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**TRAGOM PUŽEVA OD OBALE KA UNUTRAŠNOSTI I NATRAG:
PROBUŠENI MORSKI I SLATKOVODNI PUŽEVI KAO POKAZATELJ
REGIONALNIH SUSTAVA RAZMJENE TIJEKOM MEZOLITIKA U HRVATSKOJ¹**
**CHASING SNAILS FROM COAST TO INLAND AND BACK: PERFORATED
MARINE AND FRESHWATER SNAIL SHELLS AS AN INDICATION OF
REGIONAL EXCHANGE SYSTEMS DURING THE MESOLITHIC IN CROATIA¹**

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Probušene školjke imaju važnu ulogu u raspravama o sustavima razmjene i ukrašavanju tijela tijekom mezolitika Europe. U ovom radu raspravljamo o skupovima nalaza probušenih ljuštura puževa pronađenih tijekom novijih istraživanja mezolitičkih nalazišta u Hrvatskoj. Brojni nalazi pronađeni su na nekoliko nalazišta na sjevernom Jadranu i u špilji Zala u unutrašnjosti Hrvatske, na prostoru Ogulinsko-plašanske udoline. Nalazi probušenih morskih i slatkovodnih puževa iz obje regije ukazuju na postojanje regionalnih sustava razmjene između obalnih područja i unutrašnjosti tijekom mezolitika.

KLJUČNE RIJEČI: mezolitik; perforirani puževi; ukrasi tijela; sustavi razmjene; Hrvatska

Perforated shells figure prominently in discussions of exchange systems and body ornamentation during the Mesolithic in Europe. In this paper we discuss assemblages of perforated snail shells recovered from recent excavations of Mesolithic sites in Croatia. Numerous finds are found in several sites in Northern Adriatic and in Zala Cave in Croatia's inland region of Ogulin-Plaški intermountain valley. Perforated marine and freshwater snail shells from both regions suggest the existence of regional exchange systems during the Mesolithic between coastal and inland areas.

KEY WORDS: Mesolithic; perforated snail shells; body ornaments; exchange systems; Croatia

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¹ This manuscript was submitted in 2012 for the *Proceedings of the Meso 2010 Conference* (Santander, Spain) that was never published. Here we present this research in its original form as submitted in 2012. In the meantime several papers dealing with Late Upper Palaeolithic and Mesolithic personal ornaments in the eastern Adriatic were published i.e., Borić, Cristiani 2019; Cristiani et al. 2014; Cvitkušić 2017; Cvitkušić, Komšo 2015; Cvitkušić et al. 2018; Vukosavljević, Karavanić 2012; 2015. All are listed in the reference list. These new data support conclusions that are presented here.

UVOD

Probušene ljušture morskih i slatkovodnih puževa česta su tema u raspravama o sustavima razmjene i ukrašavanju tijela tijekom paleolitika i mezolitika diljem svijeta. Najstariji nalazi osobnih ukrasa potječu iz srednjeg paleolitika Bliskog istoka i sjeverne Afrike (Bar-Yosef Mayer et al. 2009; d’Errico et al. 2009; Vanhaeren et al. 2006). Tijekom ranog gornjeg paleolitika ukrasi postaju sveprisutan element koji se razvija u “potrebu za osobnim ukrasima” koja se očituje i u današnje vrijeme (Álvarez Fernández 2006; d’Errico et al. 2003; d’Errico et al. 2005; Kuhn et al. 2001; Taborin 1993; 1999; White 1989).

Probušene ljušture puževa čest su predmet proučavanja u kontekstu sustava razmjene u vrijeme paleolitika i mezolitika Europe. Spominju se u kontekstu lokalnog skupljanja i korištenja (e. g. Benghiat et al. 2009), u kontekstu regionalnih sustava razmjene (e. g. Álvarez Fernández 2008), kao i u kontekstu postojanja mreže razmjene između zajednica lovaca skupljača na većem prostoru (e. g. Eriksen 2002; Taborin 1999).

Taj trend razmjene osobito je vidljiv tijekom europskog mezolitika, a posebice je vezan uz distribuciju nalaza probušenog puža vrste *Columbella rustica*. Iako postoje i druge vrste probušenih puževa, *Columbella rustica* najčešće je korištena vrsta morskih puževa u proizvodnji ukrasa i zapravo je omiljeni ukras u mediteranskoj regiji, od Iberskog poluotoka do Bliskog Istoka (e. g. Álvarez Fernández 2003, 2008; Bar-Yosef Mayer 2005; Mussi 1992). To je rezultat njihove lake dostupnosti u Sredozemlju, a možda je u određenoj mjeri bio i dio identiteta lovačko-skupljačkih zajednica. Najranija zabilježena upotreba ovog puža poznata je iz razdoblja ranog gornjeg paleolitika (Álvarez Fernández 2008; Kuhn et al. 2001), a do završetka gornjeg paleolitika te tijekom mezolitika i početka neolitika postaje vrlo popularna (Álvarez Fernández 2003; 2008). Imajući u vidu jedan izolirani nalaz iz razdoblja aterijena (d’Errico et al. 2009), možda u budućnosti možemo očekivati veći broj takvih ukrasa iz razdoblja srednjeg paleolitika. Ovi puževi spadaju u najčešće ukrase tijekom mezolitika, posebice u mediteranskom krugu, a često se nalaze i duboko u zaleđu Europe (Álvarez Fernández 2008; Borrello 2004; Eriksen 2002). Posebno je zanimljivo da u okviru mediteranske regije, odnosno na istočnom dijelu iberskog poluotoka, postoji nekoliko koncentracija nalaza puževa vrste *Columbella rustica*, odakle se dolinom rijeke Ebro

