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PRILOG POZNAVANJU CIJEPANE LITIKE S LOKALITETA GARBINOVICA KOD POREČA

A CONTRIBUTION TO OUR UNDERSTANDING OF KNAPPED LITHICS FROM THE GARBINOVICA SITE NEAR POREČ

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U radu je predstavljena tipološka, tehnološka i funkcionalna analiza cijepanog rožnjaka iz pećine Garbinovica. Mali broj nalaza i poremećena stratigrafija u pećini omogućuju dataciju nalaza u prapovijesna razdoblja od neolitika. Od 35 litičkih nalaza izdvojeno je osam oruđa: dva sječiva, jedan bifacijalno obrađeni šiljak s trnom, dva grebala na sječivu i jedno svrdlo grebalo na krhotini jezgre, sječivo s obradom na jednom i krhotina s obradom na dva ruba. Funkcionalnom analizom utvrđeni su tragovi korištenja na jednom grebalu na sječivu te na jednom svrdlu grebalu, kao i na dva ulomka sječiva bez obrade. Analiza je pokazala tragove uporabe koji nastaju obradom mesa i kože životinja te drva.

KLJUČNE RIJEČI: *Garbinovica; Istra; cijepana litika; funkcionalna analiza; prapovijest; neolitik; pećina*

This paper presents the typological, technological, and functional analysis of knapped chert from the Garbinovica cave. The modest number of finds and the disturbed stratigraphy of the cave allow for a dating of the finds to the prehistoric Neolithic period. Eight tools were singled out from among the 35 lithic finds: two blades, one bifacially retouched tanged point, two endscrapers on a blade, and one drill-endscraper on a core chunk, a blade with one retouched edge, and a chunk with two retouched edges. The functional analysis found use-wear traces on one endscraper on a blade, on one drill-endscraper, and on two blade fragments without retouch. The analysis showed use-wear traces created by the processing of flesh, animal hides, and wood.

KEY WORDS: *Garbinovica; Istria; knapped lithics; functional analysis; prehistory; Neolithic; cave*

UVOD

Od vremena pojave prve keramike interes arheologa s litičkog materijala prelazi na keramičke nalaze te se, prilikom obrade materijala s pojedinih lokaliteta, veća pažnja posvećuje keramičkim nalazima nego litičkom materijalu. Keramički nalazi nerijetko su brojniji od litičkih te nose stilske odrednice vremena, što relativnu kronologiju prema tipologiji oblika i ukrasa keramičkih predmeta čini relevantnijom i detaljnijom od relativno jednolične tipologije litičkih nalaza. To rezultira rjeđom obradom litičkog materijala mlađeg kamenog doba i kasnijih razdoblja, što nije iznimka ni na području Istre (Forenbaher, Nikitović 2009; Forenbaher 2008; Kačar, Philibert 2022).

U okviru ovog rada predstavljeni su rezultati tipološke, tehnološke i funkcionalne analize cijepanog rožnjaka pronađenog na području arheološkog lokaliteta Garbinovica.

Garbinovica kod Poreča je urušena pećina istražena u zaštitnim arheološkim istraživanjima prilikom izgradnje porečke zaobilaznice. S obzirom na to da je stratigrafija na nalazištu nakon što se urušio svod pećine, kao i djelovanjem životinja, onemogućena je konkluzivna datacija nalaza. Međutim, najniži su slojevi pećine ostali relativno netaknuti te ih je moguće datirati u vrijeme ranog i srednjeg neolitika (Čuka 2015). Prilikom obrade litičkog materijala različite i često neodredive provenijencije cilj je bio, uz uobičajenu tipološku i tehnološku analizu, ponuditi funkcionalnu interpretaciju pojedinih nalaza.

