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THE STYGOBIONT BIVALVE *Congeria kusceri* Bole, 1962 (Bivalvia, Dreissenidae) IN CROATIA

BRANKO JALŽIĆ

Department of Zoology, Croatian Natural History Museum, Demetrova 1,
10000 Zagreb, Croatia

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Live colonies of the relict stygobiont bivalve *Congeria kusceri* have been found on three localities in Croatia, and another occurs in Bosnia and Herzegovina – all inhabit subterranean waters in the karst around the lower course of the Neretva River. Shells of the same species are also found in four springs and one sinkhole in the same area of Croatia. The August and September temperatures of the water in these karst caverns are between 14,5 and 19 °C, which is higher than in Slovenia and Popovo polje (BIH).

Key words: *Congeria kusceri*, stygobiont bivalve, Croatia

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Žive kolonije stigobionskog reliktnog školjkaša *Congeria kusceri* nađene su u Hrvatskoj na tri lokaliteta u krškim podzemnim vodama uz donji tok rijeke Neretve, te još jedna u susjednom području Bosne i Hercegovine. U istom području Hrvatske zabilježena su i nalazišta ljuštura iste vrste u četiri izvora i jednom ponoru. Temperatura vode u tim podzemnim šupljinama bila je između 14,5 i 19 °C tijekom kolovoza i rujna, više temperature od zabilježenih u Sloveniji i Popovom polju (BIH).

Ključne riječi: *Congeria kusceri*, stigobionski školjkaš, Hrvatska

INTRODUCTION

The first finding of the shell of any subterranean bivalve in the Dinaric karst was reported from Bosnia and Herzegovina (Lušci Palanka) by KATZER (1921); he considered species involved to be *Dreissena polymorpha* Pallas, 1771. A second find (and the first from Croatia) was made by the well-known Slovene malacologist Ljudevit Kuščer when he found bivalve shells in 1934. These were found in the powerful karstic spring of Stinjevac (near the village of the same name near Vrgorac) on the northern side of Jezero polje in Dalmatia, and it was decided to refer this material to the Tertiary genus *Congeria* (BOLE, 1962). Nineteen years later, the French

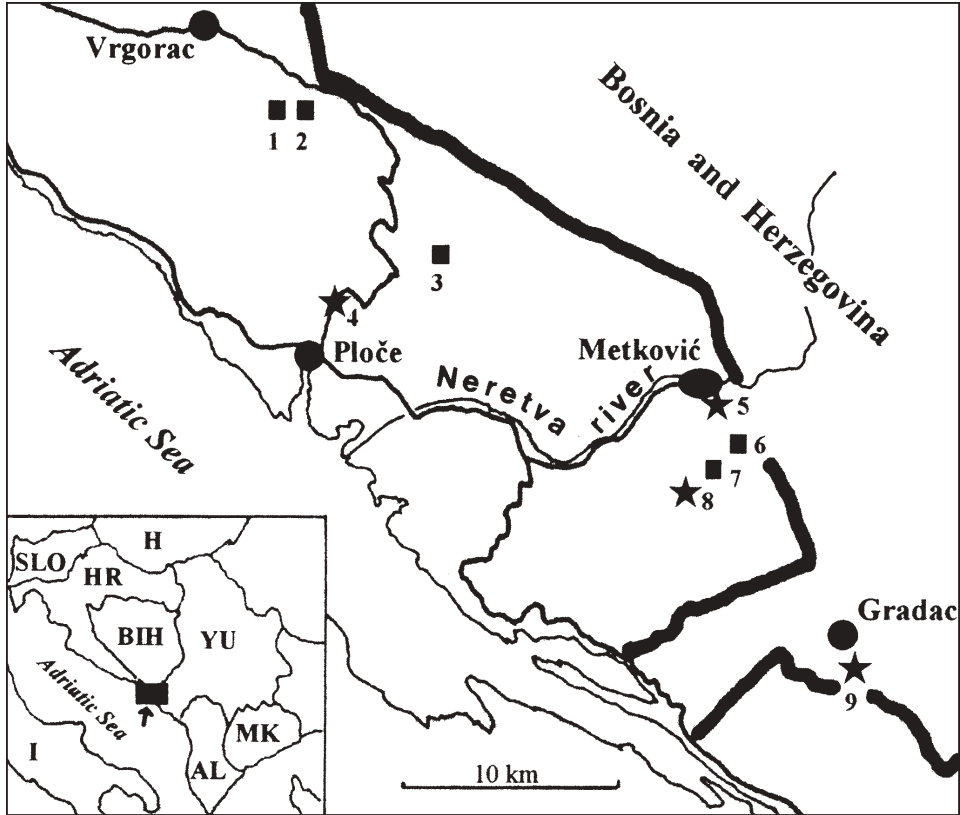


Fig 1. Find spots for *Congeria kusceri* in Croatia and neighbouring area. Stars mark localities with live specimens, squares mark sites from which only shells are known: 1. Butina spring (Izvor Butina); 2. Stinjevac spring (Izvor Stinjevac); 3. Crni Vir sinkhole (Ponor Crni Vir); 4. Fissure in the tunnel Jezero polje – Peračko blato (Pukotina u tunelu polje Jezero – Peračko blato); 5. Pit in Predolac, Metković (Jama u Predolcu, Metković); 6. Cave spring near bunker, Glušci (Izvor-spilja kod bunkera, Glušci); 7. Bijeli Vir spring (Izvor Bijeli Vir); 8. Cave spring near St. Mihovil's Chapel, Kosa (Izvor-spilja kod kapele Sv. Mihovila, Kosa); 9. Gradnica estavelle, Gradac (estavela Gradnica, Gradac), BIH.