INTRODUCTION

Perforated marine and freshwater snail shells are often discussed in the context of exchange systems and body ornaments worldwide during Palaeolithic and Mesolithic. The oldest ornaments found are from Middle Palaeolithic of the Middle East and North Africa (Bar-Yosef Mayer et al. 2009; d’Errico et al. 2009; Vanhaeren et al. 2006). During the Early Upper Palaeolithic ornaments became an omnipresent element that eventually developed into a genuine “need for body ornaments” that is present even today (Álvarez Fernández 2006; d’Errico et al. 2003; d’Errico et al. 2005; Kuhn et al. 2001; Taborin 1993; 1999; White 1989). Perforated snail shells are often studied in the context of exchange systems during the European Palaeolithic and Mesolithic. As such they are discussed in the context of local collection and use (e.g., Benghiat et al. 2009), in the context of regional exchange systems (e.g. Álvarez Fernández 2008) and even in the context of existence of long-distance exchange networks (e.g., Eriksen 2002; Taborin 1999) between hunter-gatherer communities.

This trend of exchange is particularly visible during the European Mesolithic, specifically related to distribution of finds of perforated *Columbella rustica*. Although there are also other perforated snail shells, *Columbella rustica* is the most frequently used marine snail shell in ornament production and is actually the favourite ornament in the Mediterranean region from the Iberian Peninsula to the Middle East (e.g. Álvarez Fernández 2003, 2008; Bar-Yosef Mayer 2005; Mussi 1992). This is the result of its easy availability in the Mediterranean, and possibly it was to a certain extent part of the identity of hunter-gatherer communities. The earliest recorded use of this snail is known from the Early Upper Palaeolithic (Álvarez Fernández 2008; Kuhn et al. 2001), becoming very popular by the end of Upper Palaeolithic, Mesolithic and beginning of Neolithic (Álvarez Fernández 2003; 2008). Having in mind one isolated find from an Aterian layer (d’Errico et al. 2009), perhaps in the future we can expect a greater number of such ornaments from the Middle Palaeolithic. These snails are among the most frequent ornament forms in the Mesolithic, particularly in the Mediterranean circle, and they are also often found deep in the hinterland of Europe (Álvarez Fernández 2008; Borrello 2004; Eriksen 2002). What is really interesting is the existence of several concentrations of finds of *Columbella rustica* in the Mediterranean region i.e., in the eastern Iberian Peninsula whence they spread further inland along the Ebro River valley

šire dalje u unutrašnjost (Álvarez Fernández 2008; Martínez-Moreno et al. 2010), te na prostoru južne Francuske gdje se u unutrašnjost šire dolinama rijeka Rhône i Rajne (Eriksen 2002). Blizina velikih rijeka vrlo je važna za razvoj regionalne, kao i dalekosežne mreže razmjena. Sjeverni Jadran također je jedan od prostora na kojem nalazimo visoku koncentraciju ove vrste ukrasa koji su se mogli dalje distribuirati, s jedne strane duž doline rijeke Pad, a s druge strane duž obližnjih rijeka crnomorskog sliva (tj. Kupe i Save) dalje prema zaleđu.

Glavni cilj našeg rada predložiti je postojanje lokalnih izvora puževa *Columbella rustica* i drugih vrsta morskih puževa na sjevernom Jadranu tijekom mezolitika te postojanje regionalnog sustava razmjene između prostora sjevernog Jadrana i kontinentalnog zaleđa Hrvatske, temeljeno na novijim nalazima probušenih morskih i slatkovodnih puževa. U ovom smo radu ukratko razmotrili skupove nalaza probušenih morskih i slatkovodnih puževa iz

(Álvarez Fernández 2008; Martínez-Moreno et al. 2010), and southern France where they extend far along the Rhône and Rhine valleys (Eriksen 2002). The proximity of large rivers is very important for the development of regional and long-distance exchange systems. The North Adriatic is also one of the areas where there is a high concentration of this type of ornament, which could have been distributed on one side along the Po River valley and on the other side along nearby rivers of the Black Sea drainage basin (i.e., Kupa and Sava) into the hinterland.

The main objective of our work is to suggest the existence of local collection of *Columbella rustica* and other marine snails in the North Adriatic during the Mesolithic, and the existence of the regional exchange system between the North Adriatic and inland Croatia based on the new finds of perforated marine and freshwater snail shells. In this paper we briefly discuss perforated marine and freshwater snail shell assemblages from Mesolithic contexts at six



Sl. 1 Karta s položajima nalazišta spomenutih u tekstu (1. Pupičina peć, 2. Abri Šebirn, 3. Ovčja peć, 4. Nugljanska peć, 5. Lim 001, 6. Vela spilja, 7. pećina Zala) (izradio: Darko Komšo).

Fig. 1 Map showing sites mentioned in the text (1. Pupičina Cave, 2. Abri Šebirn, 3. Ovčja Cave, 4. Nugljanska Cave, 5. Lim 001, 6. Vela Spilja Cave, 7. Zala Cave) (made by: Darko Komšo).

mezolitičkog konteksta šest nalazišta na sjevernom Jadranu (Pupićina peć, Abri Šebrn, Nugljanska peć, Lim 001, Ovčja peć i Vela spilja) te pećine Zala koja se nalazi u zapadnom dijelu kontinentalne Hrvatske (Sl. 1).

Na gore spomenutim nalazištima prikupljena su ukupno 192 primjerka probušenih morskih i slatkovodnih puževa. Prisutno je šest vrsta, od kojih je najčešća *Columbella rustica* sa 141 primjerkom te *Lithoglyphus naticoides* s 42 primjerka (T. 1.; Sl. 2).



Sl. 2 Probušeni morski i slatkovodni puževi iz Pupićine peći (fotografija: Darko Komšo).