Funkcionalna, odnosno analiza tragova uporabe koji indiciraju funkciju artefakta, *use-wear* ili *microwear analysis*, mikroskopska je analiza površine i radnog ruba oruđa, s namjerom dokazivanja znakova istrošenosti, oštećenja i ostataka materijala na kojima je oruđe korišteno (Darvill 2002, 449). Začetnik ove analize Sergej A. Semenov koristio je različite vrste povećala i mikroskopa, uključujući analizu golim okom, a uz kameno oruđe analizirao je i oruđe od drugih materijala, posebice kosti (Semenov 1964).

Za kvalitetnu funkcionalnu analizu potreban je makroskopski i mikroskopski pristup, kao i usporedba s eksperimentalnim primjercima. Istrošenost koja nastaje uporabom oruđa dijeli se na pet tipova: sitno lomljenje, zaobljivanje ruba, sjaj, brazde i ostaci (Vaughan 1985). Funkcionalna analiza koja se odnosi na pregled tragova uporabe može se podijeliti na makroskopsku - pod uvećanjem do 100X, i mikroskopsku - pod uvećanjima od 100X. Mikroskopska analiza se provodi uz pomoć

INTRODUCTION

With the appearance of early pottery the interest of archaeologists shifts from lithics to ceramic finds with greater attention afforded when analysing material from a given site to ceramic finds than to lithic material. Finds of pottery are often more numerous than lithic finds, and they exhibit the stylistic characteristics of their time, which makes the relative chronology based on the typology of pottery forms and decorations more relevant and more detailed than the relatively uniform typology of lithics. This results in the less frequent analysis of lithics from the New Stone Age and later periods, in which Istria is no exception (Forenbaher & Nikitović 2009, Forenbaher 2008, Kačar & Philibert 2022).

This paper presents the results of the typological, technological, and functional analysis of knapped chert recovered at the Garbinovica archaeological site.

Garbinovica near Poreč is a collapsed cave investigated in the scope of rescue archaeology work performed in the course of the construction of the Poreč bypass. The disturbance of the stratigraphy caused by the collapse of the cave roof and animal activity precludes any conclusive dating of the finds. The lowest strata in the cave, however, remained relatively undisturbed and can be dated to the early and middle Neolithic periods (Čuka 2015). The analysis of the lithic material, of different and often indeterminate provenience, was aimed—along with the customary typological and technological analysis—at offering a functional interpretation of the individual finds.

Functional analysis, i.e., the analysis of use-wear traces that indicate the function of an artefact—use-wear or microwear analysis—is microscopic analysis of the surface and working edge of a tool with the objective of demonstrating signs of wear, damage, and the residues of the materials on which a tool was used (Darvill 2002, 449). Functional analysis was first performed by Sergei A. Semenov, who used various types of magnifying glasses and microscopes, including examination by the naked eye. His analysis, besides lithic tools, also included tools made of other materials, bone in particular (Semenov 1964).

Proper functional analysis requires both the macroscopic and microscopic approach, and comparison against experimental specimens. The wear that occurs as the result of tool use is classified into five types: fine chipping, edge rounding, gloss (polish), striations, and residues (Vaughan 1985). Functional analysis as it pertains to the examination of use-wear traces can be divided into macroscopic, with magnification levels of up to 100×, and microscopic, with a magnification level of 100×.

metalurškog mikroskopa pod povećanjem od 200 do 400X, a po potrebi i elektronskim mikroskopima. Arheološki materijal je potrebno komparirati s referentnim zbirkama (primjerice Semenov 1964; Vaughan 1985; Van Gijn 2010). Izrada detaljnih referentnih zbirki izrazito je važna prilikom definiranja točnih načina uporabe, koji osim o materijalu ovise i o načinu primjene, ali i drugim kulturno-političkim aspektima u zajednici (Claud *et al.* 2019).

Kod izrade referentne zbirke potrebno je koristiti različite sirovinske materijale[1] za širok raspon djelatnosti za koje je arheološki materijal mogao biti korišten (primjerice Semenov 1964). Kod provedbe analize na oruđu od rožnjaka elektronskim mikroskopom i velikim povećanjima razlike u rožnjacima su vidljivije (Lerner *et al.* 2007), međutim pri analizi metalurškim mikroskopom pod uvećanjem do 400X nema potrebe za izradom referentne zbirke na različitim vrstama rožnjaka jer su razlike slabo zamjetne.

