

NOMENCLATRURAL VALIDATION OF TWO EXTANT CONGERIA SPECIES, *C. JALZICI* AND *C. MULAOMEROVICI* (BIVALVIA: DREISSENIDAE) FROM THE CAVES OF THE DINARIC KARST

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Two extant cave-dwelling bivalves of the dreissenid genus *Congeria* were recently described by Morton et Bilandžija in BILANDŽIJA *et al.* (2013) as *Congeria jalzici* Morton et Bilandžija and *C. mulaomerovici* Morton et Bilandžija. Unfortunately, the volume of the *Frontiers in Zoology* in which the descriptions were published was online-only and did not include a Zoobank registration number (LSID), which is required for validation of new names in electronic-only publications (ICZN, 2012). In consequence, the names *C. jalzici* and *C. mulaomerovici* should not be available according to the International Code of Zoological Nomenclature (ICZN 1999, 2012). Therefore, the present note serves to validate the names *C. jalzici* and *C. mulaomerovici* by fulfilling the ICZN conditions for nomenclatural availability. The holotypes of both species are deposited in the General Collection of Recent Molluscs, Croatian Natural History Museum, Zagreb and in The National Museum of Bosnia and Herzegovina, Sarajevo. Accordingly, the date and authorship of the new species names are those of this note and not those of BILANDŽIJA *et al.* (2013).

Keywords: cave biology, subterranean biota, nomenclature, Zoobank registration number, mussels.

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Morton i Bilandžija nedavno su opisali dvije vrste recentnih špiljskih školjkaša u BILANDŽIJA *et al.* (2013) kao *Congeria jalzici* Morton et Bilandžija i *C. mulaomerovici* Morton et Bilandžija. Nažalost, svezak *Frontiers in Zoology* u kojem su objavljeni opisi publiciran je samo online i bez registracijskog broja Zoobanke (LSID), potrebnog za validaciju novih imena u elektroničkim publikacijama (ICZN 2012). Stoga imena *C. jalzici* i *C. mulaomerovici* ne bi trebala biti dostupna prema Međunarodnom kodeksu zoološke nomenklature (ICZN 1999, 2012). Ovaj rad je publiciran u svrhu validacije valjanosti imena *C. jalzici* i *C. mulaomerovici* ispunjavanjem uvjeta ICZN-a za nomenklaturnu dostupnost. Holotipovi obje vrste pohranjeni su u Općoj zbirci recentnih mekušaca, Hrvatski prirodoslovni muzej, Zagreb i u Zemaljskom muzeju Bosne i Hercegovine, Sarajevo. Sukladno tome, datum i autorstvo novih imena vrsta su oni iz ovog rada, a ne iz BILANDŽIJA *et al.* (2013).

Ključne riječi: špiljska biologija, podzemna biota, nomenklatura, Zoobank registracijski broj, mekušci

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INTRODUCTION

Members of the genus *Congeria* Partsch, 1835 (Bivalvia: Dreissenidae) are known to have thrived during the Tertiary period and were considered extinct until living individuals, described as *Congeria kusceri* Bole, 1962, were discovered in the subterranean realm of the Dinaric Karst (BOLE, 1962). The main diagnostic traits of this genus differentiating it clearly from other dreissenids are the different shell form and shell microstructure, but extant cave species possess several other specific biological traits like a rare type of larval brooding, albinism, lack of photoreceptors, elaboration of chemoreceptors, as well as extreme longevity (MORTON *et al.*, 1998; BILANDŽIJA *et al.*, 2013; MORTON & PULJAS, 2013; PULJAS *et al.*, 2014).

Two new *Congeria* species, *C. jalzici* Morton et Bilandžija and *C. mulaomerovici* Morton et Bilandžija, were described in 2013 (BILANDŽIJA *et al.*, 2013), with evidence that hydrologically isolated populations have genetic and morphological differences. Unfortunately, these names are not available as they were published in *Frontiers in Zoology*, an electronic-only journal. According to the International Code of Zoological Nomenclature (ICZN), species descriptions published in electronic journals prior to 2012 are not considered valid, and after 2013 may be considered valid only under certain conditions. Hence this paper is being published for the purpose of providing a permanent public scientific record.