Fig. 2 Perforated marine and freshwater snail shells from Pupićina Cave (photo by: Darko Komšo).

Iako smo prethodno isticali važnost nalaza vrste *Columbella rustica* za razumijevanje mezolitičkih sustava razmjene, potrebno je naglasiti jedan novi element koji do sada nije zabilježen u istraživanjima rasprostranjenosti puževa tijekom mezolitika u ovom području, a to je prisutnost slatkovodne vrste *Lithoglyphus naticoides* na nalazištima Pupićina peć i pećina Zala. Vjerujemo da je prisutnost ove vrste ključna za dokazivanje postojanja regionalne mreže razmjene između sjevernog Jadrana i unutrašnjosti Hrvatske (Komšo, Vukosavljević 2011). *Lithoglyphus naticoides* slatkovodni je puž koji naseljava plićake rijeka i potoka u srednjoj i istočnoj Europi (Harzhauser et al. 2007) i živi na stijenama ili u mulju (Hladilová 2002). Ako se usredotočimo na rasprostranjenost ove vrste u promatranom području, prema Radomanu (1983), ona je prisutna samo u rijekama crnomorskog sliva. Prostorno-vremenska rasprostranjenost vrste *Lithoglyphus naticoides* u arheološkom inventaru lovaca skupljača prilično je široka. Prisutna je u arheološkoj građi iz sjeverozapadne Rumunjske (Cârciumaru et al. 2010), preko Đerdapa (Boroneanț 1999), Donje Austrije (Strobl, Obermaier

North Adriatic sites (Pupićina Cave, Abri Šebrn, Nugljanska Cave, Lim 001, Ovčja Cave and Vela Spilja Cave) and from Zala Cave located in the western part of continental Croatia (Fig. 1).

A total of 192 finds of perforated marine and freshwater snail shells were gathered at the abovementioned sites consisting of six different species, of which the two most frequently found are *Columbella rustica* with 141 specimens and *Lithoglyphus naticoides* with 42 specimens (Table 1; Fig. 2).

Although we have previously emphasised the importance of *Columbella rustica* for understanding Mesolithic exchange systems it is necessary to emphasise one new element which until now was not recorded in the distribution studies of snails during the Mesolithic in the present study area, and this is the presence of freshwater snail species i.e., *Lithoglyphus naticoides* at Pupićina and Zala Caves. We believe that the presence of this species is the key for proving the existence of a regional exchange network between the North Adriatic and inland Croatia (Komšo, Vukosavljević 2011). *Lithoglyphus naticoides* (the gravel snail) is a freshwater snail inhabiting shallows of rivers and streams in Central and Eastern Europe (Harzhauser et al. 2007), living on rocks or in mud (Hladilová 2002). If we focus on the distribution of this species in the region under consideration, according to Radoman (1983) it is present only in the rivers of the Black Sea drainage. The spatio-temporal distribution of *Lithoglyphus naticoides* in hunter-gatherer archaeological records is quite wide. It is present in archaeological records from North-West Romania (Cârciumaru et al. 2010), through the Iron Gates (Boroneanț 1999), Lower Austria (Strobl, Obermaier 1908 after Neugebauer-Maresch 2008) all the way to South-West Germany (Eriksen 2002; Rähle 1978). From the chrono-cultural perspective it is present in potential Aurignacian (Strobl, Obermaier 1908 after Neugebauer-Maresch 2008), Gravettian (Cârciumaru et al. 2010), Epipalaeolithic (Boroneanț 1999) and Mesolithic layers (Rähle 1978; Eriksen 2002). Perforated *Lithoglyphus naticoides* are almost completely unknown in the early Holocene Mediterranean archaeological records, except for Istria where they most probably represent imported items, probably from the area where Zala is located. However, there is also a possibility they originate somewhere from the Danube region where they

1908 prema Neugebauer–Maresch 2008), sve do jugozapadne Njemačke (Eriksen 2002; Rähle 1978). Iz kronološko–kulturne perspektive, nalazi dolaze iz mogućeg orinjasijenskog konteksta (Strobl, Obermeier 1908 prema Neugebauer–Maresch 2008), gravetijena (Cârciumaru et al. 2010), epipaleolitika (Boroneanț 1999) i mezolitika (Rähle 1978; Eriksen 2002). Probušeni primjerci vrste *Lithoglyphus naticoides* gotovo su potpuno nepoznati iz konteksta ranog holocena na području Mediterana, s izuzetkom prostora Istre, gdje najvjerojatnije predstavljaju uvezene predmete, vjerojatno s područja u kojem se nalazi pećina Zala. Međutim, postoji i mogućnost da potječu iz Podunavlja gdje se pojavljuju u značajnom broju (Boroneanț 1999; Rähle 1978; Eriksen 2002).²

MEZOLITIČKA NALAZIŠTA SA SKUPOVIMA NALAZA PROBUŠENIH LJUŠTURA MORSKIH I SLATKOVODNIH PUŽEVA

Nalazišta sjevernog Jadrana

Pupićina peć

Pupićina peć nalazi se u kanjonu Vela Draga na zapadnim padinama planine Učke, na nadmorskoj visini od 220 m (Sl. 3). Nalazište je istraživano od 1995. do 2002. godine i ukupno je iskopano 74 m². Pupićina peć višeslojno je nalazište koje je bilo naseljeno tijekom kasnog gornjeg paleolitika, mezolitika, neolitika, bakrenog, brončanog i željeznog doba te rimskog razdoblja. Nekoliko apsolutnih datuma smještaju mezolitičke slojeve u rani holocen (Komšo 2008; Miracle 1997; Miracle 2002; 2003; Miracle, Forenbaher 1998; 2006). U mezolitičkim slojevima Pupićine peći pronađen je ukupno 101 primjerak probušenih morskih i slatkovodnih puževa (Komšo 2007), odnosno 94 nalaza morskih puževa i 7 slatkovodnih puževa (T. 1.). Ovaj uzorak morskih puževa jedan je od najvećih na istočnoj obali Jadrana i jedan od najvećih u mezolitiku jugoistočne Europe.³

