

**ON SOME NEW CAVE-DWELLING GROUND BEETLES
(COLEOPTERA: CARABIDAE: TRECHINI) FROM EASTERN SERBIA**

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Abstract – The following new cavernicolous ground beetle taxa are described from three caves in eastern Serbia: *Duvalius* (*Paraduvalius*) *trifunovici* sp. n., from the Mandina Pećina Cave, village of Zlot, near Bor, Kučajske Planine Mts., *D. (P.) rtanjensis* sp. n., from the Golema Porica Pit, Mt. Rtanj, and *Glabroduvalius* gen. n., *G. tupiznicensis* sp. n., from the Gornja Lenovačka Pećina Cave, village of Lenovac, near Zaječar, Mt. Tupižnica. The new taxa are easily distinguished from related organisms. All important morphological features have been listed, along with the diagnoses and illustrations of the taxa. The new taxa are relicts and endemics of eastern Serbia and probably belong to old phyletic lineages of Tertiary or even pre-Tertiary origin.

Key words: Carabidae; Trechini; *Glabroduvalius*; *Duvalius*; *Paraduvalius*; new genus; new species; cave fauna; eastern Serbia

INTRODUCTION

Altogether 28 species and 3 subspecies of the subgenus *Paraduvalius* Knirsch, 1924 (genus *Duvalius* Delarouzée, 1859) are presently known. They inhabit eastern Serbia, northern and southern Bulgaria, and northeastern Greece (Moravec et al., 2003; Guéorguiev, 2004, 2005; Guéorguiev and Lobo, 2006; Janák and Moravec, 2008). Of these, only two species have been established in Serbia so far – *Duvalius* (*Paraduvalius*) *winkleri* (Jeannel, 1923) (from the Ravna Peć Cave, village of Prekonoga, near Svrlijig, Svrlijske Planine Mts.) and *D. (P.) stankovitchi* (Jeannel, 1923) (from a few caves on Kučajske Planine Mts.). The latter species comprises three subspecies: *D. (P.) stankovitchi stankovitchi* (Jeannel, 1923) (from the Ravanička Pećina Cave, village of Senje,

near Ćuprija), *D. (P.) stankovitchi georgevitchi* (Jeannel, 1923) (from the Lazareva Pećina Cave, village of Zlot, near Bor), and *D. (P.) stankovitchi devojensis* (Jeannel, 1923) (from the Devojačka Pećina Cave, village of Podgorac, near Boljevac) (Jeannel, 1923, 1928; Moravec et al., 2003).

In recent years, several new trechine genera have been described from Serbia – *Serboduvalius* Ćurčić, Pavićević & Ćurčić, 2001, *Rascioduvalius* Ćurčić, Brajković, Mitić & Ćurčić, 2003, *Curcicia* Ćurčić & Brajković, 2003, and *Javorella* Ćurčić, Brajković & Ćurčić, 2003 (Ćurčić et al., 2001, 2003b, 2003c; Ćurčić and Brajković, 2003). Certain regions of eastern, western, and southern Serbia remain unexplored, where some new trechine taxa can be expected to be found in the future.



Fig. 1. *Duvalius (Paraduvalius) trifunovici* sp. n. from the Mandina Pećina Cave, village of Zlot, near Bor, Kučajske Planine Mts., eastern Serbia. Holotype male, habitus (dorsal view). Scale = 1.00 mm.

Some field trips in eastern Serbia, organized by the Institute of Zoology, University of Belgrade – Faculty of Biology in 2012, resulted in the discovery of four new trechine taxa: a genus and three species. Descriptions and diagnoses of the new trechine taxa are given in the present study. The diagnoses of *Du-*

valius (Paraduvalius) trifunovici sp. n. and *D. (P.) rtanjensis* sp. n. are based on a thorough analysis of the type series of three males each collected in the Mandina Pećina Cave, Kučajske Planine Mts., near Bor and the Golema Porica Pit, Mt. Rtanj, respectively, while the diagnoses of *Glabroduvalius* gen. n. and *G. tupiznicensis* sp. n. are based on a thorough analysis of the type series of two males and a female collected in the Gornja Lenovačka Pećina Cave, Mt. Tupižnica, near Zaječar.

MATERIALS AND METHODS

The ground beetle specimens were analyzed in the laboratories of the Institute of Zoology, University of Belgrade – Faculty of Biology, Belgrade, Serbia. The genitalia were removed from the bodies and fixed on microscope slides in a medium composed of Canada balsam and xylol. Afterwards the beetles were glued onto paper labels and then analyzed as dry specimens. All taxonomically important morphological characters were studied for comparison. A Carl Zeiss Stemi 2000 binocular stereomicroscope and Carl Zeiss Axioskop 40 microscope with a Canon PowerShot A80 digital camera attached were used in this study. Additionally, Canon PowerShot SX 130 IS and Canon EOS 400D digital cameras were used for photographing whole specimens.

RESULTS AND DISCUSSION

FAMILY CARABIDAE LATREILLE, 1802

SUBFAMILY TRECHINAE BONELLI, 1810

TRIBE TRECHINI BONELLI, 1810

GENUS DUVALIUS DELAROUZÉE, 1859

SUBGENUS PARADUVALIUS KNIRSCH, 1924

DUVALIUS (PARADUVALIUS) TRIFUNOVICI
VRBICA, S. ČURČIĆ, ANTIĆ & B. ČURČIĆ, SP. N.
(Figs. 1-4)

Etymology – After Mr. Zvonko Trifunović, president



Figs. 2-4. *Duvalius (Paraduvalius) trifunovici* sp. n. from the Mandina Pećina Cave, village of Zlot, near Bor, Kučajske Planine Mts., eastern Serbia. 2 - holotype male, aedeagus (lateral view); 3 - holotype male, aedeagus (dorsal view); 4 - holotype male, abdominal sternite IX (urite). Scales = 0.20 mm.

of the Rock and Ice Society of Extreme Sports (Bor, Serbia).

