

TWO NEW HIGHLY SPECIALISED  
SUBTERRANEAN BEETLES FROM THE VELEBIT  
MASSIF (CROATIA): *VELEBITAPHAENOPS* (NEW  
GENUS) *GIGANTEUS* CASALE & JALŽIĆ, NEW  
SPECIES (COLEOPTERA: CARABIDAE: TRECHINI)  
AND *VELEBITODROMUS OZRENLUKICI* LOHAJ,  
MLEJNEK & JALŽIĆ, NEW SPECIES  
(COLEOPTERA: CHOLEVIDAE: LEPTODIRINI)

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Casale, A., Jalžić, B., Lohaj R. & Mlejnek, R.: Two new highly specialised subterranean beetles from the Velebit massif (Croatia): *Velebitaphaenops* (new genus) *giganteus* Casale & Jalžić, new species (Coleoptera: Carabidae: Trechini) and *Velebitodromus ozrenlukici* Lohaj, Mlejnek & Jalžić, new species (Coleoptera: Cholevidae: Leptodirini). *Nat. Croat.*, Vol. 21, No. 1., 129–153, 2012, Zagreb.

Two new highly specialised troglobitic beetles from the Velebit massif (Croatia, Dinaric chain) are described from deep caves in the Crnopac massif.

*Velebitaphaenops* (new genus) *giganteus* Casale & Jalžić, new species (Coleoptera: Carabidae: Trechini) is markedly characterised by its large size, and the peculiar combination of features in the mouth parts, chaetotaxy, and male genitalia. Its putative position amongst the aphaenopsoid trechine taxa of the Dinaric range is illustrated and discussed.

*Velebitodromus ozrenlukici* Lohaj, Mlejnek & Jalžić, new species (Coleoptera: Cholevidae: Leptodirini) is close to the type species of the genus, *Velebitodromus smidai* Casale, Giachino & Jalžić, 2004, described from Northern Velebit (Lubenovac). The new species is markedly distinct by its shorter and wider elytra, and other diagnostic features illustrated both in text and in a key for identification.

Data on the distributions and habitats of these two new, unexpected and interesting taxa are also provided.

**Key words:** *Velebitaphaenops giganteus*, Carabidae, Trechini, *Velebitodromus ozrenlukici*, Cholevidae, Leptodirini, new genera, new species, Coleoptera, Velebit, Croatia, subterranean environment, hypogetric environment

Casale, A., Jalžić, B., Lohaj R. & Mlejnek, R.: Dvije nove vrste visokospecijaliziranih podzemnih špiljskih kornjaša s Velebita (Croatia): *Velebitaphaenops* (new genus) *giganteus* Casale & Jalžić (Coleoptera: Carabidae: Trechini) i *Velebitodromus ozrenlukici* Lohaj, Mlejnek & Jalžić (Coleoptera: Cholevidae: Leptodirini). *Nat. Croat.*, Vol. 21, No. 1., 129–153, 2012, Zagreb.

U radu se opisuju dvije nove visokospecijalizirane vrste troglobiontnih kornjaša s Velebita, iz dubokih špilja Crnopca (Hrvatska, Dinaridi).

Najznačajnije osobine nove vrste *Velebitaphaenops* (n. g.) *giganteus* Casale & Jalžić (Coleoptera: Carabidae: Trechini) su veličina te posebna kombinacija značajki usnih dijelova, osobitosti četina i genitalija mužjaka. Obrazlaže se i razmatra njen vjerojatan položaj među svojstama afenopsoidnih trehina Dinarida.

Nova vrsta *Velebitodromus ozrenlukici* Lohaj, Mlejnek & Jalžić (Coleoptera: Cholevidae: Leptodirini) bliska je tipskoj vrsti roda, *Velebitodromus smidai* Casale, Giachino & Jalžić, 2004, opisanoj sa sjevernog Velebita (Lubenovac). Novu vrstu karakterizira kraće i šire pokrtilje, i ostale dijagnostičke značajke opisane u tekstu i u ključu za identifikaciju.

U radu se daju i podaci o rasprostranjenosti i staništima tih novih, neočekivanih i zanimljivih svojti.

**Ključne riječi:** *Velebitaphaenops giganteus*, Carabidae, Trechini, *Velebitodromus ozrenlukici*, Cholevidae, Leptodirini, novi rodovi, nova vrsta, Coleoptera, Velebit, Hrvatska, podzemlje, higropetrik

## INTRODUCTION

The Dinaric chain and the Balkan peninsula as a whole are an impressive hotspot of subterranean biodiversity (see, as examples, PRETNER, 1969, 1973, 1977; BEDEK *et al.*, 2006; GOTTSTEIN MATOČEC *et al.* 2002; JALŽIĆ, 1984, 1994; JALŽIĆ *et al.*, 2010). In spite of centuries of speleological and biospeleological investigations, the number of newly described taxa, at species or genus rank, dramatically increased in the last few decades, until the recent description of a new subtribe (GIACHINO *et al.*, 2011).

Amongst Carabidae, as recently recalled by LOHAJ & LAKOTA (2010) and LOHAJ & MLEJNEK (2012), ten genera of so-called aphaenopsoid Trechini beetles of the former »série phylétique d'*Aphaenops*« *sensu* JEANNEL (1922, 1928, 1930) and CASALE & LANERYRIE (1982) are currently known from the territory of the Dinaric range: *Aphaenopsis* G. Müller, 1913, *Scotoplanetes* Absolon, 1913, *Adriaphaenops* Noesske, 1928, *Dalmataphaenops* Monguzzi, 1993 (*Biokovoaphaenopsis* Jalžić, 1993, junior synonym), *Albanotrechus* Casale & Guéorguiev, 1994, *Croatotrechus* Casale & Jalžić, 1999, *Minosaphaenops* Quéinnec 2008, *Derossiella* Quéinnec, 2008, *Jalzicaphaenops* Lohaj & Lakota, 2010 and *Acheroniotes* Lohaj & Lakota, 2010. All genera include steno-endemic species, known so far only from caves and pits, from northern Croatia (*Jalzicaphaenops*, *Croatotrechus*) up to the north to central Albania in the south (*Adriaphaenops*, *Albanotrechus*).

Velebit, with its highest peak Vaganski vrh (1757 m a.s.l.) and close to the Adriatic coast, is the longest karst mountain range of the Dinaric chain. It begins in the northwest near Senj with the Vratnik mountain pass, which separates it from the massif of Velika Kapela and ends 145 km to the southeast in the canyon of the Zrmanja River near Knin. The width of the mountain range is up to 30 km. Velebit, with its area of 2,247 square kilometres, is divided into four parts: Northern (from Vratnik mountain pass to Veliki Alan mountain pass), Central (Veliki Alan – Oštarije), Southern (Oštarije – Mali Alan pass) and Southeastern (Mali Alan pass – Zrmanja River). Crnopac Massif with its highest peak Crnopac (1402 m) is situated in the southeastern part.

Velebit Mountain massif rises like a wall bounded by the Adriatic Sea on the west and Ličko polje on the east. It shows various karstic forms, of which the most significant are the underground karst forms – caves and pits. Approximately 860 caves and pits have been explored to date. Six of ten deepest pits of Croatia, with the Lukina jama-Trojama pit system (–1409 m), Slovačka jama (–1320 m) and the Velebita system (–1026 m), are located in Velebit.

Researches in the Velebit underground started with the renowned Croatian zoologist Spiridon Brusina in 1860. Thanks to the speleologist Ozren Lukić, a number of large caves and pits have been discovered in the Crnopac area: among them, we have to cite Burinka (–290 m depth) (LUKIĆ, 1989) and Munižaba (9322 m length, –510 m depth). Recent discoveries of large speleological features are related again to Crnopac area, where intensive speleological researches have been carried out in recent years. Also recently discovered are the Muda labudova pit, with its –615 m in depth and Kita Gaćešina – Draženova puhaljka pit system, which is at the moment, with over 20 kilometres of explored underground passages, the longest speleological object of the Dinaric karst as a whole (BARIŠIĆ, 2010).