Abri Šebren

Abri Šebren nalazi se na nadmorskoj visini od 750 m, 5 km od sadašnje obale i samo 4 km od Pupićine

appear in significant numbers (Boroneanț 1999; Rähle 1978; Eriksen 2002).²

MESOLITHIC SITES WITH PERFORATED MARINE AND FRESHWATER SNAIL SHELLS

North Adriatic sites

Pupićina Cave

Pupićina Cave lies in Vela Draga Canyon on the western slopes of Učka mountain at an altitude of 220 m (Fig. 3). Excavations were undertaken there from 1995 to 2002. The total excavated surface amounts to 74 m². Pupićina Cave is a multilayered site that was inhabited during the Late Upper Palaeolithic, Mesolithic, Neolithic, Copper Age, Bronze Age, Iron Age and Roman periods. Several absolute dates place Mesolithic layers in the Early Holocene (Komšo 2008; Miracle 1997; Miracle 2002; 2003; Miracle, Forenbaher 1998; 2006).

The Mesolithic layers of Pupićina Cave yielded a total of 101 perforated marine and freshwater snail



Sl. 3 Ulaz u Pupićinu peć (fotografija: Nenad Kuzmanović).

Fig. 3 Pupićina Cave entrance (photo by: Nenad Kuzmanović).

² Nekoliko primjeraka perlica napravljenih od ljuštura vrste *L. naticoides* nedavno je otkriveno u mezolitičkim skupovima nalaza iz pećine Vlakno i Lim 001 (Cvitkušić 2017; Cvitkušić et al. 2018).

³ Od vremena pisanja ovog rada, veći skupovi nalaza otkriveni su u pećini Vlakno (Cvitkušić et al. 2018) i Veljoj spili (Cristiani et al. 2014).

² Few examples of *L. naticoides* beads were recently documented in Mesolithic assemblages from Vlakno Cave and Lim 001 (Cvitkušić 2017; Cvitkušić et al. 2018).

VRSTA / SPECIES	PUPIĆINA PEĆ / PUPIĆINA CAVE	ABRI ŠEBRN / ŠEBRN ABRI	NUGLJANSKA PEĆ / NUGLJANSKA CAVE	LIM 001	OVČJA PEĆINA / OVČJA CAVE	VELA SPILJA / VELA SPILJA CAVE	PEĆINA ZALA / ZALA CAVE
Morski puževi / Marine gastropods							
<i>Columbella rustica</i>	90	15	5	15	1	2	13
<i>Tritia neritea</i>	1	-	-	-	-	-	1
<i>Nassarius nitidus</i>	1	-	-	-	-	-	
<i>Cerithium vulgatum</i>	2	-	1	2	-	-	
Slatkovodni puževi / Freshwater gastropods							
<i>Lithoglyphus naticoides</i>	6	-	-	-	-	-	36*
<i>Theodoxus danubialis strangulatus</i>	1	-	-	-	-	-	
UKUPNO / TOTAL	101	15	6	17	1	2	50

*dva primjerka nisu probušena /
two specimens are unperforated

T. 1. Skupovi nalaza probušenih puževa s nalazišta koja se spominju u tekstu.
T. 1. Perforated snail shell assemblages from sites mentioned in the text.

peći, na prirodnom prolazu u gorje (Sl. 4). Riječ je o relativno malom i otvorenom pripečku, dubokom samo 6 metara, otvora širine 13 metara i visine 7 metara, natkrivenog prostora od otprilike 40 m² (Miracle et al. 2000). Strateški položaj nalazišta omogućio bi stanovnicima da prate kretanje životinja i ljudi gore i dolje po planini. Tri datacije provedene metodom radioaktivnog ugljika ukazuju da su ljudi tamo boravili tijekom ranog holocena (Miracle et al. 2000). Na nalazištu je prikupljeno ukupno 15 probušenih primjeraka vrste *Columbella rustica* (Benghiat et al. 2009; Komšo 2007; Miracle et al. 2000).

Nugljanska peć

Nugljanska peć nalazi se na rubu lanca Ćićarije, na nadmorskoj visini od oko 550 m (Sl. 5). Ulaz je okrenut prema jugu-jugoistoku, u blizini vrha

shells (Komšo 2007), i.e. 94 marine snail shells and 7 freshwater snail shells (T. 1). This assemblage of marine snail shells is one of the biggest in the East Adriatic coast and among the largest in Mesolithic South-East Europe.³

Šebnrn Abri

Šebnrn Abri is located at an altitude of 750 m above sea level, 5 km from the present coast, and only 4 km from Pupićina Cave, at a natural passage into the uplands (Fig. 4). It is a relatively small and open rockshelter, only 6 m deep, while its opening is 13 m wide and some 7 m high. The area inside the drip line covers approximately 40 m² (Miracle et al. 2000). Its strategic location would have allowed its occupants to monitor the movement of

³ Since this paper was originally written, much bigger ornamental assemblages have been discovered in Vlakno Cave (Cvitkušić et al. 2018) and Vela Spila Cave (Cristiani et al. 2014).