Funkcionalna analiza je u proteklih 50-ak godina napredovala te je sve učestalija. Međutim, radovi koji je uključuju i dalje su relativno malobrojni. U slučaju hrvatskih nalazišta rijetko se javljaju kao zasebni radovi (Kačar, Philibert 2022), a češće su predstavljeni kao rezultati dijelova širih istraživanja ili se pak spominju kao mogući način interpretacije nalaza (Barbir *et al.* 2017, 79-97). Vezano uz vrijeme neolitika i eneolitika na istočnom Jadranu funkcionalna analiza često se svodi na detektiranje sjaja srpa (Forenbaher 2008; Mazzucco *et al.* 2016; Mazzucco *at al.* 2018; Mazzucco *et al.* 2020; Mazzucco *et al.* 2022). Sjaj srpa nastaje pod utjecajem silikatnih spojeva iz žitarica i leguminoza te je vidljiv golim okom kao sjajna površina oruđa, koja se najčešće javlja na jednoj od lateralnih strana sječiva. Prepoznatljiv je pod mikroskopom po ujednačenom sjaju površine, prekinutom brazdama u obliku meteora (Witthoft 1967, 384; Vaughan 1985, 36). Prilikom interpretacije sjaja srpa makroskopskom analizom potreban je oprez jer ga je lako zamijeniti sa sjajem koji može nastati postdepozicijski te kontaminacijom ljepilima i lakovima prilikom inventarizacije i restauratorskih postupaka.

Funkcionalna analiza pruža dio odgovora na pitanje čime su se bavili stanovnici nekog područja, odnosno čemu su služili arheološki nalazi. Funkcija arheoloških nalaza neizostavan je element njegove interpretacije te je stoga od iznimne važnosti provesti analize koje omogućuju određivanje funkcije cjelokupnog arheološkog materijala, pa tako i onog litičkog. Dopuna interpretacije posebice

[1] Rožnjake, kvarc, kvarcit, riolit i druge (Clemente Conte, Gibaja Bao 2009).

Microscopic analysis is also performed with metallurgical microscopes at magnification levels of from 200× to 400× and, when necessary, using electron microscopy. Archaeological material should be compared against reference collections (e.g., Semenov 1964, Vaughan 1985, Van Gijn 2010). The production of detailed reference collections is of critical importance in defining precise use methods, which are contingent both on the materials and the methods of use, and on other cultural and political aspects of a community (Claud *et al.* 2019).

Various raw materials[1] should be used in producing reference collections for a broad range of activities for which archaeological material may have been used (e.g., Semenov 1964). Differences in chert varieties are evident when performing analysis of chert tools using electron microscopy and at high magnifications (Lerner *et al.* 2007), however when analysis is performed using a metallurgical microscope at up to 400× magnification there is no need to create a reference collection for different varieties of chert because the differences are negligible.

Over the past fifty years functional analysis has advanced and become increasingly frequent. The number of papers that include functional analysis, however, remains relatively low. In the case of sites in Croatia it is rarely covered in papers as the sole topic (Kačar & Philibert 2022), rather the subject is more often presented as the results of aspects of broader investigations or is mentioned as a possible method of interpreting finds (Barbir *et al.* 2017, 79-97). As it relates to the Neolithic and Eneolithic in the eastern Adriatic, functional analysis often boils down to detecting sickle gloss (Forenbaher 2008, Mazzucco *et al.* 2016, Mazzucco *et al.* 2018, Mazzucco *et al.* 2020, Mazzucco *et al.* 2022). Sickle gloss forms as a result of the action of silica present in cereals and legumes and is visible to the naked eye as a glossy surface on a tool, usually appearing on one of the lateral sides of a blade. Under a microscope it is recognisable as a uniform surface gloss interrupted by comet-shaped striations (Witthoft 1967, 384, Vaughan 1985, 36). Caution should be exercised when interpreting sickle gloss by macroscopic analysis as it can easily be confused with gloss that may form post-deposition, and by contamination with adhesives and varnishes used in inventorying and restoration procedures.