MATERIAL AND METHODS

This study is written in accordance with the International Code of Zoological Nomenclature (ICZN 1999, 2012) and aims to validate the names *Congeria jalzici* Morton et Bilandžija and *C. mulaomerovici* Morton et Bilandžija. The paper will be available free of charge or by purchase when first issued, and it will be produced in an edition that includes simultaneously obtainable numerous identical and widely accessible electronic copies with fixed content and layout (PDF) as well as physical copies printed in ink or toner on paper as prescribed by the ICZN (1999, 2012). For detailed methodology on the discovery of new *Congeria* and their morphological, molecular and habitat differences, see BILANDŽIJA *et al.* (2013).

RESULTS

Superfamily DREISSENOIDEA Gray in Turton, 1840

Family Dreissenidae Gray in Turton, 1840

Genus *Congeria* Partsch, 1835

Type species: †*Congeria subglobosa* Partsch, 1835, subsequent designation by Pilsbry, 1911

Validation of *Congeria jalzici* and *C. mulaomerovici*

Congeria jalzici Morton & Bilandžija, 2023 sp. nov.

(for figures and measurements see BILANDŽIJA *et al.* 2013)

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Congeria jalzici Morton et Bilandžija, 2013 [unavailable, i.e., *nomen nudum*]: PULJAS *et al.*, 2014; ARAUJO & JONG, 2015; STOEV *et al.*, 2015; PAPAĆ *et al.*, 2016; JOVANOVIĆ GLAVAŠ *et al.*, 2017; GEDA *et al.*, 2018; GORIČKI *et al.*, 2018; MOLDOVAN, 2018; GORIČKI, 2019; MANSUR *et al.*,

2019; ŠILC *et al.*, 2020; WANGKULANGKUL & KLANGNURAK, 2021; PRIETO *et al.*, 2022; SCAPO-LATIELLO *et al.*, 2022, 2023; BILANDŽIJA *et al.*, 2022; BAKOVIĆ *et al.*, 2023; LUKIĆ *et al.*, 2023

Type series. HOLOTYPE. General Collection of Recent Molluscs, Croatian Natural History Museum, Zagreb (CNHM, Reg. No.: 10346). Locality: Markov ponor, Lipovo polje, Lika, Croatia (Co-ordinates: WGS84 $x = 44^{\circ}45'57''$; $y = 15^{\circ}10'53''$). Leg: B. Jalžić and H. Bilandžija, 2009. **PARATYPES:** Specimens 1–3, General Collection of Recent Molluscs, Croatian Natural History Museum, Zagreb (CNHM, Reg. No.: 10347); Specimens 4–6, The Natural History Museum, London (Reg. No's.: NHMUK 20110180–20110182), Specimens 7–9, The Croatian Biospeleological Society, Zagreb (CBSSC Reg. No.: BV 001). Locality: Markov ponor, Lipovo polje, Lika, Croatia (Co-ordinates: WGS84 $x = 44^{\circ}45'57''$; $y = 15^{\circ}10'53''$). Leg: B. Jalžić and H. Bilandžija, 2008–2009.

Description. Shell small, up to 13 mm in length, approximately equivalve, and distinctly inequilateral. Shell generally wider than tall, but often only slightly so. Periostracum brown. Distinctly heteromyarian with the swollen posterior face generally round; anterior narrowly rounded with the beaks pointed downwards. Postero- and antero-ventrally convex, although typically concave mid to antero-ventrally around a distinct byssal notch. Valve margins uniform, except ventrally around byssal notch where they are sinusoidal to varying degrees. An external, opisthodontic, ligament. Anterior adductor muscle scar situated on a small septum whose internal face is characteristically and smoothly rounded. Apophysis tiny, situated dorsal to the septum and located (partially hidden) under the resilifer and bears the tiny scar of the anterior byssal retractor muscle.

Diagnosis.

Shell form: *Congerina jalzici* **sp. nov.** Seen from the right, the shell is antero-dorsally keeled and deeply convex at the midpoint around the keel. Seen from the dorsal aspect, the shell is posteriorly pointed and laterally inflated. The ventral valve margins are straight posteriorly, anteriorly they are sinusoidal around a large byssal gape. The separated umbones are clearly obvious when seen from the anterior aspect. The shell is flattened ventrally and the greatest shell width is situated close to the ventral side making the shell of *C. jalzici* **sp. nov.** distinctly mytiliform. From the posterior aspect, the shell is more rounded laterally and concave centrally.