Sl. 4 Pogled na nalazište Abri Šebrn (fotografija: Nenad Kuzmanović).
Fig. 4 View of the Šebrn Abri site (photo by: Nenad Kuzmanović).

barijere od vapnenačkih litica. Iz neposredne blizine nalazišta prema istoku i jugu pruža se pogled na čitavu sjeveroistočnu Istru. Špilja ima izuzetno visok strop (preko 12 m na samom ulazu), širine je otprilike 12 metara, a dubine 35 metara. Nalazište je prvi puta istraživano krajem 19. stoljeća (Crismani 2001), a posljednja sezona iskopavanja bila je 1998. godine (Miracle, Forenbaher 1998). Istraživanja su pokazala ljudsko prisustvo na nalazištu tijekom kasnog gornjeg paleolitika, mezolitika i neolitika. Šest probušenih puževa pronađeno je prilikom sijanja starih sedimenata koji su ostali iz iskopavanja s kraja 19. stoljeća; pet primjeraka vrste *Columbella rustica* i jedan primjerak *Cerithium vulgatum*. Ove je nalaze najvjerojatnije moguće pripisati mezolitiku (T. 1., Sl. 6).



Sl. 6 Probušeni morski i slatkovodni puževi iz Nugljanske peći (fotografija: Darko Komšo).
Fig. 6 Perforated marine snail shells from Nugljanska Cave (photo by: Darko Komšo).



Sl. 5 Ulaz u Nugljansku peć (fotografija: Nenad Kuzmanović).
Fig. 5 Nugljanska Cave entrance (photo by: Nenad Kuzmanović).

animals and people up and down the mountain. Three radiocarbon dates suggest human use of the site within the early Holocene (Miracle *et al.* 2000). A total of 15 perforated examples of *Columbella rustica* were collected at this site (Benghiat *et al.* 2009; Komšo 2007; Miracle *et al.* 2000).

Nugljanska Cave

Nugljanska Cave opens at the edge of the Ćićarija chain at an altitude of about 550 m above sea level (Fig. 5). It is a south-southeast facing cave near the top of a barrier of limestone cliffs. From the immediate vicinity of the site one has a commanding view of all of North-East Istria to the east and south of the site. The cave has an extremely high ceiling (over 12 m at its opening), and is *c.* 12 m wide and *c.* 35 m deep. The cave was excavated for the first time at the end of the 19th century (Crismani 2001). The last excavation was carried out in 1998 (Miracle, Forenbaher 1998), yielding evidence of human occupation during the Late Upper Palaeolithic, Mesolithic and Neolithic periods. Six perforated snail shells were found during sieving of old sediments which remained from late 19th century

Lim 001

Lim 001 mali je pripećak smješten na kraju Linskog kanala u blizini Rovinja. Ulaz je okrenut prema jugu i ima najveću visinu od 2 m, a širinu 8 m (Sl. 7). Nalazište je prepoznato tijekom manjih sondažnih istraživanja 2008. godine (1 x 1 m), tijekom kojih je otkrivena veća nakupina školjaka i brojni nalazi trapeza, na temelju kojih je nalazište moguće datirati u kasni mezolitik.⁴ Među nalazima je otkriveno i 17 probušenih morskih puževa (Komšo 2009).⁵



Sl. 7 Ulaz na nalazište Lim 001 (fotografija: Darko Komšo).
Fig. 7 Lim 001 entrance (photo by: Darko Komšo).

Ovčja peć

Ovčja peć nalazi se na nadmorskoj visini od 750 m, u Molinarskoj dragi, malom vapnenačkom kanjonu na zapadnoj padini planine Učke, otprilike 4 km od današnje obale i 4 km istočno od Pupićine peći. To je špilja tunelasta oblika, s ulazom orijentiranim prema zapadu, dubine otprilike 35 m, ulaza širokog šest metara i ukupne površine oko 140 m² (Komšo 2008) (Sl. 8). Tijekom iskopavanja 2002. i 2003. godine pronađena su tri manja prosloja razdvojena tankim slojevima crvene sterilne gline, koja su protumačena kao kronološki različite epizode naseljavanja. Sakupljeni nalazi pripadaju isključivo divljim životinjama, kopnenim puževima te morskim školjkama i puževima, uključujući jedan nalaz probušenog puža vrste *Columbella rustica*, što su nalazi tipični za rani holocen u regiji, i time potvrđuju mezolitičku starost nalazišta (Komšo 2008).

⁴ Kasnomezolitička starost kasnije je potvrđena radiokarbonskim datiranjem (Poz-80129 - 7560 ± 50 BP, kalibrirana starost 6500 - 6261 BC, 95.4 %).

⁵ U kasnijem radu Cvitkušić (2017) bilježi veći broj nalaza perlica nego što je navedeno u ovom radu, uključujući i dva primjera slatkovodnih puževa vrste *Lithoglyphus naticoides*.

excavations i.e., five examples of *Columbella rustica* and one *Cerithium vulgatum* dated to the Mesolithic with caution (T. 1, Fig. 6).

Lim 001

Lim 001 is a small rockshelter at the end of Lim Channel near Rovinj. The entry has a maximum height of 2 m, with a length of 8 m, and is oriented towards the south (Fig. 7). This site was recorded in 2008 during limited test excavations (1x1m), which showed that this was a very rich shell midden dated to the Late Mesolithic on the basis of numerous trapeze microliths.⁴ Among other finds was a total of 17 perforated marine snail shells (Komšo 2009).⁵

Ovčja Cave

Ovčja Cave is located at an altitude of 750 m above sea level, in Molinarska draga, a small limestone canyon on the western slope of Učka mountain, c. 4 km from the present coast and 4 km east from Pupićina Cave. It is a west-facing, tunnel-shaped cave, c. 35 m deep, 6 m wide at the entrance, with approximately 140 m² within the drip line (Komšo 2008) (Fig. 8). During excavations in 2002 and 2003 three small lenses separated by thin layers of red sterile clay were found, and they were interpreted as chronologically distinct occupation episodes. Only wild fauna, land snails and



Sl. 8 Ulaz u Ovčju peć (fotografija: Paolo Pellegatti).
Fig. 8 Ovčja Cave entrance (photo by: Paolo Pellegatti).