For a considerable time, the large number of deep caves in this area stimulated many speleological explorations (see for example BAKŠIĆ *et al.*, 2007), which would tend to suggest that the subterranean fauna of this massif is adequately known. Nevertheless, biospeleological investigations performed by the members of the Czech Speleological Society in August 2000 (Roman Mlejnek and Robert Šamonil), and recent explorations provided by the members of the Croatian Biospeleological Society (B. Jalžić, A. Kirin), SO HPD Željezničar (I. Mišur, S. Tutiš), SU Spelunka (O. Dodić) and SK Samobor (T. Mihoci) in the massif of Crnopac, revealed the occurrence of two undescribed, highly specialised troglobiont beetles, which are described and illustrated in this contribution.

## MATERIAL AND METHODS

The morphological features of beetles were examined using Wild M5, Wild M3, and Olympus SZ 60 stereo-microscopes. Aedeagi were dissected, cleaned and mounted in Canada balsam or Euparal® on transparent slides under the examined specimens. Drawings of aedeagi were obtained using Zeiss Orthoplan and Leica DM 2500 transmitted-light microscopes with attached drawing tube.

### Measurements:

TL: total body length (measured from the anterior margin of clypeus to the apex of elytra)

L: overall length, from apex of mandibles to apex of elytra, measured along the suture

HL: head length (measured from the anterior margin of the clypeus to the neck constriction)

HW: maximum width of head

AL: antennal length (measured from the base of antennal scape to the apex of terminal antennal segment)

PL: pronotum length (measured along the median line)

PW: maximum width of pronotum, as greatest transverse distance

EL: elytral length (as linear distance measured along the suture from the elytral base to the apex)

EW: maximum width of elytra

PL/PW: ratio length of pronotum, as linear distance from the anterior to the basal margin, measured along the midline/maximum width of pronotum.

EL/EW: ratio length of elytra/maximum width of elytra.

Forward slash indicates separate labels.

#### Acronyms:

CNHM – Coll. Branko Jalžić, Croatian Natural History Museum, Zagreb, Croatia

CAC – private collection of Achille Casale, Torino, Italy

CRL – private collection of Roman Lohaj, Pezinok, Slovakia

CRM – private collection of Roman Mlejnek, Pardubice, Czech Republic

## RESULTS

### Genus *Velebitaphaenops* Casale & Jalžić, gen. nov.

Type species: *Velebitaphaenops giganteus* sp. nov., by monotypy

#### Diagnosis and description

A genus of large-sized aphaenopsoid trechine beetles characterised by the peculiar combination of the following features: body apterous, depigmented, elongate but robust; head and pronotum glabrous, elytra densely pubescent (Figs. 1, 2).

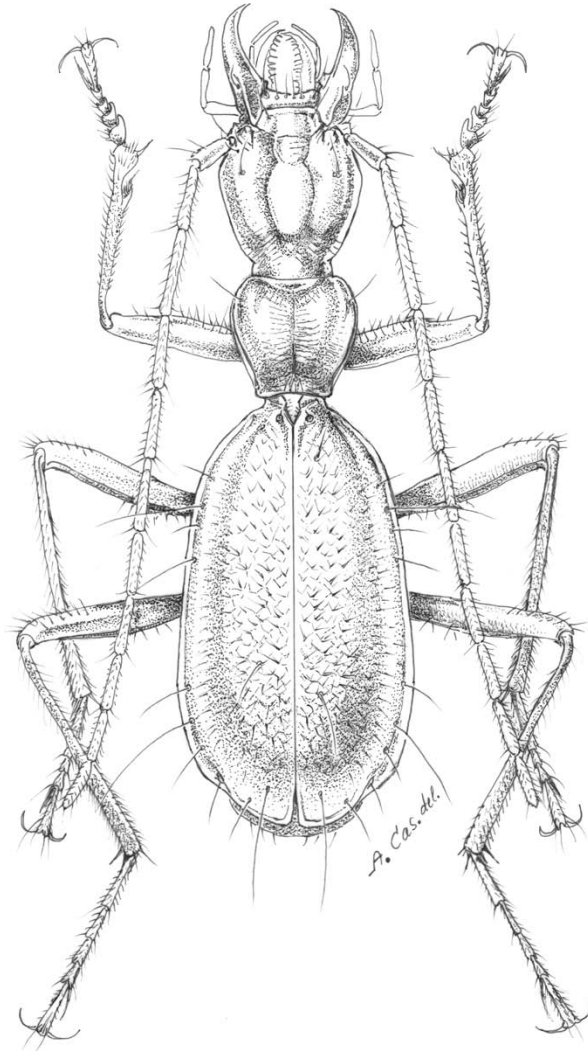
Head largest in size, inflated, obviously wider and longer than prothorax. Eyes absent. Frontal furrows very deep, markedly convergent backwards and interrupted anteriorly to the neck constriction; genae swollen, widened in front, convergent and markedly narrowed to the neck, each with two-three lateral erected setae on the ventral side. Two anterior supraorbital setae present; posterior supraorbital setae not in fixed position, fully developed or reduced to inconspicuous or fully vanished pores. Clypeus with two pairs of setae, labrum with three pairs. Antennae elongate but robust, reaching the apex of elytra when stretched backwards. Submentum transversally furrowed, with eight setae along the anterior margin. Mandibles very elongate, regularly curved; left mandible with one, acute tooth at base; right mandible with a large sized, elongate retinaculum, with traces of two teeth. Mentum free, not fused with the submentum along the suture, with a pair of long labial setae and a pair of sensory foveae; mentum tooth wide, slightly prominent, widely emarginated at apex, moderately bifid; ligula elongate, bifid at apex, with two apical and several lateral setae; paraglossae very long and slender, pubescent on the inner margin. Penultimate palpomere of the labial palpi with two or three setae on the inner margin (Fig. 6).

Pronotum small-sized, nearly as long as wide, glabrous. Disc with deep transversal wrinkles; median furrow distinct but superficially impressed, not reaching the basal margin. Lateral margins not beaded, without marginal furrows, regularly curved, slightly narrowed to the base. Anterior and posterior angles obtusely rounded. Propleura visible in dorsal aspect posteriorly to the antero-lateral seta. One pair of antero-lateral setae present; baso-lateral setae absent.

Elytra elongate, slightly widened in the apical fourth; humeral angles effaced; apical lobe and pre-apical sinuation evident. Disc moderately convex; striae completely vanished, except the juxta-scutellar striola and the apical recurrent stria; dorsal surface covered by dense punctures and a mesh of impressed micro-lines, with erected, long pubescence. Chaetotaxy: one pair of basal setiferous pores near

scutellum; one or two discal, asymmetrical setiferous pores and one pair of preapical pores; marginal umbilicate series of 8 punctures aggregated (in the sense of JEANNEL, 1928), i.e. punctures 1–8 (4 of the humeral group, 4 of the apical group) regularly situated along the putative stria 8, close to the marginal furrow; latero-apical pore close to the apical stria; inner apical pore absent, so that the so-called apical triangle (in the sense of JEANNEL, 1928) is incomplete.

Abdominal sterna 4–7 with numerous, irregularly ranged setae, more numerous in males (Figs. 7, 8). Abdominal segment IX regularly triangular, with proximal angle peculiarly emarginated, as in Fig. 5.

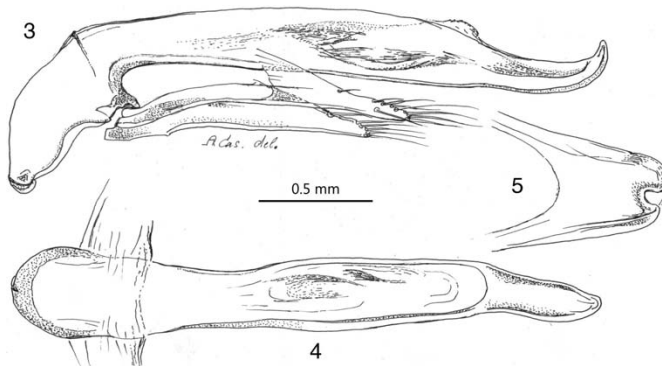


**Fig. 1.** *Velebitaphaenops* (new genus) *giganteus* Casale & Jalžić, new species, male holotype, habitus. Overall length, mandibles included: 12.5 mm.