Type locality – Mandina Pećina Cave, village of Zlot, near Bor, Kučajske Planine Mts., eastern Serbia, 27 May 2012, holotype male collected by hand, leg. S. Ćurčić; *idem*, 23 June 2012, two paratype males collected by hand and from pitfall traps with rotten meat as bait, leg. S. Ćurčić. The type specimens are deposited in the collection of the Institute of Zoology, University of Belgrade – Faculty of Biology, Belgrade, Serbia (IZFB-13/32-34).

Diagnosis – *Duvalius (Paraduvalius) trifunovici* sp. n. clearly differs from its closest congeners from underground habitats in eastern Serbia. These are *Duvalius (Paraduvalius) stankovitchi*, *D. (P.) winkleri*, and *D. (P.) rtanjensis* sp. n. However, there are numerous distinctions between the new species and the other three species. *D. (P.) trifunovici* sp. n. is easily distinguished from *D. (P.) stankovitchi* by its smaller size (4.47-4.94 mm vs. 5.00-6.20 mm), length/width ratio of the head (wider than long vs. equal length and width) and the pronotum (wider than long vs. longer than wide), shape of the posterior pronotal angles (somewhat obtuse angled vs. almost right-angled), length/width ratio of the elytra (1.69 times as long as wide vs. 2.00 times as long as wide), number of well-depressed elytral striae (three inner ones vs. four inner ones), position of the first pair of elytral discal setae (on third elytral striae vs. on fourth elytral interstriae), and size and shape of the aedeagus (medium-sized, almost forming a right angle somewhat after its basal third, then almost straight, median lobe slightly narrowing towards the apex, less abruptly narrowing apically, basal bulb rounded vs. massive, elongated, abruptly bent around its basal third, convex dorsally in that part, then straight, median lobe of a constant width towards the apex, more abruptly narrowing apically, basal bulb with a basal narrowing), and copulatory piece (as long as two-thirds of aedeagus length, widening medially, then narrowing towards the apex, apex acute vs. as long as three-fourths of aedeagus length, of a constant width, apically narrowing, apex obtuse) (Jeannel, 1923, 1928; present study).

Duvalius (Paraduvalius) trifunovici sp. n. is easily distinguished from *D. (P.) winkleri* by its bigger size (4.47-4.94 mm vs. 4.20 mm), length/width ratio of the head (wider than long vs. equal length and width), form of the eyes (ellipsoid, with a darkened border vs. in the form of a whitish elongated ring, with no trace of pigment), length of the antennae (exceeding slightly over the mid-elytra level vs. almost reaching the mid-elytra level), length/width ratio of the pronotum (wider than long vs. longer than wide), shape of the posterior pronotal angles (somewhat obtuse angled vs. somewhat acute), presence of hairs on the pronotum (present vs. absent), position of the first pair of pronotal setae (at the anterior third of pronotal length vs. slightly below the anterior fourth of pronotal length), shape of the shoulders (slightly elevated vs. fairly prominent), position of the first pair of elytral discal setae (around the anterior fourth of elytral length, at the level of the fourth humeral setae vs. around the anterior fifth of elytral length, above the level of the third humeral setae), size of the legs as compared to the body size (long vs. short), and size and shape of the aedeagus (medium-sized, almost forming a right angle somewhat after the basal third, then almost straight, median lobe slightly narrowing towards the apex, abruptly narrowing apically, basal bulb massive, rounded vs. massive, elongated, curved over the whole of its length, with a sub-apical widening, then gradually narrowing apically, apex obtuse, basal bulb medium-sized), and copulatory piece (as long as two-thirds of aedeagus length, elongated and thin, apically pointed, with no spines vs. as long as a third of aedeagus length, short and wide, triangular, with a large number of fine spines apically) (Jeannel, 1923, 1928; present study).

Duvalius (Paraduvalius) trifunovici sp. n. is easily distinguished from *D. (P.) rtanjensis* sp. n. by its bigger size (4.47-4.94 mm vs. 4.29-4.41 mm), body color (reddish-brown vs. light brown), size and form of the eyes (0.12 mm long, 0.06 mm wide, ellipsoid vs. 0.10 mm long, 0.03 mm wide, lenticular), number of the ommatidia (15-20 vs. 6-8), length of the antennae (exceeding slightly over the middle of the elytra vs. almost reaching the middle of the elytra), shape of the posterior pronotal angles (somewhat obtuse-

angled *vs.* almost right-angled), shape of the posterior pronotal margin (straight *vs.* slightly concave medially), position of the first pair of pronotal setae (at the anterior third of pronotal length *vs.* around the anterior fourth of pronotal length), shape of the shoulders (slightly elevated, rounded *vs.* lowered, obtuse-angled), distance between the humeral setae and the position (the longest distance between the second and third setae, the shortest distance between the third and fourth setae; the second seta right next to the marginal furrow, the first seta slightly away from the furrow *vs.* humeral setae equidistant; first and second setae located at the edge of the marginal furrow), length/width ratio of the elytra (1.69 times longer than wide *vs.* 1.73 times longer than wide), the position of the first pair of elytral discal setae (around the anterior fourth of elytral length, at the level of the fourth humeral setae *vs.* around the anterior fifth of elytral length, at the level of the second humeral setae), and size and shape of the aedeagus (longer, almost forming a right angle somewhat after the basal third, then almost straight, median lobe slightly narrowing towards the apex, basal bulb massive *vs.* shorter, regularly curved, slightly convex dorsally in the middle, basal bulb medium-sized), copulatory piece (as long as two-thirds of aedeagus length, unifid, apically pointed *vs.* slightly shorter than half of aedeagus length, bifid, apex in the form of two slightly pronounced lobes), and urite (slightly longer than the aedeagus, more elongated *vs.* scarcely shorter than the aedeagus, less elongated) (present study).