⁴ Late Mesolithic age was later confirmed with radiocarbon dating (Poz-80129 - 7560 ± 50BP, Cal. age 6500 - 6261 BC (2σ) 95.4%).

⁵ During her later study Cvitkušić (2017) recorded more beads than reported here including two examples of freshwater gastropod *Lithoglyphus naticoides*.

Vela spilja

Vela spilja smještena je na strmim, zapadnim padinama masiva Osorčice, ispod najvišeg vrha Televrina, na nadmorskoj visini od 268 m. Ulaz u pećinu orijentiran je na zapad, visok je 8 m i širok 7 m (Sl. 9) i ima oblik kanala dugačkog 41 m. Pećina je najšira i najviša na ulazu, a kanal postupno postaje uži i niži prema unutrašnjosti. Nalazište je istraživano sredinom 20. stoljeća (Mirosavljević 1968), a novija iskopavanja započinju 2004. godine (Komšo et al. 2005). Nalazište je višeslojno i sadrži materijal iz srednjeg i kasnog gornjeg paleolitika, mezolitika, neolitika, eneolitika, brončanog doba te srednjeg vijeka. U mezolitičkim slojevima pronađena su dva probušena primjerka vrste *Columbella rustica* (Komšo et al. 2005).



Sl. 9 Ulaz u Velu spilju (fotografija: Darko Komšo).
Fig. 9 Vela Spilja Cave entrance (photo by: Darko Komšo).

Nalazište u unutrašnjosti

Pećina Zala

Pećina Zala smještena je na lijevoj strani kanjona Bistrac, orijentacije prema istoku, na nadmorskoj visini od 207 m (Karavanić et al. 2007) (Sl. 10). Probna iskopavanja manjeg opsega provedena su 2000. godine

sea shells, including one perforated *Columbella rustica*, were collected, all typical for the early Holocene in the region, confirming the Mesolithic age of the deposit (Komšo 2008).

Vela Spilja Cave

Vela Spilja is located on the steep, western slopes of the massif Osorčica, below the highest peak Televrin, at an altitude of 268 m. The cave's entry is oriented towards the west, and is 8 m high and 7 m wide (Fig. 9). It is formed by one channel, 41 m long. The cave is widest and highest at the entrance, while the channel gradually becomes narrower and lower towards the inside. It was explored during the mid-20th century (Mirosavljević 1968), with renewed excavation carried out in 2004 (Komšo et al. 2005). This is a multi-layered site from the Middle and Late Palaeolithic, Mesolithic, Neolithic, Eneolithic, Bronze and Middle Ages. Two perforated examples of *Columbella rustica* were found in the Mesolithic layers (Komšo et al. 2005).

Inland site

Zala Cave

Zala Cave is located at an altitude of 207 m on the left side of the Bistrac canyon, oriented towards the east (Karavanić et al. 2007) (Fig. 10). Initial small test excavations were undertaken in 2000 (Perkić 2002), while systematic excavations started in 2005 and are still ongoing (Karavanić et al. 2007; Karavanić



Sl. 10 Ulaz u pećinu Zalu (fotografija: Nikola Vukosavljević).
Fig. 10 Zala Cave entrance (photo by: Nikola Vukosavljević).

(Perkić 2002), a sustavna istraživanja koja započinju 2005. godine još su u tijeku (Karavanić et al. 2007; Karavanić et al. 2009)⁶. Nalazište je višeslojno i sadrži horizonte iz kasnog gornjeg paleolitika, mezolitika, bronzanog i željeznog doba / rimskog razdoblja te srednjovjekovnog razdoblja. Nažalost, ne postoje apsolutni datumi za slojeve u kojima su pronađene perlice od puževa, međutim, postoje čvrsti pokazatelji koji sugeriraju njegovu mezolitičku starost: i) prisutnost velike količine ribljih kostiju zajedno sa školjkama i puževima, koje nisu nađene u slojevima iznad ili ispod; ii) kameni artefakti; te iii) odsutnost keramike (Karavanić et al. 2009).⁷ S obzirom na gore navedeno, opravdano je navedene nalaze pripisati mezolitiku. Rezultat apsolutne datacije metodom 14C od 9439 ± 60 BP ($9120-8550$ cal BC, Beta-235936) ukazuje na razdoblje holocena (Karavanić et al. 2008), međutim, ne postoji izravna stratigrafska poveznica između datiranog sloja i slojeva koji sadrže perlice. Datum je kalibriran u programu OxCal 4.1

et al. 2009)⁶. This multilayered site contains Late Upper Palaeolithic, Mesolithic, Bronze Age, Iron Age/Ancient Roman and Middle Age horizons. Unfortunately, there are no absolute dates for layers in which shell beads were found; however, there is clear evidence suggesting they are Mesolithic: i) presence of large amounts of fish remains, together with shells and snails, all of which were not found in the layers above or below; ii) identified chipped stone artefacts; and iii) absence of pottery (Karavanić et al. 2009)⁷. Given the abovementioned lines of evidence it seems justified to assume their Mesolithic age. There is one Early Holocene 14C AMS date from the cave of 9439 ± 60 BP ($9120-8550$ cal BC, Beta-235936) (Karavanić et al. 2008); however, there is no direct stratigraphic link between the dated layer and the layers containing shell beads. The date has been calibrated in OxCal 4.1 (Bronk Ramsey 2009) using IntCal 09 (Reimer et al. 2009).



Sl. 11 Probušeni morski i slatkovodni puževi iz pećine Zale (fotografija: Marcel Burić).

Fig. 11 Perforated marine snail shells from Zala Cave (photo by: Marcel Burić).