Ecophenotype of *Congerina jalzici* **sp. nov.** The shell of *C. jalzici* **sp. nov.** from the Lukina Jama – Trojama cave system is distinctly less antero-dorsally keeled than conspecifics from the type locality and therefore less concave at the mid antero-dorsal point. It is also posteriorly more rounded, less anteriorly convex and concave postero-ventrally around the byssal notch. Seen from the dorsal and ventral aspect, the shell is like its type locality conspecifics except there is not a byssal gape although there is a shallow byssal notch. In cross-section, the left and right valves are not indented as in type conspecifics but are more smoothly rounded to create a more drop-shaped form. The shell is less flattened ventrally, except at the valve margins, which are concave anteriorly. The greatest shell width is situated at a point more dorsally than in type locality conspecifics and thus is not mytiliform. From the posterior aspect, the shell is distinctly rounded laterally and is not flattened ventrally as in type locality conspecifics. The shell of this population of *C. jalzici* **sp. nov.** is clearly not adapted to flowing waters as are conspecifics from the type locality. The shell of *Congerina kusceri* has been redescribed and illustrated by MORTON *et al.* (1998, Figures 7-16).

Hinge plates: In *Conger* *jalzici* **sp. nov.** internally, the shell possesses a large posterior adductor muscle scar, internal to which is the scar of the posterior byssal retractor muscle. There is a thick pallial line, especially posteriorly and a small, bean-shaped anterior adductor muscle scar located on a shell shelf or septum, internal to the downwardly directed umbones. The long thin ligament is situated on a resilifer and extends approximately half way up the anterior slope of the shell. Underneath the resilifer, just above the shell shelf is a tiny apophysis on which is located the scar of the anterior byssal retractor muscle. There is a deep byssal notch. The shell shelf has a distinctively curved inner margin. In the ecophenotype of *Conger* *jalzici* **sp. nov.**, the shell is altogether more delicate than in *C. jalzici* **sp. nov.** from its type locality. Similarly, the internal muscle scars are smaller and more delicate – indeed they are difficult to discern in such a thin, near-translucent, shell but their arrangement is approximately the same. In the ecophenotype of *C. jalzici* **sp. nov.**, the shell septum is extremely delicate, but has the same form, a distinctively curved inner margin. The scar of the tiny anterior adductor muscle is located just internal to the umbo. The apophysis with its scar of the anterior byssal retractor muscle is similarly proportionally smaller than in *C. jalzici* **sp. nov.** from its type locality. In *Conger* *kusceri*, the arrangement of the internal muscle scars are approximately the same as in *C. jalzici* **sp. nov.** In *C. kusceri*, however, the shell septum is proportionally larger than in *C. jalzici* **sp. nov.**, as are the scars of the anterior adductor muscle and the anterior byssal retractor muscle situated on its also proportionally larger apophysis. The shell septum of *C. kusceri* has a straight inner margin and the apophysis is located much closer to the shell septum.

Remarks. As with its sister species, *Conger* *kusceri* and *C. mulaomerovici* **sp. nov.** the shell of *Conger* *jalzici* **sp. nov.** is variable in form, but the septum is small and distinctively concave. Hence, the anterior adductor muscle scar of the former is much larger and has a near straight internal margin aligned with the straight septum margin. The ecophenotype of *Conger* *jalzici* **sp. nov.** from the Lukina Jama – Trojama cave system is different, in terms of shell form, from the specimens obtained from the type locality. It has a near transparent shell, with the periostracum only obvious as a yellow – light brown marginal fringe. Its internal shell septum is even smaller than that of conspecifics from Markov ponor and the shell has a less triangular form in cross-section.

Etymology. *Conger* *jalzici* **sp. nov.** is named after Branko Jalžić, Croatian Biospeleological Society, in honour of his achievements in the field of cave biology in the Dinarides and in appreciation of his invaluable help during this research.