Functional analysis provides some answers when considering the activities of the inhabitants of an area, i.e., what archaeological artefacts were used for. The function of an archaeological find is an essential element in its interpretation; it is, thus, exceptionally

[1] Chert, quartz, quartzite, rhyolite, and others (Clemente Conte & Gibaja Bao 2009).

je važna u slučaju razorenih i djelomično razorenih konteksta kakav je onaj iz Garbinovice, zato što vrsta djelatnosti koju je moguće potvrditi na nekom mjestu govori o načinu života na njemu.

LOKACIJA I OPIS PEĆINE

Pećina Garbinovica nalazi se dvjestotinjak metara jugoistočno od sela Garbine kod Poreča, na jugozapadnom obronku brežuljka po kojem je dobila ime, na 56 metara nadmorske visine (sl. 1). Locirana je u blizini gradine Picugi, Velikog i Malog Svetog Anđela (Mordele) (Nodilo 2014). Smještena je ispod vrha brežuljka s ulazom okrenutim na zapad. Sastoji se od dva dijela – prvi je dio urušen, dok je drugi dio očuvani kanal koji se proteže u smjeru istok-sjeveroistok (Čuka 2015, 7-8).

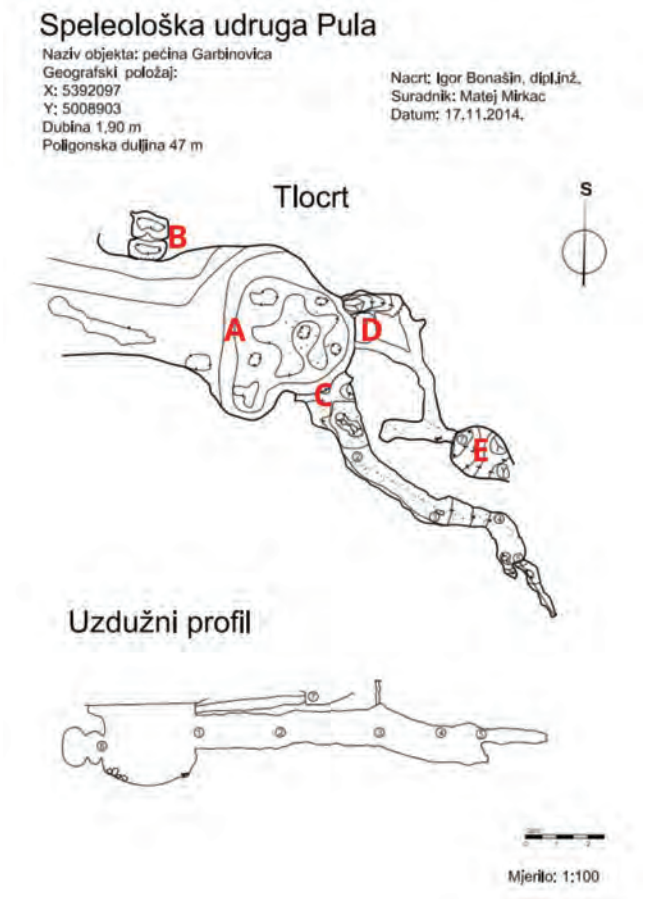
Po klasifikaciji speleoloških objekata Garbinovica je mala, jednostavna pećina na dvije etaže (sl. 2). Sastoji se od dva paralelna kanala koji se spajaju u većoj prostoriji čiji je strop urušen. Današnje stanje pećine predstavlja tek dio nekada većeg objekta (Nodilo 2014). Ulaz u pećinu je kroz prostoriju veličine 8 x 5 metara kojoj je urušeni svod uklonjen u istraživanjima 2014. godine (sl. 2/A). Metar od ulaza u pećinu nalazi se niša horizontalnog ulaza približne veličine 1,5 x 1,2 x 1,1 metar (sl. 2/B). Očuvani dio pećine čine dva paralelna kanala u njezinom jugoistočnom dijelu. U 10 metara dug kanal u obliku istegnutog slova S (sl. 2/C) ulazi se usponom od jednog metra. Ovaj kanal u početnom je dijelu širok 1,5 m, a visok jedan metar te se nakon prvog metra duljine sužava na veličinu od 80 x 40 centimetara; pet metara od ulaza u stropu kanala se nalazi ventil širine 10 x 20 centimetara