⁶ Sustavna istraživanja završena su 2012. (Šošić Klindžić et al. 2015).

⁷ Kasnije radiokarbonske analize potvrdile su ranomezolitičku starost (Šošić Klindžić et al. 2015; Vukosavljević, Karavanić 2015).

⁶ Systematic research was completed in 2012 (Šošić Klindžić et al. 2015).

⁷ Subsequent radiocarbon analysis confirmed early Mesolithic age (Šošić Klindžić et al. 2015; Vukosavljević, Karavanić 2015).

(Bronk Ramsey 2009) pomoću IntCal 09 (Reimer et al. 2009). U mezolitičkim slojevima pećine Zala pronađeno je ukupno 50 (48 perforiranih) puževa, od čega 36 slatkovodnih i 14 morskih (T. 1.; sl. 2; sl. 11).

RASPRAVA I ZAKLJUČAK

Brojna sjevernojadranska mezolitička nalazišta s nalazima probušenih morskih puževa, kao i brojni nalazi probušenih i neprobušenih slatkovodnih puževa (*Lithoglyphus naticoides*) s nalazišta Zala u kontinentalnoj Hrvatskoj sugeriraju da su školjke bile lokalno prikupljane i obrađivane. Oba područja pokazuju dominaciju u broju pretpostavljenih lokalnih vrsta poput *Columbella rustica* i drugih morskih vrsta na nalazištima uz more i *Lithoglyphus naticoides* u unutrašnjosti. Prema radu Radomana o suvremenim primjercima (1983), *Lithoglyphus naticoides* rasprostranjen je isključivo u rijekama crnomorskog sliva, što uključuje i područje gdje se nalazi pećina Zala. Uzmemo li u obzir Radomanove zaključke i nedostatak radova o rasprostranjenosti vrste *Lithoglyphus naticoides* tijekom prijelaza iz pleistocena u holocen te u ranom holocenu, moguće je pretpostaviti da ova vrsta ne potječe iz Istre, budući da sve istarske rijeke pripadaju jadranskom slivu. Iako tijekom terenskog pregleda u okolici špilje Zale nisu pronađeni moderni primjerci vrste *Lithoglyphus naticoides*, postojanje neprobušenih primjeraka u arheološkim slojevima, za koje možemo pretpostaviti da su bile sirovinski materijal za daljnju izradu, može sugerirati da su sakupljeni lokalno, tijekom ranog holocena (Komšo, Vukosavljević 2011).

Na temelju nalaza probušenih puževa dviju vrsta: *Columbella rustica* i *Lithoglyphus naticoides* pronađenih na ranije spomenutim nalazištima, moguće je raspravljati o vezi između sjevernog Jadrana i njegova zaleđa tijekom mezolitika. Nedavno pronađeni primjerci probušenih ljuštura vrste *Lithoglyphus naticoides* na dva nalazišta pokazuju da je ova vrsta predstavljala važan ukras koji bi mogao biti „unutrašnji“ ekvivalent nalaza vrste *Columbella rustica*. U drugom radu (Komšo, Vukosavljević 2011) izneseni su rezultati morfometrijskih analiza visine i širine ljuštura zajedno s metričkim atribucijama (visina i širina) antropogenih perforacija, kao i opažanja o tehnikama bušenja za skupove nalaza puževa s lokaliteta Pupićina peć i pećina Zala. Rezultati analiza snažno sugeriraju sličnost u odabiru veličine puževa, veličini i tehnici bušenja koja se primjenjivala u oba

A total of 50 (48 perforated) marine and freshwater snail shells were found in Zala Cave in layers dated to the Mesolithic, i.e. 36 freshwater snail shells and 14 marine snail shells (T. 1; Fig. 2; Fig. 11).

DISCUSSION AND CONCLUSION

Numerous Mesolithic sites with perforated marine snail shells in the North Adriatic and numerous finds of perforated and unperforated freshwater snail shells (*Lithoglyphus naticoides*) at the Zala site in continental Croatia suggest the shells were locally gathered and produced. Both areas show dominance in numbers of the presumably local species i.e., *Columbella rustica* and other marine species at littoral sites and *Lithoglyphus naticoides* at the inland site. According to Radoman's work on modern specimens (1983), *Lithoglyphus naticoides* are distributed only in the rivers of the Black Sea drainage, which includes the region of Zala Cave. If we take into account Radoman's conclusions and lack of studies on the distribution of *Lithoglyphus naticoides* during the Pleistocene/Holocene transition and the Early Holocene, it is possible to assume that this species does not originate from Istria because all Istrian rivers belong to the Adriatic Sea drainage. Moreover, no recent specimens of *Lithoglyphus naticoides* were found during a brief survey of the terrain around Zala Cave. However, the existence of unperforated specimens in the archaeological deposits that are presumably blanks, could suggest that they were collected locally during the Early Holocene (Komšo, Vukosavljević 2011).

Based on perforated snail shells of two species - *Columbella rustica* and *Lithoglyphus naticoides* - from previously mentioned sites, we can discuss the connection between the North Adriatic and its hinterland during the Mesolithic. Recently found perforated *Lithoglyphus naticoides* at two sites show that this species represented an important ornament that could be the 'inland' equivalent of *Columbella rustica*. In another paper (Komšo, Vukosavljević 2011) we study the results of morphometric analyses of the height and width of shells together with metric attributions (height and width) of anthropogenic perforations, as well as observations on the perforation techniques for Pupićina and Zala Caves' snail assemblages. Those analyses strongly suggest similarities in terms of size selection of snails, and size and technique of perforation applied between the two assemblages. This supports the assumption

uzorka. Ovi rezultati, kao i ranije spomenuta ekološka rasprostranjenost određenih vrsta, govori u prilog pretpostavci o kontaktima i postojanju regionalnog sustava razmjene između sjevernog Jadrana i zaleđa.⁸