biospeleologist Remy found similar *Congeria* remains in Baba cave in Popovo polje (Bosnia and Herzegovina), but these were referred to *Dreissensia* sp. (REMY, 1953).

A living colony of *Congeria* was first found by Jože Štirn in the Žira pit in Popovo polje in 1956 (BOLE, 1962); this was proof that subterranean bivalve still survived in the Dinaric karst. At the end of 1960 the Slovene biospeleologists Jože Bole, Boris Sket and Egon Pretner undertook detailed researches in Žira pit, where they found quite large numbers of live specimens of this »living fossil«. Two years later BOLE (1962) formally described this bivalve, naming it after Ljudevit Kuščer. In subsequent years it was found at several localities in Bosnia and Herzegovina (SKET, 1970) and in

Slovenia (BOLE, 1992). BOLE & VELKOVRH (1986) also mention a locality »near Metković«, but do not give the precise name or position of the locality so, because of its closeness to the Croatian and Bosnia-Herzegovinian border and the city of Metković, it remained unclear within which country this find was made. MORTON *et al.* (1998) list *C. kusceri* as living only in Bosnia and Herzegovina.

MATERIALS AND METHODS

Under a permit issued by the Croatian State Agency for Protection of Natural and Cultural Heritage (now the State Directorate for the Protection of Nature and Environment), biospeleological researches undertaken in the lower course of the Neretva River in 1995, 1996 and 1997 led to the discovery of shells and live specimens of *Congerina kusceri*. The samples (preserved in 70% ethanol) are held in the biospeleological collection of the Croatian Natural History Museum (CNHM) in Zagreb, and in the private collection of Tonći Rađa in Split. Through the kind assistance of colleagues from Slovenia (France Velkovich, Boris Sket and Rajko Slapnik) it has been possible to compile a listing of all localities from which *C. kusceri* is known, and of the collections in which this material is kept.

RESULTS

The stygobiont bivalve *Congerina kusceri* has been found at the following localities in Croatia (Fig. 1):

1. Butina spring (right side of the Neretva River)

A captured spring in the village of the same name on the northern side of Jezero polje near Vrgorac. Shells were found in the drift at the front of the spring, however, because of the small size of the fissures through which the water escapes, sampling underground was impossible. The samples are kept in the collections of the CNHM, the Institute of Biology of the Slovenian Academy of Sciences and Arts, and private collection of T. Rađa.

2. Stinjevac spring (right side of the Neretva River) (BOLE, 1962)

A spring in the village of the same name, not far from Butina Spring. This is a very powerful karstic spring, in which water comes from a drowned cavern fissure channel. Cave diving was undertaken to inspect part of the fissure, but live molluscs were not found (although speleological research is on-going). Shells have been found in the sediments in front of the spring, these metre-thick deposits being composed almost exclusively of the shells of dead stygobiont molluscs (mainly snails). These samples are held in the collections of the CNHM, Institute of Biology of the Slovenian Academy of Sciences and Arts and in private collections of F. Velkovich and T. Rađa.

3. The Crni Vir sinkhole (right side of the Neretva River)

This sinkhole lies in the south-east part of Jezero polje (some of the waters from the Matica River are drained by this sinkhole). This is actually a cave about 12 metres deep, with a channel approximately 10 metres long. Only shells were found at the site and it is possible that they have been carried here from nearby springs. The sample is held in private collection of F. Velkovich, and in the CNHM.

4. Fissure in the tunnel between Jezero polje and Peračko blato (right side of the Neretva River)

This fissure is on the right hand side of the tunnel, and some of it is occasionally submerged. Living specimens were found above the water level (August water temperatures are 19 °C). A sample from this site is held in the CNHM.

5. Pit in Predolac (left side of the Neretva River)

(= »near Metković« BOLE & VELKOVICH 1986; »Metkovic« MORTON *et al.* 1998)

This pit is located on the way out of Metković at the foot of the hill Predolac. It is about ten metres deep, with a subterranean lake at its bottom. Specimens of *C. kusceri* (Fig. 2) were found living on the rocks by the water. In August 1997 the water temperature was 19 °C, and about 17,5 and 18 °C in September 1998. This is the



Fig. 2. Part of a living colony of *Congeria kusceri* with tubes of *Marifugia cavatica* on the shells. Pit in Predolac, Metković, Croatia (photo Dragan Pečić).

biggest known colony of *C. kusceri* in Croatia, so it is unfortunate that this pit has been used as a rubbish dump. Samples from Predolac are held in the collections of F. Velkovich, T. Rađa, and in the CNHM.