Description – Medium-sized. Total body length (without mandibles) 4.47-4.94 mm. Body elongated, covered with hairs of moderate length. Body color reddish-brown. Head and pronotum each with a polygonal microsculpture (Fig. 1).

Head stout, rounded, slightly wider than long. Frontal furrows deep, complete, and arcuate. Hairs lacking, except for cheeks. Cheeks convex. Eyes reduced, small, 0.12 mm long and 0.06 mm wide, ellipsoid, with a darkened border, composed of 15-20 depigmented ommatidia. An arcuated preocular furrow present. Mentum tooth bifid. Antennae of

moderate length, exceeding slightly over the middle of elytra. Antennomere II shorter than antennomere IV. Antennal article XI about three times as long as wide (Fig. 1).

Pronotum small, wider than long, sub-cordate, widest around the anterior fourth, slightly wider than head, narrowing towards the base. Anterior pronotal margin slightly concave. Anterior pronotal angles prominent and rounded. Lateral pronotal margins rounded anteriorly and somewhat concave posteriorly. Posterior pronotal angles prominent, somewhat obtuse-angled, sharp. Posterior pronotal margin mostly straight. Pronotal disc convex, with a median furrow. Marginal furrows narrow and shallow. Basal foveae wide, deep, and slightly punctate (Fig. 1).

Elytra elongated, ovoid, 1.69 times as long as wide, widest slightly below the mid level. Shoulders rounded, slightly elevated. Elytral apex rounded. Marginal furrows narrow and deep. Elytral disc slightly convex. First three inner striae developed, well depressed. Outer striae present in a form of more or less pronounced rows of points. Inner interstitial spaces convex.

Legs long and thin. Fore tibiae with a longitudinal fissure each. Male protarsi I and II dilated (Fig. 1).

Chaetotaxy: Head with two pairs of supraorbital setae. Pronotum with two pairs of pronotal setae. The first pair located at the anterior third, while the second pair situated in posterior pronotal angles. Each humerus with four setae. The longest distance is between the second and third setae, the shortest distance is between the third and fourth. The second seta right next to the marginal furrow. First, third, and fourth setae away from the furrow, with the first one being closest to it, while the fourth one is farthest from it. Two discal setae on each elytron. The first pair of elytral discal setae situated on third striae, around the anterior fourth of elytral length, at the level of the fourth humeral setae. The second pair of elytral discal setae situated on third striae, somewhat below the mid-elytra level (Fig. 1).

Aedeagus medium-sized, almost forming a right angle somewhat after the basal third, then almost straight (lateral view) (Fig. 2). Median lobe basally slightly curved, then straight, at first gradually narrowing towards the apex, then abruptly narrowing apically. Apex flattened (lateral view). Basal bulb massive, rounded (Fig. 2). Dorsally median lobe straight, with a rounded apex (Fig. 3). Aedeagus sub-apically with a very slight dorsal widening, then narrowing towards the apex (Fig. 3). Paramerae moderately wide, narrowing towards the apices, with four setae each (Figs. 2 and 3). Copulatory piece nearly as long as two-thirds of the length of the aedeagus, strongly chitinized, gutter-shaped, unific, apically pointed.

Urite (male abdominal sternite IX) elongated, sub-triangular, slightly longer than the aedeagus (Fig. 4).

Female genitalia unknown since no females were found.

Bionomy and distribution – The new species was found on the floor, under rocks and a piece of rotten wood, as well as in pitfall traps baited with rotten meat in the middle part of the Mandina Pećina Cave, village of Zlot, near Bor, Kučajske Planine Mts., eastern Serbia. For the time being, the species is known only from the type locality.

Remarks – The new species belongs to the “*stankovitchi*” group of species based on the shape of the elytra, presence of unpronounced shoulders (rounded, not angled), absence of laid hairs on the vertex, and presence of a longitudinal fissure on the fore tibiae and the first elytral discal setae located below the level of the third humeral setae (Guéorguiev, 1971).

DUVALIUS (PARADUVALIUS) RTANJENSIS
VRBICA, S. ČURČIĆ, ANTIĆ & B. ČURČIĆ, SP. N.
(Figs. 5-8)

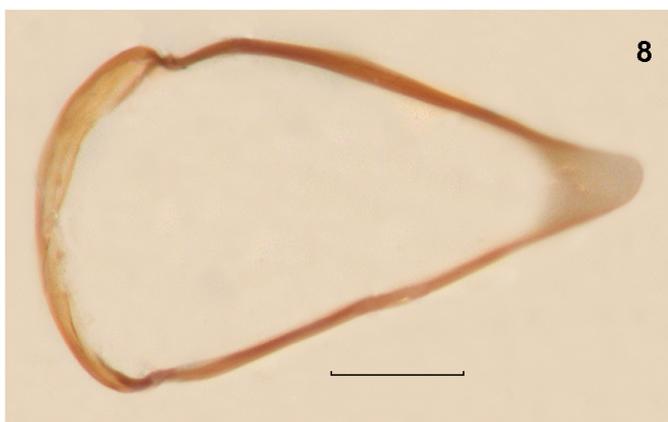
Etymology – After Mt. Rtanj, its *terra typica*.