Sl. 1 Smještaj pećine Garbinovice na topografskoj karti (iz: Čuka 2015).
Fig. 1 The Garbinovica cave on a topographic map (after Čuka 2015).

important that analyses are performed that allow for a determination of the function of the entire body of the archaeological material, including lithics. Supplementing any interpretation is especially important in the case of destroyed or partially destroyed contexts, such as the one we see at the Garbinovica site, because the kind of activity that can be confirmed at a site speaks to the lifestyle of its occupants.

LOCATION AND DESCRIPTION OF THE CAVE

The Garbinovica cave is located about two hundred metres to the southeast of the hamlet of Garbina near Poreč, on the southwest slope of the hill the cave is named after at 56 m.a.s.l. (Fig. 1). It is located near the Picugi hillfort, the Veliki sveti Anđeo, and the Mali sveti Anđeo (Mordele) sites (Nodilo 2014). The cave lies below the



Sl. 2 Crtež pećine Garbinovice s oznakama (modificirano prema nacrtu Igora Bonašina i suradnika Mateja Mirkaca; Speleološka udruga Pula; Nodilo 2014).
Fig. 2 Drawing (labelled) of the Garbinovica cave (modified after the drawing by Igor Bonašin and his associate Matej Mirkac; Pula Speleological Association; Nodilo 2014).

koji komunicira s površinom. Kanal se nastavlja, ali ga dalje nije moguće pratiti zbog malih dimenzija (Nodilo 2014). Paralelno s opisanim kanalom te iznad njega, na udaljenosti od metar do dva, nalazi se osam metara dug kanal (sl. 2/D). Djelomično je prolazan te mu se pristupa s dvije strane - iz glavnog ulaznog prostora pećine (sl. 2/A) te s jugoistoka (sl. 2/E), gdje se račva prema zapadu i sjeveru. Sjeverni odvojak nastavlja se prema glavnom ulazu (Nodilo 2014).

POVIJEST ISTRAŽIVANJA I PRELIMINARNO DATIRANJE

Prilikom zaštitnih arheoloških istraživanja u listopadu 2009. (Šalov 2010, 329) na lokalitetu *V-U 303 - Radi* zbog izgradnje trase istarskog plinovoda, obilaskom okolnog terena uočene su neobičnosti na tlu koje su ukazivale na postojanje djelomično zatrpane pećine. Tom je prilikom ustanovljeno postojanje pet do šest rovova ispred kojih su, djelovanjem lokalne faune, u svježe iskopanoj zemlji pronađeni ulomci brončanodobne keramike metličastog ukrasa (Šalov 2010, 332).

Zbog izgradnje južnog dijela zaobilaznice Poreča (dionica Vrvari - Bijela uvala) Arheološki muzej Istre je 22. siječnja 2010. godine proveo rekognosciranje položaja potencijalno urušene pećine (Čuka 2013). Pronalaskom veće količine prapovijesne keramike stvoreni su uvjeti za probno arheološko sondiranje (Čuka 2015, 9).

Probna arheološka istraživanja provedena su od 16. rujna do 4. listopada 2013. godine. U tom je periodu istraženo osam probnih sondi, od kojih sonde 2 i 4 najkonkretnije definiraju kulturni kontekst (sl. 3) (Čuka 2015, 9-10).