***Conger* *mulaomerovici* Morton & Bilandžija, 2023 sp. nov.**

(for figures and measurements see BILANDŽIJA *et al.* 2013)

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Conger *mulaomerovici* Morton et Bilandžija, 2013 [unavailable, i.e., *nomen nudum*]: PULJAS *et al.*, 2014; ARAUJO & JONG, 2015; JOVANOVIĆ GLAVAŠ *et al.*, 2017; GEDA *et al.*, 2018; MOLDOVAN, 2018; MANSUR *et al.*, 2019; ŠILC *et al.*, 2020; UŠANOVIĆ *et al.*, 2020; WANGKULANGKUL & KLANGNURAK, 2021; BILANDŽIJA *et al.*, 2022; SCAPOLATIELLO *et al.*, 2022, 2023; BAKOVIĆ *et al.*, 2023

Type series. HOLOTYPE. Collection of Molluscs, The National Museum of Bosnia and Herzegovina, Sarajevo (Reg. No.: 470). Locality: Oko, Lušci Palanka, north-western Bosnia, Bosnia and Herzegovina (Co-ordinates: WGS84 x = 44°42'08": y = 16°28'04"). Leg:

B. Jalžić, 2011. **PARATYPES:** Specimens 1–3, The National Museum of Bosnia and Herzegovina, Sarajevo (Reg. No.: 471); Specimens 4–6, The Natural History Museum, London (Reg. No's.: NHMUK: 20110469/1,2,3); Specimens 7–9, General Collection of Recent Molluscs, Zoology Department, Croatian Natural History Museum, Zagreb (CNHM, Reg. No.: 10348). Locality: Oko, Luči Palanka, Bosnia and Herzegovina. Leg: B. Jalžić, 2011.

Description. Shell small, up to 12 mm in length, approximately equivalve but distinctly and acutely inequilateral. Shell usually wider than tall, but often only slightly so. Periostracum uniformly brown. Distinctly heteromyarian with the postero-dorsal slope straight and, hence, sharply pointed; anteriorly also pointedly rounded. Ventrally flattened, although somewhat concave antero-ventrally around a slight byssal notch. Valve margins uniform, except ventrally around the byssal notch where they are slightly sinusoidal to varying degrees. The beaks point downwards. An external, opisthodetic, ligament. Anterior adductor muscle scar situated on a small septum whose internal face is smoothly sinusoidal. Apophysis small, situated dorsal to the septum and located (partially hidden) under the resilifer and bears the tiny scar of the anterior byssal retractor muscle.

Diagnosis.

Shell form: *Congeria mulaomerovici* **sp. nov.** The shell of *C. mulaomerovici* **sp. nov.** is somewhat antero-dorsally keeled but at a point more anteriorly than in *C. jalzici* **sp. nov.** It is dorsally peaked, almost pyramidal. Seen from the dorsal aspect, the shell is posteriorly pointed and laterally inflated. The ventral valve margins are slightly curved posteriorly, anteriorly they are somewhat sinusoidal around a large byssal gape. The right valve overlaps the left somewhat posterior and, especially, anteriorly such that the umbones are distinctly unequally situated, the left more anterior than the right. The umbones are also less separated than in *C. jalzici* **sp. nov.**. The valves are slightly laterally indented in cross-section and the shell is ventrally keeled. As a consequence, the greatest shell width is situated more dorsally than in *C. jalzici* **sp. nov.** so that the whole form of the shell is less mytiliform.

Hinge plates: In *Congeria mulaomerovici* **sp. nov.** The shell is more steeply pointed dorsally and is distinctively more pointed posteriorly than in both *C. kusceri* and *C. jalzici* **sp. nov.**, but the byssal notch is small. The arrangement of the internal muscle scars is approximately the same as in the previous two species. In *C. mulaomerovici* **sp. nov.**, however, the shell septum is approximately mid way in size between the other two *Congeria* species as is the scar of the anterior adductor muscle. The apophysis with its scar of the anterior byssal retractor muscle is approximately the same size as in *C. kusceri* but, of all the three species it is located the closest to the shell septum and, in fact, partially beneath it. The shell shelf has a sinusoidal inner margin.

Remarks. As with its sister species, *Congeria kusceri* and *Congeria jalzici* **sp. nov.**, the shell of *Congeria mulaomerovici* **sp. nov.** is variable in overall form but is more distinctively pyramidal dorsally. Further, the septum is sinusoidal, such that the anterior adductor muscle scar is bean-shaped.

Etymology. *Congeria mulaomerovici* **sp. nov.** is named after Dr. Jasminko Mulaomerović, Centre for Karst and Speleology, Sarajevo, an eminent researcher of the karst in Bosnia and Herzegovina, and in appreciation of his support during our research.

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