized phanerae, its outer part carrying two weak sclerifications sub-apically vs. mostly with weakly-sclerotized phanerae, its outer part rarely with two weak sclerifications sub-apically vs. with well-sclerotized phanerae, its outer part carrying two weak sclerifications sub-apically); form of the tegumen (relatively elongated vs. relatively elongated/rounded vs. relatively elongated); position of the outer gonostyl seta (situated at level of the first inner seta vs. situated at level between the first and second inner setae vs. situated at level of the first inner seta); form of the spermatheca (more elongated, slightly widening distally vs. not so elongated, less widening distally vs. less curved, tube-shaped, with a small rounded top); and species distribution (Pešter Polje vs. Pešter Polje vs. Mt. Javor) (Jeannel, 1931, 1934; Winkler, 1933; Giachino and Etoni, 1995) (Figs. 1-4).

Description. – Medium-sized. Body length: 4.21 mm (3.88-4.45 mm). Body scaphoid; elytra elongated, convex, and without physogastry (Fig. 1). Body color yellowish-brown. Tegument shiny. Both head and pronotum with polygonal microsculptures.

Head elongated, its width/length ratio: 0.81 (0.76-0.86), both shorter and wider than pronotum (head/pronotum width ratio in males: 1.04), narrowing posteriorly, with somewhat concave genae, eyeless, covered with sparsely distributed short yellowish setae and punctures (Fig. 1). Antennae long and thin, longer in males than in females, 1.22 (1.03-1.39) times longer than the body itself, 1.81 (1.47-2.10) times longer than elytra. Antennomeres I

and II equally long, antennomere III 1.78 (1.70-1.82) times longer than antennomere II. Antennomeres IV-VI longer than the preceding ones, antennomere IV being somewhat longer than the others. Antennomere VIII both shorter and narrower than antennomeres VII and IX.

Pronotum sub-bell-shaped, longer than wide, somewhat wider in females; its width/length ratio: 0.74 (0.71-0.76) in ♂♂ and 0.75 (0.74-0.76) in ♀♀; with maximum width slightly below level of its middle portion, much narrower than elytra, covered with sparsely distributed short yellowish setae (Fig. 1). With finely margined lateral sides, which are somewhat narrowing anteriorly and sinuated posteriorly. Hind angles rectangular. Pronotal base finely margined, straight, somewhat shorter than slightly convex anterior margin. Disk regularly convex, with sparse punctuation. Mesothoracic epimera and episterna coalesced. Mesocoxal cavities closely positioned. Mesosternal intercoxal apophysis not reaching anterior border of metasternum. Without mesosternal carina. Metasternal intercoxal apophysis wide, with separate posterior processes.

Elytra scaphoid, very elongated, convex, larger in females than in males; the width/length ratio: 0.41 (0.40-0.42) in ♂♂ and 0.42 (0.39-0.44) in ♀♀; the length/height ratio: 3.24 (3.07-3.41) in ♂♂ and 3.16 (2.69-3.40) in ♀♀; with maximum width at level of their half-way point (Fig. 1). Scutellum well-developed; sutural striae absent; elytral apices not covering pygidium in males. Disk covered with densely distributed relatively deep punctures and long, recumbent, yellowish hairs.

Legs very long and thin, with femora strongly dilated basally. Protibiae apically curved exteriorwards, with setose apical border and inner polydentate spine each. Meso- and metatibiae straight. Protarsi pentamerous and not dilated in males (Fig. 1).

Abdomen with seven visible segments in males and six in females. Male abdominal sternite IX (urite) complete, in form of weakly sclerotized pleuro-tergite with membranous area ventrally, carrying a few setae apically. Spiculum of eighth ventrite in females wide, onion-shaped, with thin base and rounded top.

Aedeagus small, weakly sclerotized, with straight median lobe in lateral view, narrowing distally, with flattened apex curved dorsally (Fig. 2). Median lobe wide and stout dorsally, narrowing gradually at first and then suddenly to form a subacute apex distally. Paramerae somewhat curved exteriorwards and narrowing distally, longer than median lobe (Fig. 2). Parameral setae subequal and equidistant: one preapical dorsal, one proximal dorsal, and one ventral. Tegumen well-sclerotized, somewhat elongated, with hyaline rounded ventral lamina. Inner sac leaving median lobe ventrally and exceeding its length, carrying two weak sclerifications subapically. Endophalus in form of two median sclerified phanerae and a basal phanera at the place of ductus insertion in the inner sac.