**Fig. 2.** *Velebitaphaenops* (new genus) *giganteus* Casale & Jalžić, new species, female paratype, Munižaba cave, habitus. Oilpainting of Jan Kobylák. Overall length, mandibles included: 12.3 mm.





**Figs. 3–5.** *Velebitaphaenops giganteus*, male holotype, aedeagus in lateral aspect (3), median lobe of aedeagus in dorsal aspect (4), detail of the proximal angle of the IX abdominal segment (5).

Legs very long, but markedly robust; femora with series of erected setae along the margins of the ventral sides, more numerous in males than in females (Figs. 10, 11); tibiae densely pubescent; protibiae without external furrow; pro- and mesotarsi short, metatarsi elongate; two basal tarsomeres of male protarsi dilated and markedly denticulate inwards; tarsomeres 4 of meso- and metatarsi each with a tubercle on the ventral side taking long, thickened setae; tarsal claws very long.

Male genitalia (Figs. 3, 4) median lobe of aedeagus very elongate and slender, slightly sinuate in dorsal view, in lateral aspect straight, but curved and hooked on the dorsal side at apex; basal bulb small, not inflated; basal sagittal carina very reduced in size. Parameres very long and slender, each with numerous (5–8) apical long setae, and one pre-apical seta on the dorsal side.

Female genitalia (Fig. 9): gonocoxite 1 with five short setae close to the distal margin; gonocoxite 2 short, rounded at apex, with two setae close to the inner margin; sternal sensorial fovea small, with two short setae.

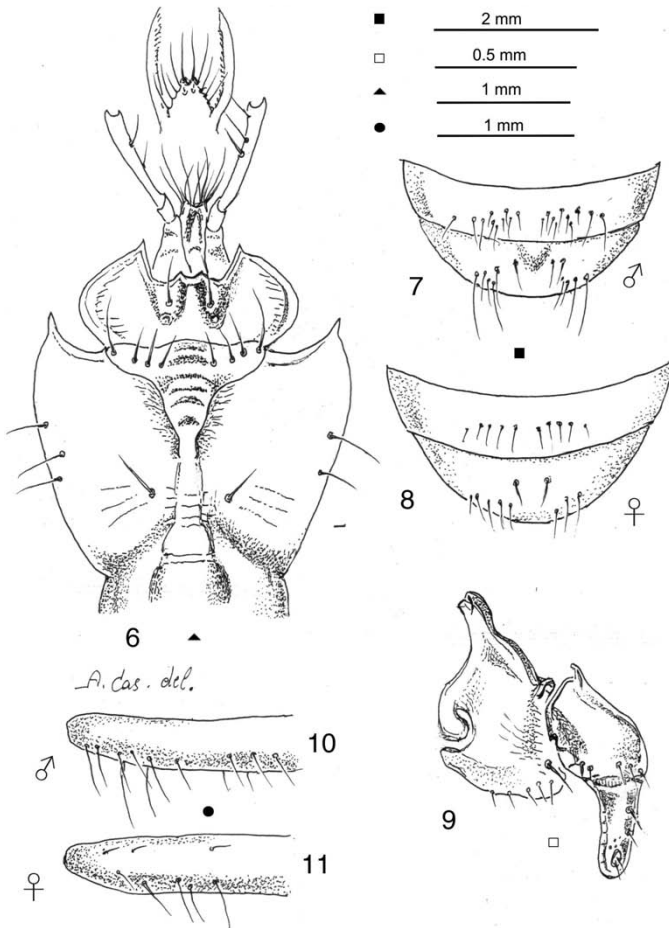
### Etymology

Named after Velebit, the big limestone massif in Croatia in which the type species of this genus was discovered. Gender is masculine.

### *Velebitaphaenops giganteus* Casale & Jalžić, sp. nov. (Figs. 1 – 11)

#### Type series

Holotype male, labelled: »Croatia, Velebit, Crnopac Mt., Muda labudova pit, – 450 m deep on the walls, 05.06.2010, leg. B. Jalžić / HOLOTYPUS *Velebitaphaenops* gen. nov. *giganteus* sp. nov., A. Casale & B. Jalžić 2011« (red label, printed) (CNHM); Paratypes (1♂, 3♀♀): 1 female, same data as holotype, but 17.08.2010, trap, leg. I. Mišur (CNHM); 1 male, same data as holotype, but – 580 m deep, in water, 10.08.2011, leg. O. Dodić & S. Tutiš (CAC); 1 female labelled: »Croatia, Velebit Mts., Crnopac massif, Munižaba (cave), –400 m, 10.8.2000, R. Mlejnek lgt. (white label, printed)« (CRM); remains of one female, including head with maxilles and mandibles, pronotum and elytra, abdominal sterna 1–5, 5 femora, 5 tibiae (including left protibia with first tarsomere), 15 antennal segments and 14 tarsal segments, labell-



**Figs. 6–11.** *Velebitaphaenops* (new genus) *giganteus*, female paratype, head, mentum, ligula and paraglossae in ventral aspect (6); abdominal sternite VI–VII in male holotype (7) and female paratype (8), respectively; gonocoxite 1 and 2 (basal and apical segments of gonostylus) in female paratype (9); base of metatibia in male holotype (10) and female paratype (11), respectively.

ed »Croatia, Velebit Mts., Crnopac massif, Munižaba (cave), –400 m, 10.8.2000, R. Mlejnek lgt. (white label, printed)« (CRL). All paratypes are labelled with red printed labels »PARATYPUS *Velebitaphaenops* gen. nov. *giganteus* sp. nov., A. Casale & B. Jalžić 2011«.

### Description

Largest in size: TL 10.9 mm, L 12.5 mm (male holotype), TL 10.5–11.8 mm, L 12.3–13.6 mm (female paratypes), respectively. Colour rufotestaceous, markedly darker, dark reddish on head, pronotum and basal antennomeres; maxillae and palpomeres pale-yellow (Fig. 1). Lustre and microsculpture: moderately shiny, with generally effaced microlines on head and pronotum, more evident on the elytral surface, in form of transverse mesh pattern. Head and pronotum glabrous; elytra covered with



short, erected pubescence, inserted on foveae in the crossing of linear impressions which form an evident mesh of scale-like tubercles on the integument (Fig. 2).

Head large, inflated, wider and longer than prothorax, with its maximum width at the level of insertion of the anterior supraorbital setae, distinctly and proportionally wider in females: HL 2.40 mm (male holotype), 2.30–2.53 mm (female paratypes); HW 2.20 mm (male holotype), 2.13–2.73 mm (female paratypes); index HL/HW 1.10 (male holotype), 0.95–1.08 (female paratypes). Eyes absent. Genae obliquely convergent to the neck constriction, which is markedly evident; at the level of the neck constriction, the head shows several dorsal deep, obliquely impressed wrinkles, extended from the frontal furrows to genae. Frontal furrows very deep, incomplete and interrupted before the neck constriction, curved in the middle and delimiting a convex frontal area. A pair of long supraorbital setae present at the anterior third of head; posterior supraorbital setae not in fixed position, present in one female paratype, reduced to inconspicuous, hardly visible pores, or fully vanished in other individuals. Antennae long (AL: 10.73 mm in male holotype, 9.8–11.2 mm in female paratypes) but robust, reaching the apex of elytra when stretched backwards, covered with short pubescence; antennomere 3 longer than antennomere 2; antennomeres 4–10 nearly equally long, as long as antennomere 2. Mouth parts as in description of the genus.

Prothorax small-sized; pronotum narrower than head, slightly narrower at base than at anterior margin, nearly as long as wide or slightly transverse: PL: 1.80 mm (male holotype), 1.75–1.86 (female paratypes); PW: 2.00–2.13 mm (female paratypes); index PL/PW: 0.9 (male holotype), 0.83–0.89 (female paratypes). Disc moderately convex, with deep transversal wrinkles; median furrow distinct but superficially impressed, not reaching the basal margin. Lateral sides regularly curved, slightly narrowed to the base and shortly sinuate before the basal angles; lateral margins not beaded; lateral grooves completely effaced. Both anterior and posterior margins slightly concave in the middle; anterior and posterior angles obtusely rounded. Propleura visible in dorsal aspect from the posterior two-thirds of lateral margins, posteriorly to the antero-lateral setae. One pair of antero-lateral setae present, inserted before the maximum width of pronotum; baso-lateral setae absent.