Type locality – Golema Porica Pit, Mt. Rtanj, eastern Serbia, 29 May 2012, holotype male collected by



Fig. 5. *Duvalius (Paradualius) rtanjensis* sp. n. from the Golema Porica Pit, Mt. Rtanj, eastern Serbia. Holotype male, habitus (dorsal view). Scale = 1.00 mm.

hand, leg. D. Antić; *idem*, 22 September 2012, two paratype males collected from pitfall traps with rotten meat as bait, leg. S. Čurčić. The type specimens are deposited in the collection of the Institute of Zo-



Figs. 6-8. *Duvalius (Paraduvalius) rtanjensis* sp. n. from the Golema Porica Pit, Mt. Rtanj, eastern Serbia. 6 - holotype male, aedeagus (lateral view); 7 - holotype male, aedeagus (dorsal view); 8 - holotype male, abdominal sternite IX (urite). Scales = 0.20 mm.

ology, University of Belgrade – Faculty of Biology, Belgrade, Serbia (IZFB-13/35-37).

Diagnosis – *Duvalius* (*Paraduvalius*) *rtanjensis* sp. n. clearly differs from its closest congeners from underground habitats in eastern Serbia. These are *Duvalius* (*Paraduvalius*) *stankovitchi*, *D. (P.) winkleri*, and *D. (P.) trifunovici* sp. n. However, there are numerous distinctions between the new species and the other three species, and these are presented below. *D. (P.) rtanjensis* sp. n. is easily distinguished from *D. (P.) stankovitchi* by its smaller size (4.29-4.41 mm vs. 5.00-6.20 mm), length/width ratio of the head (wider than long vs. as long as wide), shape of the pronotum (wider than long vs. longer than wide), position of the first pair of pronotal setae (around the anterior fourth of pronotal length vs. slightly above the anterior third of pronotal length), length/width ratio of the elytra (1.73 times as long as wide vs. 2.00 times as long as wide), shape of the shoulders (lowered vs. elevated), position of the first pair of elytral discal setae (around the anterior fifth of elytral length, on third striae, at the level of the second humeral setae vs. around the anterior fourth of elytral length, in fourth interstriae, below the level of the third humeral setae), number of well-depressed striae (three inner ones vs. four inner ones), and size and shape of the aedeagus (medium-sized, curved, slightly convex dorsally in the middle part, apex acute, basal bulb medium-sized, rounded vs. massive, elongated, abruptly bent around the basal third, convex dorsally in that part, then straight, median lobe of a constant width towards the apex, abruptly narrowing apically, basal bulb massive, with a basal narrowing) and copulatory piece (slightly shorter than half of aedeagus length, bifid, apex in the form of two lobes vs. as long as three-fourths of aedeagus length, unifid, with a rounded apex) (Jeannel, 1923, 1928; present study).

Duvalius (*Paraduvalius*) *rtanjensis* sp. n. is easily distinguished from *D. (P.) winkleri* by its bigger size (4.29-4.41 mm vs. 4.20 mm), length/width ratio of the head (wider than long vs. equal length and width), form of the eyes (lenticular, with a darkened border vs. in the form of a whitish, elongated ring, with no trace of pigment), length/width ratio of the pronotum

(wider than long vs. longer than wide), shape of the posterior pronotal angles (almost right-angled vs. somewhat acute) and pronotal margin (slightly concave medially vs. straight), presence of hairs on the pronotum (present vs. absent), length/width ratio of the elytra (1.73 times as long as wide vs. 1.67 times as long as wide), shape of the shoulders (obtuse-angled, lowered vs. rounded, fairly prominent, elevated), position of the humeral setae (first and second setae located at the edge of the marginal furrow, third and fourth setae slightly away from the furrow, with the fourth one slightly farther away from it than the third vs. all humeral setae located next to the marginal furrow) and second pair of elytral discal setae (slightly below the mid-elytra level vs. slightly above the mid-elytra level), size of the legs as compared to the body size (long vs. short), and size and shape of the aedeagus (medium-sized, curved, slightly convex dorsally in the middle part, narrowing apically, apex acute, basal bulb larger vs. massive, elongated, curved over the whole of its length, with a sub-apical widening, then narrowing apically, apex obtuse, basal bulb smaller) and copulatory piece (slightly shorter than half of aedeagus length, elongated, with no spines, bifid, apex in the form of two lobes vs. as long as a third of aedeagus length, triangular, short, wide, with a large number of fine spines apically, unifid) (Jeannel, 1923, 1928; present study).

All morphological differences between *Duvalius* (*Paraduvalius*) *rtanjensis* sp. n. and *D. (P.) trifunovici* sp. n. are mentioned above (*Diagnosis of D. trifunovici* sp. n.).

Description – Medium-sized. Total body length (without mandibles) 4.29-4.41 mm. Body elongated, covered with hairs of moderate length. Body color light brown. Head and pronotum each with a polygonal microsculpture (Fig. 5).

Head stout, rounded, slightly wider than long. Frontal furrows deep, complete, and arcuate. Cheeks rounded, covered with tiny hairs. Eyes reduced, small, 0.10 mm long and 0.03 mm wide, lenticular, with a darkened border, the anterior margin convex, the posterior one flattened, composed of 6-8 depig-

mented ommatidia. An arcuated pre-ocular furrow present. Mentum tooth bifid. Antennae of moderate length, almost reaching the middle of the elytra. Antennomere II shorter than antennomere IV. Antennal article XI about three times as long as wide (Fig. 5).

Pronotum small, wider than long, slightly wider than head, sub-cordate, widest at the anterior third, narrowing towards the base. Anterior pronotal margin slightly concave. Anterior pronotal angles prominent and rounded. Lateral pronotal margins rounded anteriorly and somewhat concave posteriorly. Posterior pronotal angles prominent, sharp, almost right-angled. Posterior pronotal margin slightly concave medially. Pronotal disc convex, with a median furrow. Marginal furrows narrow and shallow. Basal foveae wide, deep, and slightly punctate (Fig. 5).