Tijekom svibnja i lipnja 2014. godine poduzeće Geoarheo d.o.o. za arheologiju, geologiju i geofiziku nastavlja s istraživanjem na području pećine Garbinovica. U ovom je zaštitnom arheološkom istraživanju uklonjen sav sediment iz pećine, pri čemu je sloj SJ 15 definiran kao zdravica koja leži na sloju SJ 4, odnosno vapnenačkoj stijeni (Nodilo 2014).

Urušenje svoda prve prostorije pećine (sl. 2/A) i djelovanje životinja među glavnim su razlozima stratigrafskih poremećaja unutar pećine (Nodilo 2014). Zbog stratigrafskih problema datacija se bazira na tipologiji keramičkih nalaza. Pronađena je ranoneolitička impresso keramika, a zatim srednjoneolitička keramika „danilsko-vlaške" grupe (Nodilo 2014). Za razdoblja kasnog neolitika javlja se keramika ukrašena kontinuiranom vodoravnom linijom urezanom ispod

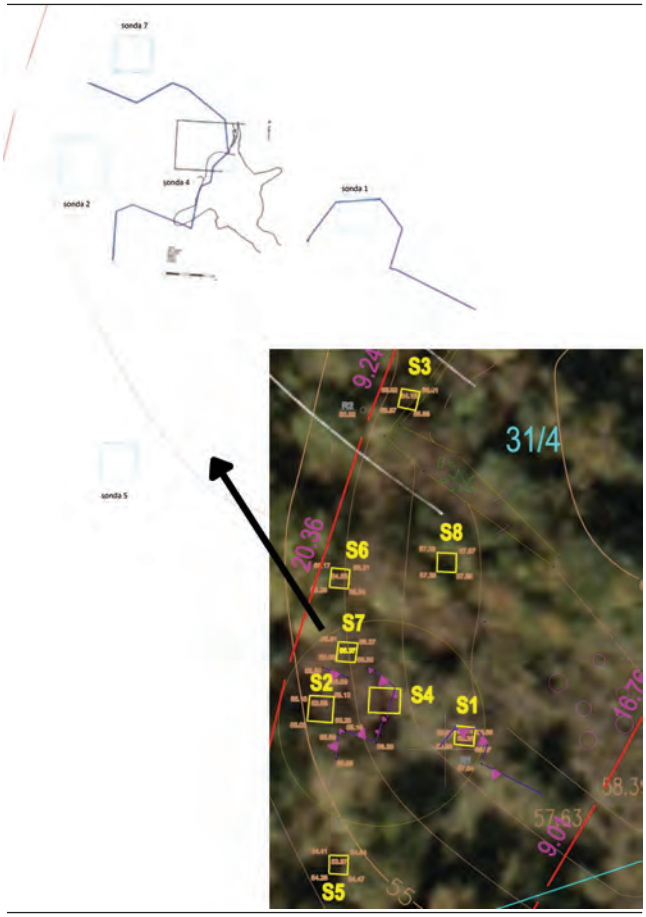
hilltop with its entrance facing westward. It has two zones; the first of which has collapsed, while the second is a surviving passage running east to northeast (Čuka 2015, 7-8).

In terms of the classification of speleological structures Garbinovica is a small and simple two-level cave (Fig. 2). It is comprised of two parallel passages that join at a chamber where the roof has collapsed. The current state of the cave constitutes just a part of what was once a much larger structure (Nodilo 2014). The entrance to the cave is reached through an eight by five metre chamber, the collapsed roof of which was removed in the course of investigation work performed in 2014 (Fig. 2/A). A metre from the entrance to the cave there is a niche measuring approximately 1.5 by 1.2 by 1.1 metres with a horizontal mouth (Fig. 2/B). The surviving part of the cave is comprised of two parallel passages in its southeastern part. A ten-metre-long passage in the form of a stretched letter S (Fig. 2/C) is entered at a rise of one metre. This passage is 1.5 metres wide and one metre high at its entrance, narrowing after one metre to 80 by 40 cm; five metres from the entrance there is a 10 by 20 cm daylight hole in the roof of this passage running to the surface. The passage continues from here, but cannot be negotiated due to its small dimensions (Nodilo 2014). Parallel to and above the level of this passage, at a distance of one to two metres, is an eight-metre-long passage (Fig. 2/D). It is partially negotiable and is accessed from two sides: from the primary cave entrance chamber (Fig. 2/A) and from the southeast (Fig. 2/E), where it forks to the west and north. The northern branch runs on to the primary entrance (Nodilo 2014).