Postoje i drugi lokaliteti na sjevernom Jadranu, na područjima tršćanskog krasa (Boschian, Pitti 1984; Cremonesi 1984; Cremonesi et al. 1984; Montagnari Kokelj 1984) i slovenskog krasa (Brodar 1992; Mikuž 2004; Mikuž, Turk 2004), gdje su pronađeni nalazi probušenih puževa vrste *Columbella rustica*. Ti lokaliteti, zajedno s ovdje spomenutim nalazištima, čine jednu od mediteranskih zona s velikom koncentracijom takvih nalaza. Također, velik broj nalazišta s primjercima puževa *Columbella rustica* zabilježen je u talijanskoj predalpskoj i alpskoj regiji (Borrello, Dalmeri 2004; Cristiani 2009). Na temelju predloženih regionalnih sustava razmjene u dolinama Ebro u Španjolskoj i Rhône u Francuskoj (Álvarez Fernández 2003; 2008; Martínez-Moreno et al. 2010) moguće je predložiti postojanje šireg međuregionalnog sustava razmjene između sjevernog Jadrana i talijanske predalpske i alpske regije (Komšo, Vukosavljević 2011). Prisutnost probušenih primjeraka vrste *Columbella rustica* na nalazištu Vlasac u Đerdapu u današnjoj Srbiji (Borić 2011) može ukazivati na razmjenu na daljinu s prostorom sjevernog Jadrana, iako moramo uzeti u obzir mogućnost da taj primjerak možda dolazi s nekog drugog dijela Jadrana ili s prostora sjeverne Grčke, odnosno Egejskog mora (Komšo, Vukosavljević 2011).

Ostavlajući na stranu značenje koje su probušeni puževi imali za zajednice lovaca skupljača koji su ih koristili, na temelju njihova prisustva moguće je ukazati na postojanje mogućih veza između sjevernog Jadrana i njegova zaleđa tijekom razdoblja mezolitika. To pokazuje da su postojali kontakti između različitih geografskih regija, što sugerira mogućnost društvenog umrežavanja između različitih zajednica lovaca skupljača koje bi moglo predstavljati određenu sigurnosnu mrežu u vrijeme ograničene dostupnosti lokalnih resursa (Whallon 2006).*

⁸ U drugom radu Vukosavljević i Karavanić (2015) predlažu kontakte između kontinentalne Hrvatske, gdje je smještena pećina Zala, i prostora sjeverne Dalmacije. Taj prijedlog temelji se na prisustvu perlica od puževa vrste *L. naticoides* na nalazištu pećine Vlakno te prisustva sirovinskog materijala u pećini Zali koji potječe s izvora u sjevernoj Dalmaciji. Taj zaključak podržan je i nalazima vrste *C. rustica* u pećini Zali, koji mogu potjecati i iz sjevernodalmatinskih i sjevernojadranskih izvora. Na temelju analiza mezolitičkih ukrasnih predmeta, Cvitkušić i suradnici (2018) predložili su postojanje regionalnog sustava razmjene između sjeverne Dalmacije i Istre.

* Prijevod s engleskog na hrvatski: Ivor Janković
Lektura hrvatskog: Nikola Vukosavljević

of contacts and the existence of a regional exchange system between the North Adriatic and its hinterland, together with the previously mentioned ecological distribution of certain species.⁸

There are other North Adriatic sites with perforated *Columbella rustica* in the areas of the Trieste Karst (Boschian, Pitti 1984; Cremonesi 1984; Cremonesi et al. 1984; Montagnari Kokelj 1984) and the Slovenian Karst (Brodar 1992; Mikuž 2004; Mikuž, Turk 2004), which together with the sites discussed here form one of the Mediterranean zones with a high concentration of these finds. Also, a great number of sites with *Columbella rustica* were recorded in the Italian Pre-Alpine and Alpine region (Borrello, Dalmeri 2004; Cristiani 2009). Pursuant to the suggested regional exchange systems in the valleys of the Ebro in Spain and the Rhône in France (Álvarez Fernández 2003; 2008; Martínez-Moreno et al. 2010) it is possible to suggest the existence of a wider inter-regional exchange system between North Adriatic and Italian Pre-Alpine and Alpine regions (Komšo, Vukosavljević 2011). The presence of perforated *Columbella rustica* at Vlasac in the Iron Gates in present-day Serbia (Borić 2011) may point to a long-distance exchange between this region and the North Adriatic, although we have to take into account the possibility that this specimen may originate from some other part of the Adriatic or maybe from North Greece, i.e., the Aegean Sea (Komšo, Vukosavljević 2011).

Leaving aside the meaning that these perforated snail shells had for the hunter-gatherer communities that used them, we use their presence to point to possible Mesolithic connections between the North Adriatic and its hinterland. This proves that there were contacts between different geographic regions, pointing perhaps to the creation of social networks between different hunter-gatherer communities that could have been a safety net during times of limited availability of local resources (Whallon 2006).*

⁸ In the later work Vukosavljević and Karavanić (2015) also propose contacts during Mesolithic between continental Croatia where Zala Cave is located and North Dalmatia. This proposal is based on presence of *L. naticoides* beads in Vlakno Cave and lithic raw material from North Dalmatia in the assemblage from Zala Cave. This could also be supported by *C. rustica* finds in Zala Cave that could be both of North Dalmatian and North Adriatic origin. Cvitkušić et al. (2018) suggested existence of regional exchange system between North Dalmatia and Istria on the ground of their analysis of Mesolithic ornamental assemblages from these two regions.

* Translation (English to Croatian): Ivor Janković
Croatian lecturer: Nikola Vukosavljević

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