Elytra elongated, ovoid, 1.73 times as long as wide, widest slightly below the mid-level. Shoulders lowered, obtuse-angled. Elytral apex rounded. Marginal furrows narrow and deep. Elytral disc slightly convex. First three inner striae developed, well depressed. Fourth striae incomplete, while other striae present in the form of rows of points. Inner interstitial spaces convex (Fig. 5).

Legs long and thin. Fore tibiae with a longitudinal fissure each. Male protarsi I and II dilated (Fig. 5).

Chaetotaxy: Head with two pairs of supraorbital setae. Pronotum with two pairs of pronotal setae. The first pair located around the anterior fourth, while the second pair situated in posterior pronotal angles. Each humerus with four setae. Humeral setae equidistant. First and second setae located at the edge of the marginal furrow, while third and fourth setae slightly away from the furrow, with the fourth one slightly farther from it than the third. With two discal setae on each elytron. The first pair of elytral discal setae situated around the anterior fifth of elytral length, on third striae, at the level of the second humeral setae. The second pair of elytral discal setae situated on third striae, slightly below the mid-elytra level.

Aedeagus medium-sized, regularly curved, slightly convex dorsally in the middle part (lateral view) (Fig. 6). Median lobe in the sub-apical part suddenly narrowing towards the apex. Apex acute in lateral view. Basal bulb medium-sized, rounded (Fig. 6). Dorsally aedeagus slightly bent to the left (Fig. 7). Median lobe gradually narrowing apically (dorsal view). Apex rounded dorsally (Fig. 7). Paramerae moderately wide, narrowing towards the apices, with four setae each (Figs. 6 and 7). Copulatory piece short, slightly shorter than half of aedeagus length, strongly chitinized, gutter-shaped, bifid, the apex in the form of two lobes.

Urite (male abdominal sternite IX) sub-triangular, of nearly the same size as the aedeagus (Fig. 8).

Female genitalia unknown since no females were found.

Bionomy and distribution – The new species was found under rocks on the floor and in pitfall traps at the end of one of the tunnels of the Golema Porica Pit, Mt. Rtanj, eastern Serbia. For the time being, the species is known only from the type locality.

Remarks – The new species belongs to the “*winkleri*” group of species based on the shape of the elytra, presence of unpronounced shoulders (rounded, not angled), absence of laid hairs on the vertex, and presence of a longitudinal fissure on the fore tibiae and the first elytral discal setae located above the level of the third humeral setae (Guéorguiev, 1971).

GLABRODUVALIUS VRBICA, S. ĆURČIĆ, ANTIĆ
& B. ĆURČIĆ, GEN. N.

Etymology – After the smooth elytra due to the absence of striae (Latin *glabrus* = smooth, glabrous).

Diagnosis – *Glabroduvalius* gen. n. clearly differs from the following phenetically close genera from the Balkan Peninsula: *Serboduvallius* (from southwestern Serbia and eastern Montenegro), *Rascioduvallius* (from western Serbia), *Curcicia* (from eastern Serbia), *Javorella* (from southwestern and western Ser-

bia), and *Duvalius* (a variable genus with a wider distribution that needs further revision; because of this, the comparison is made with the type species *Duvalius raymondi* Delarouzée, 1859) (Ćurčić et al., 2001, 2003b, 2003c; Ćurčić and Brajković, 2003). However, there are numerous distinctions between the new genus and the listed genera. *Glabroduvalius* gen. n. clearly differs from *Serboduvalius* in the body length (shorter vs. longer), form of the eyes (in the form of a darkened line vs. flattened and reduced), presence/absence of the ommatidia (absent vs. present), body hairs (present vs. absent), and hairs on the cheeks (present vs. absent), shape of the shoulders (lowered, obtuse-angled, pointed vs. slightly lowered, obtuse, rounded), distance between the humeral setae and the position (the longest distance between the first and second setae, the shortest distance between the second and third; the first seta located on the inner edge of the marginal furrow, the second seta right next to the inner edge of the furrow, third and fourth setae located away from the furrow, with the fourth one slightly farther away from it than the third vs. the longest distance between the second and third setae, distances between setae I and II, as well as between setae III and IV are equal; the first seta located in the marginal furrow, the second on the inner edge of the furrow, the third and fourth setae slightly away from the furrow, both of these setae equidistant from the outer elytral edge), presence/absence of the elytral striae (absent vs. present), number of elytral discal setae (two vs. three in most cases), length/width ratio of the first male protarsomere (slightly longer than wide vs. twice as long as wide), size and shape of the aedeagus (small, regularly curved, abruptly narrowing apically vs. medium-sized, in most cases not regularly curved, sub-apically gradually narrowing towards the apex), number of setae on the paramerae (three vs. four), and shape of the copulatory piece (scarcely bifid vs. unifold in most cases) (Ćurčić et al., 2001; present study).