Gonostyli straight. Each stylus with a single apical seta, three inner setae, and one outer seta. Two inner setae close-set, while the third inner seta is well-distanced. Outer seta situated at level of first inner seta. Spermatheca small, completely hyaline, not sclerified, elongately curved, with rounded dilated apex. Ductus long and thin; accessory gland in hyaline form.

Bionomy and distribution. – This species was found under stones and on walls in the middle part of the Pećina na Vrelu Raške Cave near Novi Pazar, Pešter Polje, Southwest Serbia. We noticed that the new species prefers wet cave walls and floor around the bed of the Raška River, which runs through the cave. This beetle feeds on filtrated organic matter found on the cave's wet walls and floor.

The new species probably belongs to an old phyletic lineage of Tertiary (or Pre-Tertiary) origin. This species is both relict and endemic to Southwest Serbia, like other known *Remyella* taxa inhabiting some cave habitats in a limited area of the Dinarides in the Western Balkans (G u é o r g u i e v, 1977).

REMYELLA JAVORENSIS S. ĆURČIĆ & B. ĆURČIĆ,
NEW SPECIES (Figs. 3-4)

Etymology. – After Mt. Javor (Southwest Serbia), its terra typica.

Material examined. – Holotype male, from the

Baždarska Pećina Cave, village of Ursule, Mt. Javor, near Sjenica, Southwest Serbia, 25.8.2005, leg. S. Ćurčić; six paratype males and 27 paratype females, same data as holotype, leg. S. Ćurčić, B. Ćurčić, and N. Ćurčić. All type specimens are deposited in the collection of the Center for Biospeleology of Southeast Europe, Belgrade, Serbia (CBSEE-06/27-60).

Diagnosis. – The new species clearly differs from all its congeners. There are two species phenetically most similar to it, both from underground habitats in Southwest Serbia and Northeast Montenegro: *R. scaphoides* and *R. raskae* n. sp. The numerous distinctions between the three analyzed species are presented above in the diagnosis of *Remyella raskae* n. sp.

We maintain that the genus *Remyella* is in need of a new revision that will definitely show the real status of all its congeners. Most present subspecies of this genus each deserve a higher (species) rank in future classification. However, we still lack sufficient data on some mostly morphological and anatomical characters (shape of the head, length and shape of certain antennomeres, shape of the urite and spiculum, shape of the aedeagus, length and form of the paramerae, form of the inner sac with the copulatory piece, and form of the female genitalia) to prove our assertion. Only after detailed study based on a larger sample of the analyzed leptodirines will it be possible to ascertain the real status of all taxa belonging to the genus *Remyella*.

Description. – Medium-sized. Body length: 4.75 (4.21-5.00) mm. Body scaphoid; elytra elongated, convex, and without physogastry (Fig. 3). Body color reddish-brown. Tegument shiny. Both head and pronotum with polygonal microsculptures.

Head elongated, its width/length ratio: 0.81 (0.73-0.85), shorter and narrower than pronotum (the head/pronotum width ratio in males: 0.98), narrowing posteriorly, with somewhat concave genae, eyeless, covered with sparsely distributed short yellowish setae and punctures (Fig. 3). Antennae long and thin, longer in males than in females, 1.10 (0.94-1.39) times longer than the body itself, 1.66 (1.40-2.12) times longer than elytra. Antennomere II widening distally, shorter than antennomeres I



Figs. 3-4. *Remyella javorensis* n. sp., from the Baždarska Pećina Cave, village of Ursule, Mt. Javor, near Sjenica, SW Serbia. 3 - holotype male, habitus; 4 - aedeagus, holotype male. Scales = 1.00 mm (Fig. 3) and 0.10 mm (Fig. 4).

and III; antennomere III 1.77 (1.56-1.94) times longer than antennomere II. Antennomeres IV-VI longer than the preceding ones, antennomere IV being somewhat longer than the others. Antennomere VIII shorter and narrower than antennomeres VII and IX.

Pronotum sub-bell-shaped, longer than wide, somewhat wider in females; its width/length ratio: 0.74 (0.71-0.75) in ♂♂ and 0.77 (0.73-0.80) in ♀♀; with maximum width at level of its half-way point, much narrower than elytra, covered with sparsely distributed short yellowish setae (Fig. 3). With finely margined lateral sides, which are somewhat tapered anteriorly and sinuated posteriorly. Hind angles rectangular. Pronotal base finely margined, straight, somewhat shorter than slightly convex anterior margin. Disk regularly convex, with sparse punctuation. Mesothoracic epimera and episterna coalesced. Mesocoxal cavities closely positioned. Mesosternal intercoxal apophysis not reaching anterior border of metasternum. Without mesosternal carina. Metasternal intercoxal apophysis wide, with separate posterior processes.