Elytra elongate, narrowed at base, slightly widened at the posterior third: EL: 6.33 (male holotype), 6.20–7.00 (female paratypes); EW: 3.40 (male holotype), 3.60–4.00 (female paratypes), index EL/EW 1.86 (male holotype), 1.69–1.75 (female paratypes); pre-humeral margins markedly oblique, humeral angles effaced. Disc markedly convex; striae vanished, excepted the scutellar and the apical striae; dorsal surface peculiarly rugose, owing to evident punctuations and reticulate meshes of wrinkles, forming convex scales on which are inserted dense, long, erected setae. Elytral chaetotaxy very peculiar: pair of basal iuxta-scutellar setiferous pores present; one (exceptionally two in right elytron, in male holotype) discal pores present on each elytron, hardly visible owing to the scabrous elytral integument and the erected, long pubescence, the basal one (if present) located at the level of apex of the iuxta-scutellar striola, the posterior at the level of the fifth pore of the marginal umbilicate series; one pre-apical macrochaeta (anterior apical pore, in the sense of JEANNEL, 1928) on the putative stria 3. Umbilicate series of 8 setiferous punctures along the putative stria 8. Humeral group of 4 pores; pores 2 and 3 closer to each other than to pores 1 and 4, respectively; pore 1 aggregated, but slightly moved on the discal surface. Apical group of 4 pores, as in Fig. 2. External apical pore located on the

apical lobe of elytra, close to the recurrent apical stria. Apical seta absent, so that the »apical triangle« (in the sense of JEANNEL, 1926) is incomplete.

Legs long, robust, densely pubescent; pro- and mesotarsi short. Basal two tarsomeres of male protarsi distinctly dilated and denticulate inwards; female tarsomeres equally narrow, not dilated. Tarsal claws very long and slender. Other characters as in description of the genus.

Abdominal sterna IV–VI with several setae on their hind margins, more numerous in males. Abdominal sternum VII (anal ventrite) with two setae on each side in males and one seta in females, in median position, and several (3–5) long setae on each side near the apical margin, longer in males (Figs. 7, 8). Abdominal segment IX triangular, without peculiar features in its general shape, but with a peculiar emargination at the proximal angle, which is membranous in this area (Fig. 5).

Male genitalia: aedeagus as in Figs. 3 and 4. Median lobe very elongate, 2.5 mm long, narrow and slender, hooked at apex on the dorsal side. Basal bulb small, elongate, not inflated; sagittal carina very reduced in size. Endophallus with a small, sub-triangular, slightly defined copulatory piece, close to the right side of the median lobe and in »anisotropic« position (in the sense of JEANNEL, 1928), and a series of serrate scales in middle-apical position. Parameres very elongate and slender, with numerous apical and pre-apical setae: in male holotype, eight apical and one dorsal, pre-apical setae on right paramere, five apical and one dorsal, pre-apical setae on left paramere, respectively.

Female genitalia (Fig. 9): ovipositor of peculiar shape. Gonocoxite 2 (apical segment of gonostylus) of stout form, short, sub-rectangular, rounded at apex, with two short setae close to the inner margin; ventral sensorial fovea small, with two short setae.

## Etymology

The name indicates the very large size of the new, unexpected type species of this new genus.

## Topographic location and habitat

Crnopac Massif is perforated by many deep pits and large underground systems, which are frequently connected with each other, or very probably so (see below). Speleological research, provided by the members of Croatian speleological societies during the past ten years, was focused on the deepest and largest of them: such are the Kita Gaćešina – Draženova Puhaljka pit system (depth 580 m, length 20 656 m), currently the longest cave system in Croatia; Munižaba (depth 510 m, length 9 322 m); Muda labudova (depth 586 m) and Burinka (depth 290 m). These explorations and new discoveries are being regularly published on the website [www.speleologija.hr](http://www.speleologija.hr).

Muda labudova (Figs. 12, 13, 14):

The entrance of this vertical cave is located on the northern side of a deep sink-hole, in a beech and fir-tree forest (*Abieto-Fagetum*). The entrance and the first part of the 180 meter-deep pit are in limestone and limestone-dolomite Jelar *breccia* (E3, O1). Then, dark grey limestones follow, and all the way to the bottom of the pit there is an interchange of layers of dark and light limestones (probably of Cretaceous and Jurassic age); dolomites are rare. In the deeper parts, there are rare chert layers. The pit has a polygenetic origin: the most expressed processes are chemical dissolution and erosion. The water is strained towards the bottom of the pit, forming hygropetric biotopes (*sensu* SKET, 2004) and creating vertical meanders extend-



Fig. 12. Map of Croatia with red dots marking the positions of Muda labudova (1) and Munižaba (2).

ed almost through the entire pit. At about 270 m depth, a more expressed influence of tectonics is evident, in form of numerous fault planes, fractures, broken-off blocks and rubble. At the bottom of the pit there are horizontal meanders, in which numerous erosion forms are expressed, and a weak, but constant water flow. No notable speleothems were observed in the pit. Muda labudova pit is currently known to be –615 m deep, and represents the deepest known pit in the Crnopac area.

At the bottom of the vertical entrance of the pit (–60 m), snow and ice tend to remain the whole year, where in summer the air temperature is approximately +2°C. The fauna in this part of the pit is represented by species of the leptodirine genera *Astagobius* and *Spelaeodromus*, and rare individuals of *Redensekia likana* Karaman, 1953 (Coleoptera, Cholevidae). At the depth of –200 m, there is the beginning of the hygropetric zone (sensu SKET, 2004). The air temperature gradually increases towards the bottom. At the depth of –320 m, it is +3.6°C, and at –450 m the temperature is +4.7°C. *Parapropus sericeus augustae* Müller, 1941 appears from the depth of –200 meters and is present all the way to the bottom. Findings of *Velebitaphaenops* (gen. nov.) *giganteus* sp. nov. are associated with deeper parts of the pit, below –400 m in depth. The male holotype and one female paratype were collected at the depth of about –450 m; the male was found walking on a wet wall, the female was baited with sardines and cheese; the male paratype was found at the depth of about –580 m, having fallen into a small lake.

Munižaba (Figs. 12, 20, 21 and 22):

The entrance of the cave is located in the area called Duman, at about 840 m a. s. l. It is formed by a vertical shaft of large proportions, 202 meters deep. The entrance

and vertical part of the cave are built in layers of limestone and limestone-dolomite Jelar *breccias* (E3, O1), and the rest, which has a horizontal shape, is in limestone and dolomite layers. Besides the entrance, a sink-hole-like vertical passage is created by dissolution and erosion by water, which spreads by vertical fractures; expressive tectonic movement also led to creation of this passage. Also obvious are numerous fault planes and large blocks broken off from the ceilings and side walls of larger passages, and now the current formation is building vast rock creeps in the passages. The morphology and spread of the passages are conditioned by tectonic movements, in which active water seepage causes the formation of speleothems. Munižaba cave shows abundant and diverse speleothems: the most distinct are the large and numerous flowstones and cascades. This cave is a large speleological feature and part of the deep underground system of Crnopac, which most likely connects the Kita Gačešina-Draženova puhaljka pit system, and the Burinka pit, Muda labudova pit and Cerovačke špilje caves into one whole, large cave system.



Fig. 13. Muda labudova, entrance of the pit (Photo: J. Bedek).