Glabroduvalius gen. n. clearly differs from *Rascioduvalius* in body length (shorter vs. longer), form of the cheeks (slightly convex vs. fairly convex) and eyes (in the form of a darkened line vs. small, elliptic, depigmented, and flattened), presence/absence

of the ommatidia (absent vs. present), pre-ocular furrow (absent vs. present), and body hairs (present vs. absent), shape of the shoulders (lowered, obtuse angled, pointed vs. elevated, angulose, rounded), distance between the humeral setae and the position (the longest distance between the first and second setae, the shortest distance between the second and third; the first seta located on the inner edge of the marginal furrow, the second seta right next to the inner edge of the furrow, third and fourth setae located away from the furrow, with the fourth one slightly farther away from it than the third vs. distances between setae I and II, as well as between setae II and III, are equal, the shortest distance between the third and fourth setae; setae I and II, as well as III and IV equidistant from the outer elytral edge, but the distance is different in each of the two-setal pairs; first and second setae located on the inner edge of the marginal furrow, third and fourth setae slightly out of the furrow), presence/absence of the elytral striae (absent vs. present), shape of the legs (elongated vs. shortened) and aedeagus (less elongated, wider, median lobe slightly narrowing from the base towards the middle part, then slightly widening sub-apically and abruptly narrowing apically, basal bulb widening towards the base vs. more elongated, narrower, gradually narrowing towards the apex, basal bulb rounded), number of setae on the paramerae (three vs. four), and shape of the copulatory piece (scarcely bifid, wider vs. strongly bifid, narrower, tapering towards the apex, with two very long parallel lobes) (Jeannel, 1923, 1928; Ćurčić et al., 2003c, 2005; present study).

Glabroduvalius gen. n. clearly differs from *Curcicia* in body length (shorter vs. longer), presence/absence of the body hairs (present vs. absent), length/width ratio of the head (more wide than long vs. equal length and width), presence/absence of hairs on the cheeks (present vs. absent), form of the cheeks (very slightly convex vs. more convex), presence/absence of the eyes (present, in the form of a darkened line vs. absent), length of the antennae (reaching between a third and a half of elytral length vs. exceeding over the mid-elytra level), shape of the shoulders (lowered, obtuse-angled, pointed vs. elevated, angulose,

rounded), distance between the humeral setae and the position (the longest distance between the first and second setae, the shortest distance between second and third; the first seta located on the inner edge of the marginal furrow, the second seta right next to the furrow, third and fourth setae slightly away from the furrow, with the fourth one slightly farther away from it than the third *vs.* humeral setae equidistant, first and second setae located right next to the inner edge of the marginal furrow, third and fourth setae slightly away from the furrow), presence/absence of the elytral striae (absent *vs.* present) and longitudinal median fissure on the fore tibiae (present *vs.* absent), shape of the aedeagus (less elongated, regularly curved, abruptly narrowing apically, apex straight, basal bulb medium-sized *vs.* more elongated, basally strongly curved, then almost straight, gradually narrowing from the sub-apical part towards the apex, apex curved upwards, basal bulb relatively small), number of setae on the paramerae (three *vs.* four), and shape of the copulatory piece (scarcely bifid, gutter-formed, wider *vs.* strongly bifid, not gutter-formed, more elongated) (Pretner, 1963; Ćurčić and Brajković, 2003; present study).

Glabroduvalius gen. n. clearly differs from *Javorella* in body length (shorter *vs.* longer), length/width ratio of the head (wider than long *vs.* longer than wide), form of the cheeks (very slightly convex *vs.* more convex), presence/absence of hairs on the cheeks (present *vs.* absent), form of the eyes (in the form of a darkened line *vs.* reduced, elliptic, pale, flattened, encircled with a slightly pigmented eye border), presence/absence of the pre-ocular furrow (absent *vs.* present) and ommatidia (absent *vs.* present), length of the antennae (shorter *vs.* longer), presence/absence of the body hairs (present *vs.* absent), shape of the shoulders (lowered, obtuse-angled, pointed *vs.* elevated, distinctly marked, obtuse, rounded), distance between the humeral setae and the position (the shortest distance between the second and third setae; the first seta located on the inner edge of the marginal furrow, the second seta right next to the inner edge of the furrow, third and fourth setae located away from the furrow, the fourth one slightly farther away from it than the third *vs.* the shortest distance

between the third and fourth setae; first and second setae located on the inner edge of the marginal furrow, third and fourth setae situated slightly out of the furrow, seta I closest to the elytral edge, seta II slightly farther from the edge, setae III and IV more spaced from the elytral edge and equidistant from it), presence/absence of the elytral striae (absent *vs.* present), number of setae on the paramerae (three *vs.* four), and shape of the copulatory piece (scarcely bifid *vs.* unifold) (Ćurčić et al., 2003a, 2003b; present study).

Glabroduvalius gen. n. is easily distinguished from *Duvalius* in body length (shorter *vs.* longer), presence/absence of the body hairs (present *vs.* absent), length/width ratio of the head (wider than long *vs.* longer than wide), form of the eyes (in the form of a darkened line *vs.* in the form of a whitish oval spot), presence/absence of the pre-ocular furrow (absent *vs.* present) and hairs on the cheeks (present *vs.* absent), length of the antennae (shorter *vs.* longer), length/width ratio of the pronotum (wider than long *vs.* longer than wide), shape of the posterior pronotal angles (acute-angled *vs.* almost right-angled) and shoulders (lowered, obtuse-angled, pointed *vs.* prominent, rounded), distance between the humeral setae and the position (the longest distance between the first and second setae, the shortest distance between the second and third; the first seta located on the edge of the marginal furrow, the second seta right next to the furrow, third and fourth setae slightly away from the furrow, with the fourth one slightly farther away from it than the third *vs.* all humeral setae right next to the marginal furrow, aggregated), presence/absence of the elytral striae (absent *vs.* present) and longitudinal median fissure on the fore tibiae (present *vs.* absent), shape of the aedeagus (less elongated, with a pronounced sub-apical widening, abruptly narrowing apically, apex wider, basal bulb widening towards the base *vs.* more elongated, with a slight sub-apical widening, then gradually narrowing apically, apex narrower, basal bulb not widening towards the base), number of setae on the paramerae (three *vs.* four), and shape of the copulatory piece (scarcely bifid, wider *vs.* bifid, narrower) (Jeannel, 1928; present study).