HISTORY OF INVESTIGATION AND PRELIMINARY DATING

A fieldwalk of the surrounding terrain during rescue archaeological investigative work performed in October of 2009 (Šalov 2010, 329) at the V-U 303-Radi site in the course of the construction of the Istrian gas pipeline revealed anomalies in the ground that indicated the presence of a partially buried cave. The presence of five to six ditches was observed; fragments of Bronze Age pottery with brushed surface decoration were found in front of them in soil freshly disturbed by local fauna (Šalov 2010, 332).

On 22 January of 2010, ahead of the construction of the southern portion of the Poreč bypass (the Vrvari to Bijela uvala section), the Archaeological Museum of Istria performed an archaeological survey (reconnaissance) of



Sl. 3 Smještaj probnih sondi prilikom istraživanja pećine Garbinovica u 2013. godini (iz: Čuka 2015).
Fig. 3 The location of test pits excavated in the course of the investigation of the Garbinovica cave in 2013 (after Čuka 2015).

oboda posude (Nodilo 2014). Brončanodobni keramički nalazi, pronađeni izmiješani s neolitičkim materijalom, tipološki odgovaraju keramici s brončanodobnih istarskih gradina i špiljskih lokaliteta (Nodilo 2014). U pećini su pronađeni i sporadični nalazi ulomaka antičke i novovjekovne keramike (Nodilo 2014). Čuka (2015) i Nodilo (2014) pretpostavljaju da se pećina urušila u prapovijesti, jer su antički i novovjekovni slojevi pronađeni iznad urušenog svoda pećine (Čuka 2015, 25).

Postavljanje datacije većine nalaza cijepane litike za ovaj lokalitet nije moguće zbog navedene problematike, no tragovi korištenja vidljivi mikroskopskim pregledom otvaraju mogućnost provedbe funkcionalne analize.

the possibly collapsed cave (Čuka 2013). The recovery of a significant quantity of prehistoric pottery set the stage for exploratory archaeological excavation (Čuka 2015, 9).

The exploratory excavation was performed from 16 September to 4 October of 2013. This work saw the investigation of eight test pits, of which pits 2 and 4 most conclusively defined the cultural context (Fig. 3) (Čuka 2015, 9-10).

In May and June of 2014, the Geoarheo d.o.o. company for archaeology, geology, and geophysics continued investigative work in the Garbinovica cave. This rescue archaeology investigation saw the removal of all sediment from the cave, with layer SU 15 identified as subsoil laying atop limestone bedrock designated as layer SU 4 (Nodilo 2014).

The collapse of the roof of the cave's first chamber (Fig. 2/A) and animal activity are among the primary causes of stratigraphic disturbance within the cave (Nodilo 2014). Because of the stratigraphic issues the dating is based on the typology of the recovered pottery. The pottery found includes Impressed Ware of the early Neolithic period, followed by middle Neolithic pottery of the Danilo-Vlaška group (Nodilo 2014). From the late Neolithic we see pottery decorated with a continuous horizontal line incised below the vessel's rim (Nodilo 2014). The Bronze Age pottery, found mixed with the Neolithic material, corresponds typologically to pottery from Istrian hillforts and cave sites of the Bronze Age (Nodilo 2014). Also found in the cave were sporadic finds of sherds of antique period and post-medieval pottery (Nodilo 2014). Čuka (2015) and Nodilo (2014) have proposed that the cave collapsed in the prehistoric period given that the antique and post-medieval period strata were identified above the material of the collapsed roof of the cave (Čuka 2015, 25).