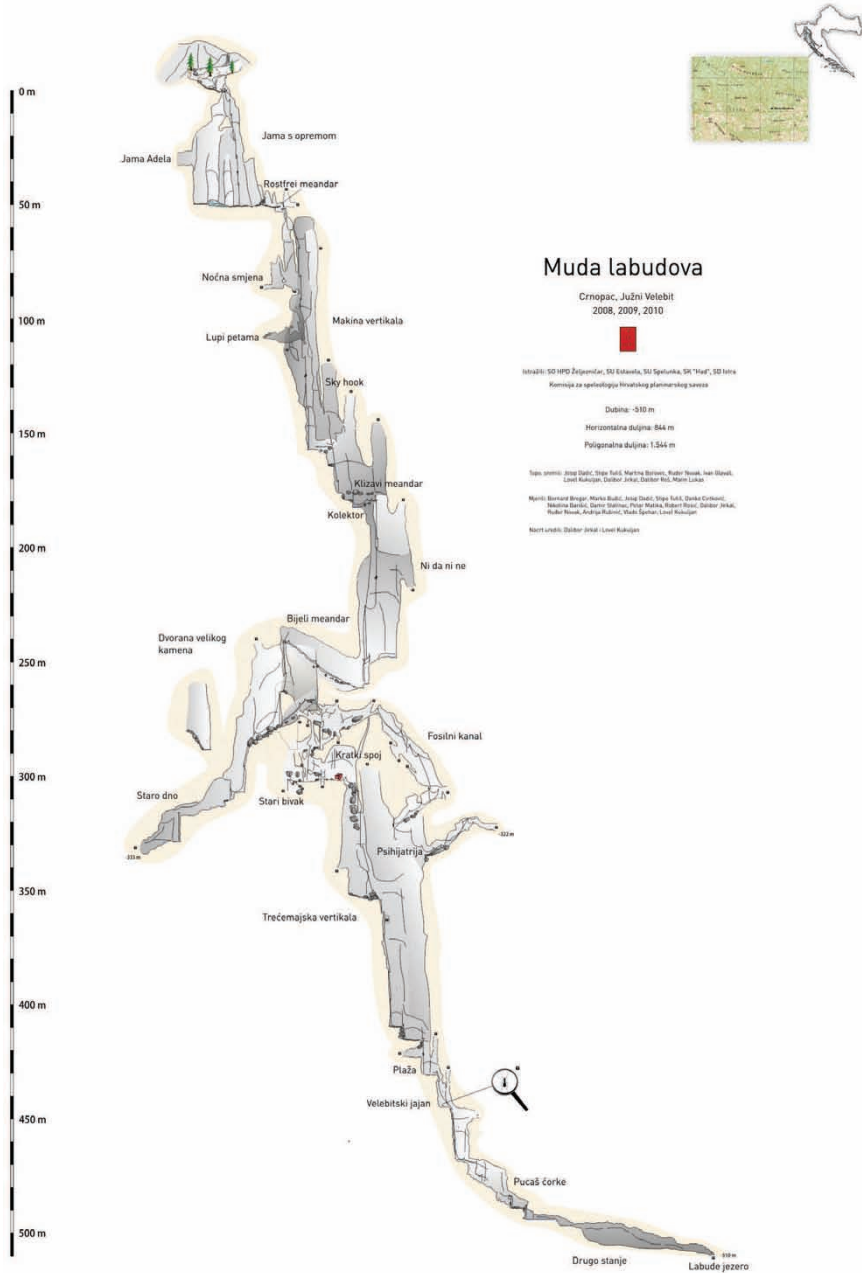


Fig. 14. Muda labudova, topographical scheme of the pit.

At the bottom of the vertical entrance of the cave there is a large chamber with rock debris. This is also the coldest part of the cave, with air temperature in summer never higher than +3°C. Regular residents here are leptodirine species of genera

*Astagobius*, *Spelaeodromus* and *Parapropus* (Coleoptera, Cholevidae), as well as some epigeal species of carabid beetles like *Trechus quadristriatus* (Schrank, 1781), *Nebria dahli velebitica* Heyden, 1884 and *Nebria germarii germarii* Heer, 1837. After the entrance chamber, the cave further spreads as a large cave passage. Parts with rock debris alternate with large flowstones and sinter pools, where hygropetric biotopes (sensu SKET, 2004) occasionally occur. In summer, in this part of the cave the air temperature is +6.5°C and water temperature is +5.5°C. The humidity is approximately 92%. The female paratype of *Velebitaphaenops* (gen. nov.) *giganteus* sp. nov. was found at the rear part of the main corridor named »Završna Dvorana«, which is formed by a very large hall (ca 150 × 40 m, and 70 m high), free walking on a wet rock at the depth of ca 410 metres (Fig. 21). Remains of the second female specimen were found near this place, in wet clay.

Like *Velebitaphaenops giganteus* described above, most taxa of Dinaric »aphaenopsoid« trechine beetles known so far, with the exception of *Acheroniotes mlejniki* Lohaj & Lakota, 2010 and *Aphaenopsis apfelbecki* (Ganglbauer, 1891), were collected only individually or are known only from a very few individuals. Features of mandibles, which are very long and slender, apically pointed and with robust teeth at the base of the right mandible, indicate that they are very active predators. Moreover, our investigations confirmed that in most cases they were not attracted by traps baited with meat and/or cheese as are, for example, representatives of other genera of subterranean trechine beetles (e.g. *Duvalius* Delarouzé, 1859, *Neotrechus* J. Müller, 1913, *Typhlotrechus* J. Müller, 1913 or *Anophthalmus* Sturm, 1844), which are probably occasional scavengers. Some exceptions can be explained by the fact that baits attracted other subterranean organisms, which are the food of these specialised predators.

## Relationships

For its largest size, and the same degree of troglomorphic specialised features, *Velebitaphaenops* (gen. nov.) *giganteus* n. sp. is superficially very similar to *Italaphaenops dimaioi* Ghidini, 1964, endemic to the Lessini mountains in N-E Italy, the largest trechine beetle known so far in the world (in some females of the latter, the overall size – mandibles included – reaches 14.9 mm). The new taxon shares other morphological characters with *Italaphaenops*: pronotum without baso-lateral setae, elytra with discal series of pores reduced to one only on each elytron (two, asymmetrical, on the right elytron of the male holotype of *V. giganteus* n. sp.), »aggregate« humeral group of the lateral umbilicate series, and preapical seta absent (CASALE & VIGNA TAGLIANTI, 1975).

More informative characters, however, show that these similarities are mere homoplastic features in troglombiont trechines, and that *Velebitaphaenops* belongs to the phyletic lineage of the aphaenopsoid genera of Dinaric trechines – listed in Introduction – with copulatory piece and/or sclerotised scales of endophallus in an »anisotropic« position (i.e.: displaced on the right side of the median lobe), and two basal fore tarsomeres dilated in males. The limits of this lineage, the diagnostic features, and taxonomic characters of its representatives have been stressed, debated and illustrated in recent contributions by QUÉINNEC (2008) and LOHAJ & LAKOTA (2010), with keys for identification of genera, whereas the main errors of interpretations of characters, and wrong descriptions (PRETNER, 1959) were widely discussed and corrected by VIGNA TAGLIANTI & SCIACY (1988), SCIACY & VIGNA TAGLIANTI (1990), MONGUZZI (1992), and CASALE & GUÉORGUIEV (1994).



Amongst these genera, *Velebitaphaenops* shows a very peculiar combination of morphological features stressed in Description. In particular, unique are the larger, impressive size of the type species of the genus; the fore body (head and pronotum) glabrous, whereas elytra are covered with dense, long, erected pubescence on the scabrous integument (in all other genera, the dorsal surface is fully pubescent in *Adriaphaenops*, whereas the head only – in *Jalzacaphaenops* –, or head and pronotum – in *Minosaphaenops* and *Acheroniotes* – are pubescent, but elytra are glabrous; or the dorsal surface is fully glabrous – other genera); the not fixed number and size of the posterior supraorbitale setae; the reduced number of discal pores on the putative stria 3 of elytra (one/two discal and one preapical pore only on each elytron, in not fixed positions), and the absence of the apical seta; the sexually dimorphic and high number of setae on femora and abdominal sterna. Furthermore, both male and female genitalia show very peculiar features.

Nevertheless, some other informative characters allow us to relate the new taxon to other genera of Trechini known so far from the Dinaric area. In spite of the fact that these characters are irregularly distributed in different lineages of trechine beetles (see LOHAJ & LAKOTA, 2010), the absence of basolateral setae of pronotum, and other characters, exclude any relationship with the genera *Jalzacaphaenops*, *Acheroniotes* and *Croatotrechus*, all including small-sized species with different chaetotaxy or peculiar structure of male genitalia (in *Croatotrechus*, the shape of aedeagus is very distinct from that of all other »aphaenopsoid« Dinaric trechines: see CASALE & JALŽIĆ, 1999).