Description – Small-sized. Total body length (without mandibles) 3.40-3.59 mm. Body elongated, smooth, matte, covered with short erect rare hairs. Body color reddish-brown.

Head stout, wider than long, slightly narrower than pronotum. Frontal furrows deep, complete, and arcuate. Cheeks very slightly convex, covered with tiny hairs. Eyes quite reduced, in the form of a darkened line, with no ommatidia. Pre-ocular furrow absent. Mentum tooth bifid. Antennae moderately elongate, reaching between a third and a half of elytral length (Fig. 9).

Pronotum small, slightly wider than long, subcordate, covered with short rare hairs. Posterior angles prominent, acute-angled, sharp (Fig. 9).

Elytra elongated, ovoid. Elytral surface matte. Shoulders lowered, obtuse-angled, pointed. Elytral apex rounded. Elytral striae absent, but rows of points occur instead of them (Fig. 9).

Legs moderately elongate, thin. Fore tibiae with a longitudinal fissure each. Male protarsi I and II dilated. The first article of the male protarsi longer than wide (Fig. 9).

Chaetotaxy: Head with two pairs of supraorbital setae. Pronotum with two pairs of pronotal setae. The first pair located around the anterior fourth, while the second pair situated in posterior pronotal angles. Each humerus with four setae. The longest distance between the first and second setae, the shortest distance between the second and third setae. The first seta located on the inner edge of the marginal furrow, the second seta right next to the furrow, third and fourth setae slightly away from the furrow, with the fourth one slightly farther away from it than the third. Two discal setae on each elytron. Both discal and umbilicate setae very long (Fig. 9).

Aedeagus small, regularly curved. Basal bulb medium-sized. Paramerae with three setae each (Figs. 10 and 11). Copulatory piece medium-sized, about as long as half of aedeagus length, chitinized,

gutter-shaped, scarcely bifid, the apex in the form of two slightly pronounced lobes (Fig. 11).

GLABRODUVALIUS TUPIZNICENSIS VRBICA, S. ĆURČIĆ, ANTIĆ & B. ĆURČIĆ, SP. N.

(Figs. 9-13)

Etymology – After Mt. Tupižnica, its *terra typica*.

Type locality – Gornja Lenovačka Pećina Cave, village of Lenovac, near Zaječar, Mt. Tupižnica, eastern Serbia, 25 June 2012, holotype male collected by hand, leg. D. Antić; *idem*, 22 September 2012, a paratype male and a paratype female collected by hand and from pitfall traps with rotten meat as bait, leg. D. Antić. The type specimens are deposited in the collection of the Institute of Zoology, University of Belgrade – Faculty of Biology, Belgrade, Serbia (IZFB-13/38-40).

Diagnosis – This is the only species in the genus so far, so comparison with other species could not be made for the time being.

Description – Small-sized. Total body length (without mandibles) 3.40-3.59 mm. Body elongated, covered with short erect rare hairs. Body color reddish-brown. Head and pronotum each with a polygonal microsculpture (Fig. 9).

Head stout, slightly wider than long. Frontal furrows deep, complete, and arcuate. Cheeks very slightly convex and covered with tiny hairs. Eyes quite reduced, in the form of a darkened line, with no ommatidia. Pre-ocular furrow absent. Antennae moderately elongate, reaching between a third and a half of elytral length. Antennomere II about of the same size as antennomere IV. Antennal article XI twice as long as wide (Fig. 9).

Pronotum small, slightly wider than long, subcordate, widest around the anterior fourth, slightly wider than head, narrowing towards the base. Anterior pronotal margin slightly concave. Anterior pronotal angles prominent and rounded. Lateral pronotal margins rounded anteriorly and somewhat con-



Fig. 9. *Glabroduvalius* gen. n., *G. tupiznicensis* sp. n. from the Gornja Lenovačka Pečina Cave, village of Lenovac, near Zaječar, Mt. Tupižnica, eastern Serbia. Holotype male, habitus (dorsal view). Scale = 1.00 mm.

cave posteriorly. Posterior pronotal margin slightly concave in the middle. Posterior angles prominent, acute-angled, sharp. Pronotal disc convex, with a median furrow. Marginal furrows narrow and shal-