6. Cave spring near a bunker at Glušci (left side of the Neretva River)

The cave spring is located not far from Metković, on the left hand side of the road towards the hamlet of Glušci. The cave consists of a 5 metre long channel with water at the bottom and, although the fissure runs further, stone debris makes further research impossible. Here shells have been found in bottom sediments. Samples from this site are held in the collections of the CNHM and of T. Rađa.

7. Bijeli Vir Spring (left side of the Neretva River)

This lake-shaped spring is located in the village of the same name. Diver explorations at the bottom of the 7 metre deep lake revealed the presence of a narrow fissure, however, only shells were found here. The samples are in private collection of T. Rađa.

8. Cave spring near St. Mihovil's Chapel (near village Kosa, left side of the Neretva River)

The spring from the cave is actually a narrow fissure with water at its bottom, but this is covered with stone debris that stops further research. Live bivalves were found in an August water temperature of 14,5 °C. Samples are held in the collections of the CNHM and T. Rađa.

DISCUSSION

Before this report, according to MORTON *et al.* (1998), *C. kusceri* could only be found alive in the Dinaric karst from Bosnia and Herzegovina. Following our researches, we know now that live colonies of *C. kusceri* exist in subterranean waters on both sides of the Neretva River in Croatia (Fig. 1).

The dilemma with regard to the location of the »near Metković« locality (BOLE & VELKOVHRH, 1986) has been solved: it is in Croatia. At the time of the first finding of this bivalve alive (in the 1960s) the cave lay to the south of the town of Metković, however, because the town has expanded, today it is within the city limits. During documentation of their collections Slovene biospeleologists have referred to this site as the Pit »near Predoca« (»kod Predoca«), but the correct name is the Pit in Predolac.

In neighbouring parts of Bosnia and Herzegovina (apart from Popovo polje), *C. kusceri* has been found in the Gradnica estavelle by the author in 1995 (KUHTA, 1997). This locality is in Gradničko polje near Gradac, at the left side of the Neretva River. It is an 80 metre deep well-like cave with a lake at the bottom and an August water temperature of 16,5 °C. Live specimens have been found here, and the samples are in the collection of the CNHM.

Whilst these localities are quite close together and probably derive from the same population, far away in the north-west of Bosnia and Herzegovina *Congeria* can be found in the isolated karst at Lušci Palanka and Dabarska pećina and, still further to the north-west at the source of the Krupa River in Slovenia. Today these isolated populations are considered to be the same taxon (MORTON *et al.*, 1998), but research is needed to verify their specific status. According to BOLE (1962), *C. kusceri* is undoubtedly is a Tertiary relict which survived by gradually colonising underground habitats before the Pleistocene. However, according to SKET (1997) this colonisation may have occurred at the end of the Pleistocene. Whatever the case, further finds of *Congeria* can be expected in some other parts of the Dinaric karst.

The results of our measurements of water temperatures in habitats with living *Congeria* differ from the data of MORTON *et al.* (1998). In August and September temperatures are between 14,5 and 19 °C, higher then approximately 13,5 °C reported for the population in Popovo polje in Bosnia and Herzegovina.

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S A Ž E T A K

**Stigobiontski školjkaš *Congeria kusceri* Bole, 1962
(Bivalvia, Dreissenidae) u Hrvatskoj**

B. Jalžić

Tijekom biospeleoloških istraživanja na području donjeg toka rijeke Neretve provedenih u razdoblju od 1995. do 1997. godine, ustanovljeno je 7 novih nalazišta reliktnog stigobiontskog školjkaša *Congeria kusceri*, 6 u Hrvatskoj i jedno u Bosni i Hercegovini (estavela Gradnica). Među nalazištima u Hrvatskoj sada su poznata tri sa živim kolonijama ovog »živog fosila«. Ta nalazišta su na obje strane rijeke Neretve: pukotina u tunelu između polja Jezero i Peračkog blata s njezine desne strane, a Jama u Predolcu i izvor-špilja kod kapelice Sv. Mihovila s lijeve strane. Najveća kolonija je u Jami u Predolcu koju bi trebalo što prije zaštititi.

Do sada je ova vrsta u Hrvatskoj prema literaturnim podacima bila poznata samo po ljušturama iz izvora Stinjevac na rubu polja Jezero, a za lokalitet »kod Metkovića« (BOLE & VELKOVRH, 1986), gdje su pronađene kolonije živih školjkaša, nije bilo sigurno da li se nalazi u Hrvatskoj ili Bosni i Hercegovini. Utvrdili smo da se spominjani lokalitet Jama kod Predoca nalazi u Hrvatskoj, u samom Metkoviću i da je njegovo pravo ime Jama u Predolcu. Temperatura vode u objektima sa živim jedinkama vrste *Congeria kusceri* u kolovozu i rujnu kretala se između 14,5 i 19 °C, što je iznad raspona koji su zabilježili MORTON *et al.* (1998) na nalazištima u Sloveniji i Popovom polju (BIH).