Amongst genera in which the basolateral setae are absent, both *Adriaphaenops* and *Minosaphaenops* include small to medium-sized species with head and pronotum pubescent, and elytral chaetotaxy, mouth parts and genitalia markedly different from those of *Velebitaphaenops*; in *Scotoplanetes*, elytra have numerous setae in both stria 3 and stria 5, and the mentum tooth is absent.

Therefore, the genus *Velebitaphaenops* should be closer to the genera *Aphaenopsis*, *Dalmataphaenops*, *Derossiella* and *Albanotrechus*.

*Derossiella* includes so far one only medium-sized (5 mm, about), dorsally glabrous species from Mosor Planina, another coastal massif of the Croatian coast, which presents complete cephalic furrows, mentum incompletely fused with submentum, mentum tooth unid, right mandible tridentate, and marginal umbilicate series of elytra not aggregate.

*Aphaenopsis* includes medium-sized (5-6 mm about), dorsally glabrous species, with mentum free, not fused with the submentum and with six only setae along the anterior margin, mentum tooth unid, humeral group of the elytral umbilicate series not aggregate; the median lobe of aedeagus is short, robust, with apex obtuse, basal carina developed, and copulatory piece of endophallus markedly sclerotized.

*Albanotrechus* shows markedly different characters from *Velebitaphaenops*. In particular, the dorsal surface is fully glabrous, the habitus is markedly slender with not inflated head, the mentum tooth is acutely prominent and bifid, the hind angles of pronotum are acutely protruding; the elytra have distinct humeri and impressed striae, three pores on stria 3, and apical triangle complete; furthermore, in *Albanotrechus* the humeral group of the elytral umbilicate series is not aggregate, with the first pore displaced on the elytral disc and located at the level of the first pore of the discal series, as in *Aphaenopsis*. Nevertheless, the structure of the median lobe of

aedeagus in *Albanotrechus beroni* Casale & Guéorguiev, 1994, with its elongate shape and apex markedly hooked on the dorsal side, is somewhat similar to that of *Velebitaphaenops giganteus* (see CASALE & GUÉORGUIEV, 1994)

Finally, with *Dalmataphaenops chiarae* Monguzzi, 1993, *Velebitaphaenops giganteus* shares the following features: large size and general habitus; submentum with numerous (8–10) setae along the anterior margin; mentum free, not fused with the submentum along the suture; mentum tooth wide, slightly prominent, widely emarginated at apex, moderately bifid; general pattern of elytral chaetotaxy, with aggregate humeral group of the umbilicate series; and identical structure of endophallus. However, *Velebitaphaenops* is markedly distinct from *Dalmataphaenops* by its densely pubescent elytra (glabrous in *Dalmataphaenops*), by the lack of the apical pore on elytra and the discal series reduced to one/two discal pores (plus the pre-apical seta), whereas in *Dalmataphaenops* they are four to six; by the different shape of aedeagus, which in *Velebitaphaenops* has the median lobe very elongate and slender, narrowed and hooked on the dorsal side at apex, and parameres with numerous apical setae.

In conclusion, the description of this new, isolated genus of subterranean trechines confirms that homoplastic features in aphaenopsoid taxa make, in many cases, any phylogenetic analysis of their relationships very difficult.

In this case, we could hypothesize an ancient origin of *Velebitaphaenops* and *Dalmataphaenops* by a common ancestor in two isolated coastal massifs of the eastern Adriatic coast. Nevertheless, their relationships with other aphaenopsoid Dinaric genera of trechine beetles – in which the diagnostic features are mostly based on plesiomorphic characters, or derived by different degrees of specialisation – remain unclear, and hidden by features corresponding to different grades of evolution, radiation, and adaptation to the subterranean way of life (see QUÉINNEC, 2008).

Molecular phylogenies, such as those performed recently on Pyrenean (FAILLE *et al.*, 2010) and Western-Mediterranean trechines (FAILLE *et al.*, 2011), respectively, are certain to provide in the future new and interesting information on these lineages of Dinaric and Balkan subterranean carabids, speciated and radiated in the context of an exceptional diversity of subterranean environments.

### Genus *Velebitodromus* Casale, Giachino & Jalžić, 2004

*Velebitodromus* Casale, Giachino & Jalžić, 2004: 311.

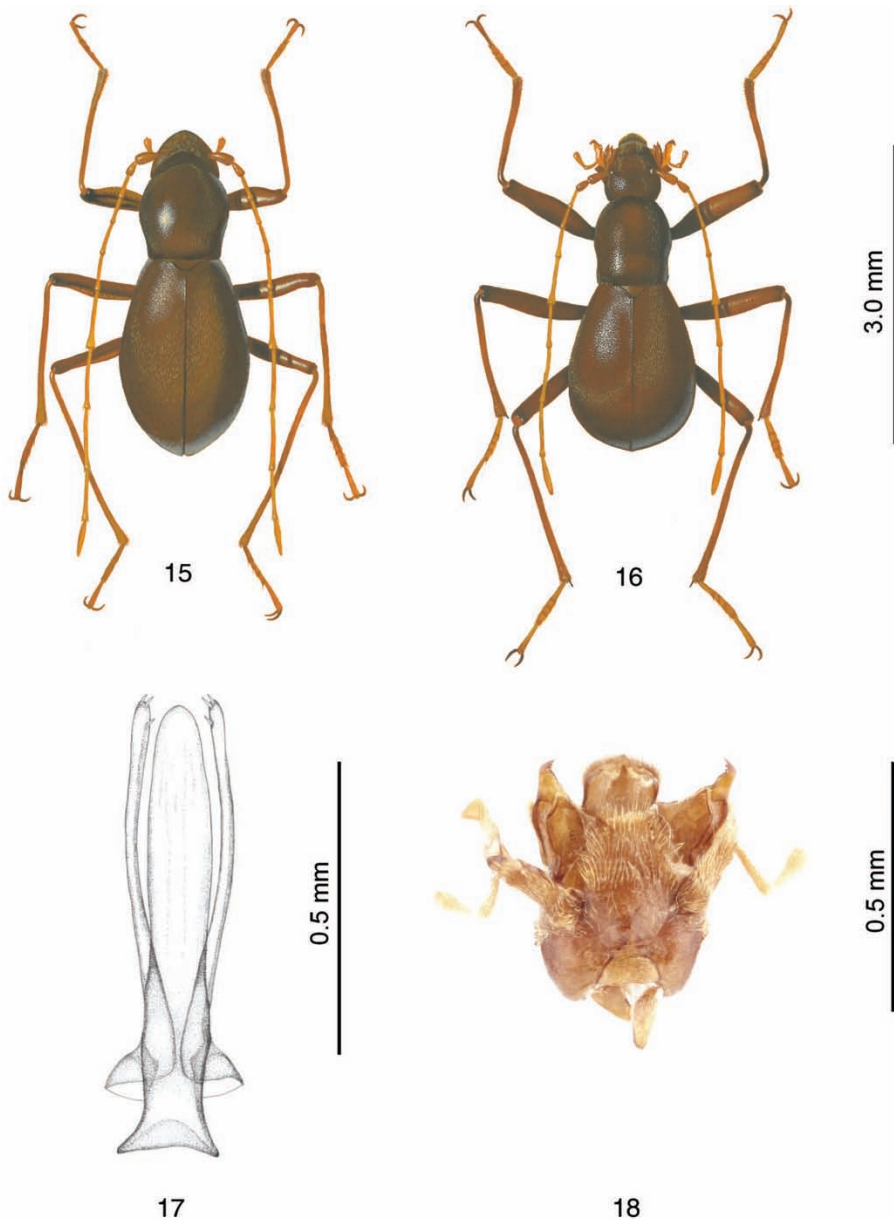
Type species: *Velebitodromus smidai* Casale, Giachino & Jalžić, 2004: 313, by monotypy.