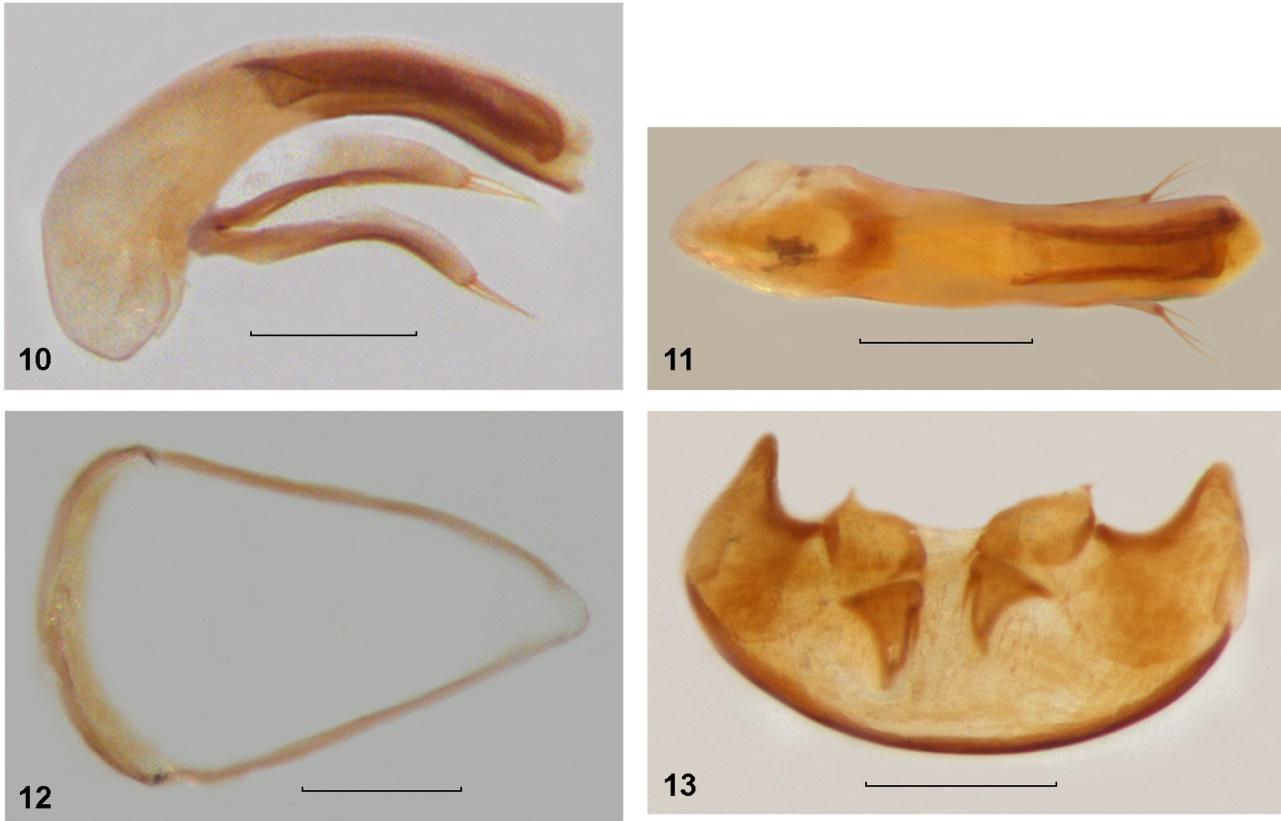
low. Basal foveae wide, deep, and slightly punctate (Fig. 9).

Elytra elongated, ovoid, 1.775 times as long as wide, widest slightly below the mid-level. Shoulders lowered, obtuse-angled, pointed. Elytral apex rounded. Elytral disc slightly convex. Marginal furrows narrow and deep. No developed striae, but instead of them rows of points occur (Fig. 9).

Legs moderately elongate, thin. Fore tibiae with a longitudinal fissure each. Male protarsi I and II dilated (Fig. 9).

Chaetotaxy: Head with two pairs of supraorbital setae. Pronotum with two pairs of pronotal setae. The first pair located around the anterior fourth, the second pair situated in posterior pronotal angles. Each humerus with four setae. The longest distance between the first and second setae, the shortest distance between the second and third setae. The first seta located on the inner edge of the marginal furrow, the second seta right next to the furrow, third and fourth setae slightly away from the furrow, with the fourth one slightly farther away from it than the third. With two discal setae on each elytron. The first pair of elytral discal setae situated in fourth interstriae, about at the level of the anterior fourth of elytral length, slightly below the level of the third humeral setae. The second pair of elytral discal setae situated on third rows of points, somewhat below the mid-elytra level (Fig. 9). Both discal and umbilicate setae very long (Fig. 9).

Aedeagus relatively small, regularly curved (lateral view) (Fig. 10). Median lobe gradually narrowing towards the sub-apical part, then somewhat widening, afterwards abruptly narrowing apically. Apex straight (lateral view) and rounded (dorsal view) (Figs. 10 and 11). Basal bulb medium-sized, widening towards the base (Fig. 10). Aedeagus scarcely bent to the left and gradually narrowing apically in dorsal view (Fig. 11). Paramerae moderately wide, narrowing towards the apices, with three setae each (Figs. 10 and 11). Copulatory piece about as long as half of aedeagus length, elongated,



Figs. 10-13. *Glabroduvalius* gen. n., *G. tupiznicensis* sp. n. from the Gornja Lenovačka Pećina Cave, village of Lenovac, near Zaječar, Mt. Tupižnica, eastern Serbia. 10 - holotype male, aedeagus (lateral view); 11 - holotype male, aedeagus (dorsal view); 12 - holotype male, abdominal sternite IX (urite); 13 - paratype female, genitalia. Scales = 0.20 mm.

sub-parallel, chitinized, gutter-shaped, scarcely bifid, the apex in the form of two slightly pronounced lobes (Fig. 11).

Urite (male abdominal sternite IX) sub-triangular, about the same size as the aedeagus (Fig. 12).

Female genitalia are presented in Fig. 13. Gonocoxites IX relatively small, thickened, curved, basally partly jointed with gonosubcoxites IX. Female paired genital structures somewhat separated (Fig. 13).

Bionomy and distribution – The new species was found under rocks on the floor and in pitfall traps baited with rotten meat at the back of the Gornja Lenovačka Pećina Cave, village of Lenovac, near Zaječar, Mt. Tupižnica, eastern Serbia. For the time

being, the species is known only from the type locality.

CONCLUSIONS

The new trechine taxa probably belong to old phyletic lineages of Tertiary or even pre-Tertiary origin (Guéorguiev, 1977). The taxa are both relicts and endemics of the Carpathian mountain chain in eastern Serbia. The endemic differentiation of the new taxa and relatives on the Balkan Peninsula was facilitated by the great Alpine Orogeny, paleoclimatic events, and subsequent evolution of the underground karstic relief, which yielded numerous new epigeal and hypogean niches suitable for preservation of the old and autochthonous fauna (Ćurčić et al., 2012).

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