Elytra scaphoid, very elongated, convex, larger in females than in males; the width/length ratio: 0.42 (0.40-0.46) in ♂♂ and 0.45 (0.41-0.49) in ♀♀; the length/height ratio: 3.17 (3.06-3.30) in ♂♂ and 2.89 (2.54-3.14) in ♀♀; with maximum width at level of their half-way point (Fig. 3). Scutellum well-developed; sutural striae absent; elytral apices not covering pygidium in males. Disk covered with densely distributed relatively deep punctures and long, recumbent, yellowish hairs.

Legs very long and thin, with femora thickened basally. Protibiae apically curved exteriorwards, with setose apical border and inner polydentate spine each. Meso- and metatibiae straight. Protarsi pentamerous and not dilated in males.

Abdomen with seven visible segments in males and six in females. Male abdominal sternite IX (urite) complete, in form of weakly sclerotized pleuro-tergite with membranous area ventrally, carrying a few setae apically. Spiculum of eighth ventrite in females wide, ginkgo leaf-shaped, with thin base and rounded top.

Aedeagus small, weakly sclerotized, with straight median lobe in lateral view, narrowing distally, with flattened apex curved dorsally (Fig. 4). Median lobe wide and stout dorsally, narrowing gradually at first and then suddenly to form a subacute apex distally. Paramerae somewhat curved exteriorwards and narrowing distally, longer than median lobe (Fig. 4). Parameral setae subequal and equidistant: one preapical dorsal, one proximal dorsal, and one ventral. Tegumen well-sclerotized, somewhat elongated, with hyaline rounded ventral lamina. Inner sac leaving median lobe ventrally and exceeding its length, carrying two weak sclerifications subapically. Endophalus in form of two median sclerified phanerae and a basal phanera at the place of ductus insertion in the inner sac.

Gonostyli straight. Each stylus with a single apical seta, three inner setae, and one outer seta. Two inner setae close-set, while the third inner seta is well-distanced. Outer seta situated at level of first inner seta. Spermatheca small, completely hyaline, not sclerified, elongately curved, with rounded dilated apex. Ductus long and thin; accessory gland in hyaline form.

Bionomy and distribution. – This species was found on the wet floor and both under and on stones in the posterior part of the Baždarska Pećina Cave, village of Ursule, Mt. Javor, near Sjenica, Southwest Serbia. This beetle feeds on filtrated organic matter found on the cave's wet floor and rocks.

The new species probably belongs to an old phyletic lineage of Tertiary (or Pre-Tertiary) origin. This species is both relict and endemic to Mt. Javor in Southwest Serbia. The endemic differentiation of *Remyella* and its related genera on the Balkan Peninsula was facilitated by the great Alpine Orogeny, paleoclimatic events, and subsequent evolution of the underground karstic relief, which yielded many new epigeal and hypogean niches suitable for the preservation of this old and autochthonous fauna.

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Ultrastructure Research, Faculty of Life Sciences, University of Vienna) for their valuable help in taking digital photos of the analyzed beetles. Last but not least, we also appreciate the help of Dr. Heinrich Schönmann (Natural History Museum, Vienna), who loaned us different *Remyella* taxa important for comparison with the new species. This study was financially supported by the Serbian Ministry of Science (Grant No. 143053).

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НОВЕ ПЕЋИНСКЕ ВРСТЕ РОДА *REMYELLA* JEANNEL (LEPTODIRINI, LEIODIDAE, COLEOPTERA) ИЗ СРБИЈЕ

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Нове врсте лејодида, *Remyella raskaе* n. sp. и *Remyella javorensis* n. sp. (обе из пећина југозападне Србије, регион Санџака), описане су и дијагностификоване. Гениталије адулата и други битни таксономски карактери су илустровани. Студиране нове врсте су јасно различите од других блиских врста у оквиру рода. Нове форме су терцијарне или чак претерцијарне старости и настале су током алпијске орогенезе, која је

обухватила простране области Балканског полуострва, у оквиру кога се и налазе њихови типски локалитети. Нове врсте представљају ендемичне реликте који насељују југозападну Србију. Потпуна анализа указује да су нови таксони из рода *Remyella* Jeannel настали у региону прото-Балкана; њихово садашње распрострањење одговара бар делу њихових првобитних ареала (и станишта).