### *Velebitodromus ozrenlukici* Lohaj, Mlejnek & Jalžić, sp. nov.

(Figs. 16–19)

#### Type series

Holotype male, labelled: »CROATIA, Velebit Mts., Crnopac massif, Munižaba (cave), –340 m, 8.8.2000, R. Mlejnek lgt. (white label, printed) / HOLOTYPUS *Velebitodromus ozrenlukici* sp. nov. Lohaj, Mlejnek & Jalžić det. 2011« (red label, printed)« (Fig.16) (CNHM), Paratypes (8♂♂, 5♀♀): 5♂♂, 3♀♀, same data as Holotype, 2♀♀ labelled: »CROATIA, Velebit Mts., Crnopac massif, jamski sutav Kita Gaćešina – Draženova puhaljka, 16.07.2011, leg. T. Mihoci«, 2♂♂: same data but 30.07.2011, leg. A Kirin; 1♂: same data but 15.10.2011, leg. B. Jalžić (CNHM, CAC, CRL, CRM).



**Figs. 15–18.** genus *Velebitodromus* sp., *Velebitodromus ozrenlukici*, Lohaj, Mlejnek & Jalžić, new species (16, 17, 18), *Velebitodromus smidai* Casale, Giachino & Jalžić, 2004 (15), habitus (15, 16, oilpainting of Jan Kobylák), aedeagus, dorsal view (17), head, ventral view (18).

All paratypes are labelled with white, printed locality labels and with red printed labels »PARATYPUS *Velebitodromus ozrenlukici* sp. nov. Lohaj, Mlejnek & Jalžić det. 2011«.



**Fig. 19.** *Velebitodromus ozrenlukici*, Lohaj, Mlejnek & Jalžić, new species, from Kita Gačešina-Draženova puhaljka cave system at the depth of –400 m (Photo: B. Jalžić).

**Additional specimens examined:** male Holotype of *Velebitodromus smidai* Casale, Giachino & Jalžić, 2004 (Fig.15), labelled: »HRVATSKA, N Velebit, Lubenovac, 6.VIII. 1998, Slovačka jama, B. Jalžić leg. (white label, printed) / HOLOTYPUS Velebitodromus smidai n. sp. Casale – Giachino – Jalžić, 2004 (red label, printed)« (CNHM); one female Paratype, same data as Holotype (CNHM); one female Paratype, same data as Holotype, but 3.VIII.2002 (CNHM); one female Paratype labelled: »Lukina jama, 8.93« (white label, handwritten) (CNHM).

### Diagnosis

A small-medium sized, depigmented, anophthalmous, leptodiroid leptodirine beetle with the character state of the genus *Velebitodromus*, closely related to *V. smidai*, type species of the genus, from which it is markedly distinct mostly by its shorter and wider elytra.

### Description

Total body length (measured with head in natural, prognathe position) 2.88–3.20 mm, HT 3.10 mm. Colour reddish-brown, with paler antennae and legs; body and appendages with dense, pale-yellow pubescence.

Head elongate, distinctly narrower than pronotum, without occipital carina. Eyes absent. Mouth parts modified: clypeus, labrum, labium, maxillary and labial palpi covered with long and dense setation (Fig. 18). Antennae inserted on the posterior third of head, very long and slender, more elongate in males, AL 3.80–4.03 mm in ♂, 3.45–3.70 mm in ♀, ratio AL/PL+EL 1.4–1.5 in ♂, 1.2–1.23 in ♀, covered with dense, decumbent, pale pubescence. Antennomere I distinctly longer than antennomere II, antennomere X 1.37–1.52 times longer than antennomere XI in males, 1.30–1.32 in females.



Length of antennomeres (from scape to terminal segment, in mm):

HT ♂: 0.21; 0.14; 0.20; 0.23; 0.29; 0.34; 0.44; 0.47; 0.53; 0.56; 0.39

PT ♀: 0.21; 0.14; 0.20; 0.23; 0.29; 0.30; 0.46; 0.43; 0.50; 0.41; 0.33

Antennomere ratio (from scape to terminal segment, in %):

HT ♂: 5.64; 3.76; 5.26; 6.02; 7.52; 9.02; 11.65; 12.41; 13.91; 14.66; 10.15

PT ♀: 6.12; 4.08; 5.71; 6.53; 8.16; 8.57; 13.06; 12.24; 14.29; 11.84; 9.39

Prothorax moderately elongate, with dorsal and ventral sides covered with very dense, fine, pale-yellow pubescence. Pronotum slightly longer than wide, PL 0.90–1.00 mm, PW 0.79–0.83 mm, index PL/PW 1.14–1.21, with maximum width in the middle of pronotal length. Anterior margin strongly convex; lateral sides anteriorly to the middle length slightly sinuate; basal margin straight, slightly wider than the base of elytra; basal angles obtuse.

Elytra elongate-ovate, strongly convex, with maximum width in the apical third of elytral length, EL 1.63–1.95, EW 1.23–1.37, index EL/EW 1.30–1.43, covered with very dense, pale-yellow pubescence.

Legs very long and slender; femora and tibiae covered with fine, dense, pale pubescence. Protibiae not widened, without external apical comb of spines. Male protarsi 5-segmented, with tarsomeres I – III distinctly dilated, female protarsi 4-segmented. Tarsal claws widened, long and curved, pointed apically.

Aedeagus (Fig. 17) markedly similar to *V. smidai*, small sized, 0.77–0.80 mm in length (HT 0.77 mm); median lobe elongate, parallel sided, towards apex slightly sinuate in dorsal aspect, slightly arcuate in lateral aspect; apex widely rounded. Endophallus without sclerotised structures. Parameres very long and narrow, distinct-



Fig. 20. Munižaba, entrance of the cave (Photo: D. Cvitković).

ly longer than the median lobe, moderately curved in dorsal aspect. Apex of parameres with two-three apical and one preapical setae.

Female genitalia: as in the genus description (see CASALE *et al.*, 2004, p. 313).

### Etymology

Patronymic, dedicated to Ozren Lukić – »Luka« (Zagreb, 1965 – Velebit, 1992), geologist, speleologist, and member of the Željezničar Speleological Club in Zagreb. A well-known cave explorer who focused his work to the Crnopac massif, and was one of the discoverers and explorers of the Munižaba cave. During the Croatian war of Independence he was a Croatian Army soldier. He was killed on 14th July 1992, in an ambush on southern Velebit.

### Topographic location and habitat

Munižaba cave: male holotype and eight paratype specimens were found in the median area of the main corridor named »Veliki Kanjon« at the depth of ca 340 metres, behind (direction from entrance to Završna Dvorana) a small lake which divided this passage (Fig.21). Beetles were observed in a typical hygropetric en-

#### MUNIŽABA

DUBINA: 610 m, DULJINA: 9322 m

ISTRAŽILI: SOŽ, SOV, SOD, SOM, SOSM, DISKF, HBSD, SDI, SKS, ASAK i SOI, 1989 - 2011.

TOPOGRAFSKI SNIMILI: D. ĐURETEK, O. LUKIĆ, R. DADO, M. KUHTA, T. BARIŠIĆ, A. K. SANSEVIĆ

D. BAKŠIĆ, M. GLUŠEVIĆ, J. PETRIČEVIĆ, D. LACKOVIĆ, R. ŽELEZNIJAK, A. KOMERIČKI, M. PULJAK

L. ČEPELAK, H. IVANIĆ, M. MALENICA, M. ČEPELAK, D. PAAR, L. MUDRONJA, A. BAKŠIĆ i T. SELAKOVIĆ

NACRT UREDILI: T. BARIŠIĆ i D. BAKŠIĆ

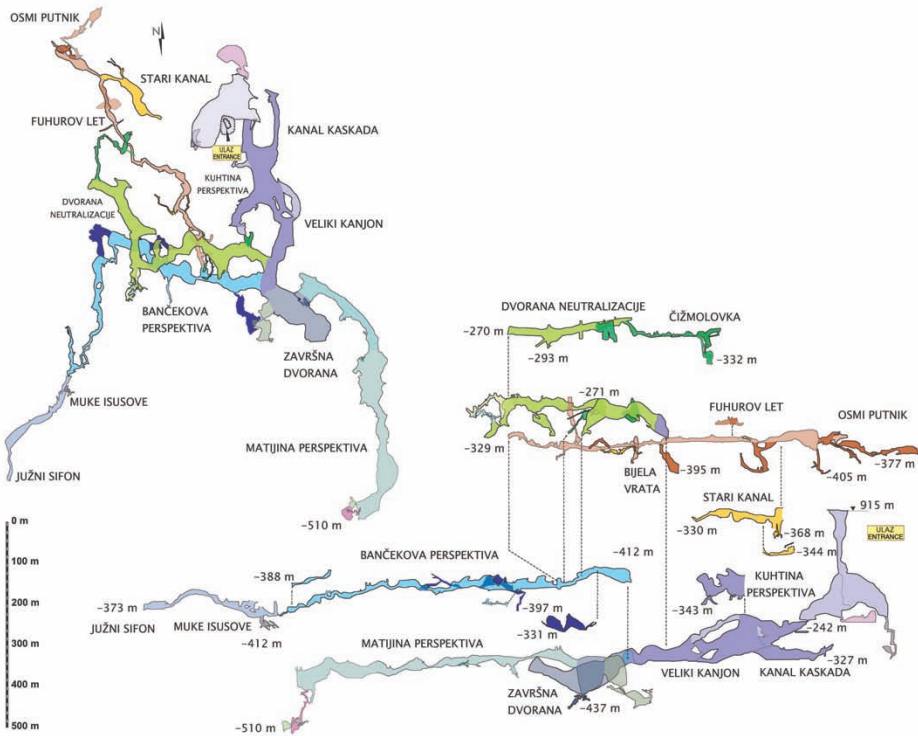


Fig. 21. Munižaba, topographical scheme of the cave.





Fig. 22. Munižaba, hygropetric biotope (Photo: D. Bakšić).

vironment (sensu SKET, 2004) – on rock with a thin layer of flowing and dripping water percolating from the ceiling of the cave corridor. This place was very limited in size, ca  $1.5 \times 1.5$  meters; at the time of collecting (August 8th 2000), no such biotope conditions were observed in the main corridor of the cave (entrance part, Kanal Kaskada, Veliki Kanjon and Završna Dvorana).

Kita Gaćešina-Draženova puhaljka pit system: this cave is a part of the deep underground system of Crnopac, most likely connected with the caves Munižaba, Burinka, Muda labudova and Cerovačke špilje into one large cave system (see above, in *Velebitaphaenops giganteus*). Five paratype specimens were found at –400 meters depth in the area called »Nebozemlje«, and at –580 meters depth in the area called »Dva sifona«, on wet rocks, very close to the typical cave hygropetric environment (sensu SKET, 2004). Together with the last finding of one paratype specimen (October 15th 2011), many remains of individuals of this new species were also found.

### Relationships

Genus *Velebitodromus* Casale, Giachino & Jalžić, 2004 is member of the subtribe *Anthroherponina* Jeannel, 1910 sensu PERREAU (2000) (*Anthroherpon* [sic] phyletic series of Jeannel, 1924 of »Infraflagellates« sensu GIACHINO *et al.*, 1998), characterised by the following combination of characters: 1. antennae inserted in the posterior third or fourth of the head length (including labrum and neck), 2. second antennomere markedly shorter than the first one, 3. concave ventral surface, 4. mesosternum not carinate, 5. male protarsi five-segmented, 6. protibiae without external apical comb of spines, 7. widened tarsal claws and, 8. small-sized aedeagus, with-

out sclerotized pieces in endophallus (NEWTON, 1998, CASALE *et al.*, 2004). This subtribe currently comprises eight genera: *Anthroherpon* Reitter, 1889, *Leptomeson* Jeannel, 1924, *Parantrophilon* Noeske, 1914, *Hadesia* Müller, 1911, *Kircheria* Giachino & Vailati, 2006, *Nauticiella* Moravec & Mlejnek, 2002, *Croatodirus* Casale, Giachino & Jalžić, 2000 and *Velebitodromus* Casale, Giachino & Jalžić, 2004, distributed along the Dinaric range from Northern Croatia – Istria, Gorski Kotar and Velebit Mountains (*Croatodirus*, *Velebitodromus*) up to Northern Albania (*Kircheria*, *Anthroherpon*).

Except for the species of less specialised genera *Anthroherpon*, *Leptomeson* and *Parantrophilon*, all representatives of the genera of this phyletic lineage were observed as inhabitants of the cave hygropetric environment, as defined by SKET (2004). In these, mouthparts (in particular, maxillary and labial palpi) are covered with very dense setation able to filter organic matter from the water; furthermore, the mandibles are truncate, hoe-shaped and apically not pointed, with several obtuse teeth, to canalize waterflow to the mouth, and tarsal claws are very long and widened, strongly curved, allowing beetles to grasp the surface in waterstream (a behaviour supposed by GIACHINO & VAILATI (2006) for *Kircheria* and observed in *Hadesia* and *Nauticiella*).

Genus *Velebitodromus*, with its type species *Velebitodromus smidai*, was described from a series of seven specimens (three males and four females) sampled in two deepest pits in Croatia, located on Northern Velebit – Lubenovac: pit system Lukina jama – Trojama (–1409 m) and Slovačka jama (–1320 m). As stated above (see Diagnosis), *Velebitodromus ozrenlukici* sp. nov. is markedly similar to the type species of the genus. However, these two species are easily distinguishable by the following key:

- 1 (2) Elytra narrower, index EL/EW 1.60–1.66, with their maximum width anteriorly to the middle length (Fig.12)..... *Velebitodromus smidai* Casale, Giachino & Jalžić, 2004  
 2 (1) Elytra wider, index EL/EW 1.30–1.43, with their maximum width in the apical third (Fig.13).....*Velebitodromus ozrenlukici* Lohaj, Mlejnek & Jalžić sp. nov.

## DISCUSSION AND CONCLUSIONS

The discovery of the highly specialised troglobiont, unexpected species described in this contribution, confirms the Dinaric chain, and the Velebit massif, as an impressive hotspot of subterranean biodiversity.

Concerning the Crnopac massif, the following list reports the specialised subterranean taxa, of different animal groups, sampled in two of the caves where the new taxa were discovered:

### **Muda labudova pit:**

Gastropoda, Pulmonata, Carychiidae:

*Zospeum* sp.

Amphipoda, Niphargidae:

*Niphargus* sp.

Isopoda, Trichoniscidae:

*Alpioniscus* sp. (det. J. Bedek)

Diplopoda, Anthogonidae:

*Haasia stenopodium* (Strasser, 1966) (det. T. Dražina)

Pseudoscorpiones, Neobisiidae:

*Neobisium (Pennobisium) stribogi* Ćurčić, 1988 (det. R. Ozimec)

Araneae, Linyphiidae:

*Troglolyphantes* sp. (det. M. Pavlek)

Coleoptera, Cholevidae:

*Astagobius angustatus* (Schmidt, 1852) ssp.?

*Parapropus sericeus augustae* Müller, 1941

*Redensekia likana* Karaman, 1953 ssp.?

*Spelaeodromus pluto* (Reitter, 1881)

### Munižaba pit:

Gastropoda, Pulmonata, Carychiidae:

*Zospeum* sp.

Amphipoda, Niphargidae:

*Niphargus* sp.

Isopoda, Trichoniscidae:

*Alpioniscus* sp. (det. J. Bedek)

Diplopoda, Polydesmidae:

*Brachydesmus subterraneus* Heller, 1858 (det. T. Dražina)

Pseudoscorpiones, Neobisiidae:

*Neobisium* sp.

Araneae, Linyphiidae:

*Troglolyphantes roberti roberti* Deeleman-Reinhold, 1978 (det. M. Pavlek)

Coleoptera, Cholevidae:

*Astagobius angustatus* (Schmidt, 1852) ssp.?

*Parapropus sericeus augustae* Müller, 1941

*Redensekia likana* Karaman, 1953 ssp.?

*Spelaeodromus pluto* (Reitter, 1881)

Chiroptera, Vespertilionidae:

*Miniopterus schreibersi* (Kuhl, 1819)

*Myotis myotis* (Borkhausen, 1797)

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