These issues preclude any confident dating of the bulk of the finds of knapped lithics at this site, however the use-wear traces visible under microscopic examination open a window to the performance of functional analysis.

TECHNOLOGICAL AND TYPOLOGICAL ANALYSIS

The technological analysis of the lithic material is based on a table drawing on standard tables of technological types for the Upper Palaeolithic, modified by Rajna Šošić Klindžić and Ivor Karavanić for the Neolithic and Eneolithic periods (Karavanić *et al.* 2009, 8-11; Šošić & Karavanić 2004, 23-25). In all the analysis examined 35 knapped lithic artefacts.

TEHNOLOŠKA I TIPOLOŠKA ANALIZA

Za tehnološku analizu litičkog materijala korištena je tablica koju su prema standardnim tablicama tehnoloških tipova za gornji paleolitik, za neolitik i eneolitik modificirali Rajna Šošić Klindžić i Ivor Karavanić (Karavanić *et al.* 2009, 8-11; Šošić, Karavanić 2004, 23-25). Ukupno je analizirano 35 cijepanih litičkih nalaza.

Proizvodni tipovi grupirani su u četiri faze lanca operacija proizvodnje oruđa od cijepanog rožnjaka: nulta faza, koja obuhvaća sabiranje i testiranje sirovine; prva faza, u kojoj se skida okorina i oblikuje sirovina; druga faza ili faza proizvodnje, i treća ili finalna faza u kojoj se oblikuje oruđe. Prvoj fazi proizvodnje pripadaju kategorije 1 - 6, a drugoj one 7 - 17. Kategorije 19 - 22 mogu pripadati bilo kojoj fazi proizvodnje prema popisu proizvodnih tipova (Šošić, Karavanić 2004, 23-25).

Tehnološki prvoj fazi proizvodnje na nalazištu Garbinovica pripada pet nalaza, odnosno 14 % ukupnog materijala. Drugoj fazi proizvodnje pripada 17 nalaza, odnosno 49 % ukupnog broja litičkih nalaza dok preostalih 13 nalaza, odnosno 37 % pripada kategoriji „ostalo". Iako pronalazak jezgara i ulomaka jezgara upućuje na to da je u nekim fazama života na ovom lokalitetu litički materijal proizveden u pećini, zbog malog broja nalaza i djelomično poremećene stratigrafije nije moguće utvrditi period i intenzitet proizvodnje.

Od osnovnih tipova osam ulomaka je finalno oblikovano: pet sječiva, dvije krhotine i bifacijalno obrađeni šiljak, koji pripada kategoriji neodredivih ulomaka. Pronađena je i jedna jezgra koja se veže uz drugu fazu proizvodnje.

Izdvojenih je osam nalaza moguće tipološki odrediti kao oruđe (Karavanić *et al.* 2015, 131). Jedan ulomak sječiva ima obradu na jednom rubu (T. I e), a jedna krhotina na dva ruba (T. I g). Oba su primjera djelomično dorađena mekim čekićem te tehnikom pritiska. Dva su nalaza ulomaka sječiva dorađenih metodom pritiska (T. I c/d). Tipološki su izrazitiji jedan bifacijalno obrađeni šiljak s trnom, obrađen metodom pritiska (T. I h), dva grebala na distalnom ulomku sječiva (T. I a/b) i jedno svrdlo grebalo na krhotini jezgre (T. I f), obrađeni mekim čekićem i dodatno obrađeni metodom pritiska. Šiljak je malih dimenzija te se može okarakterizirati kao strelica.

Nalazi s obradom tipološki su podijeljeni u šest tipova: komadić s cjelovitom obradom na jednom i na dva ruba, šiljak, sječivo, grebalo i svrdlo grebalo.

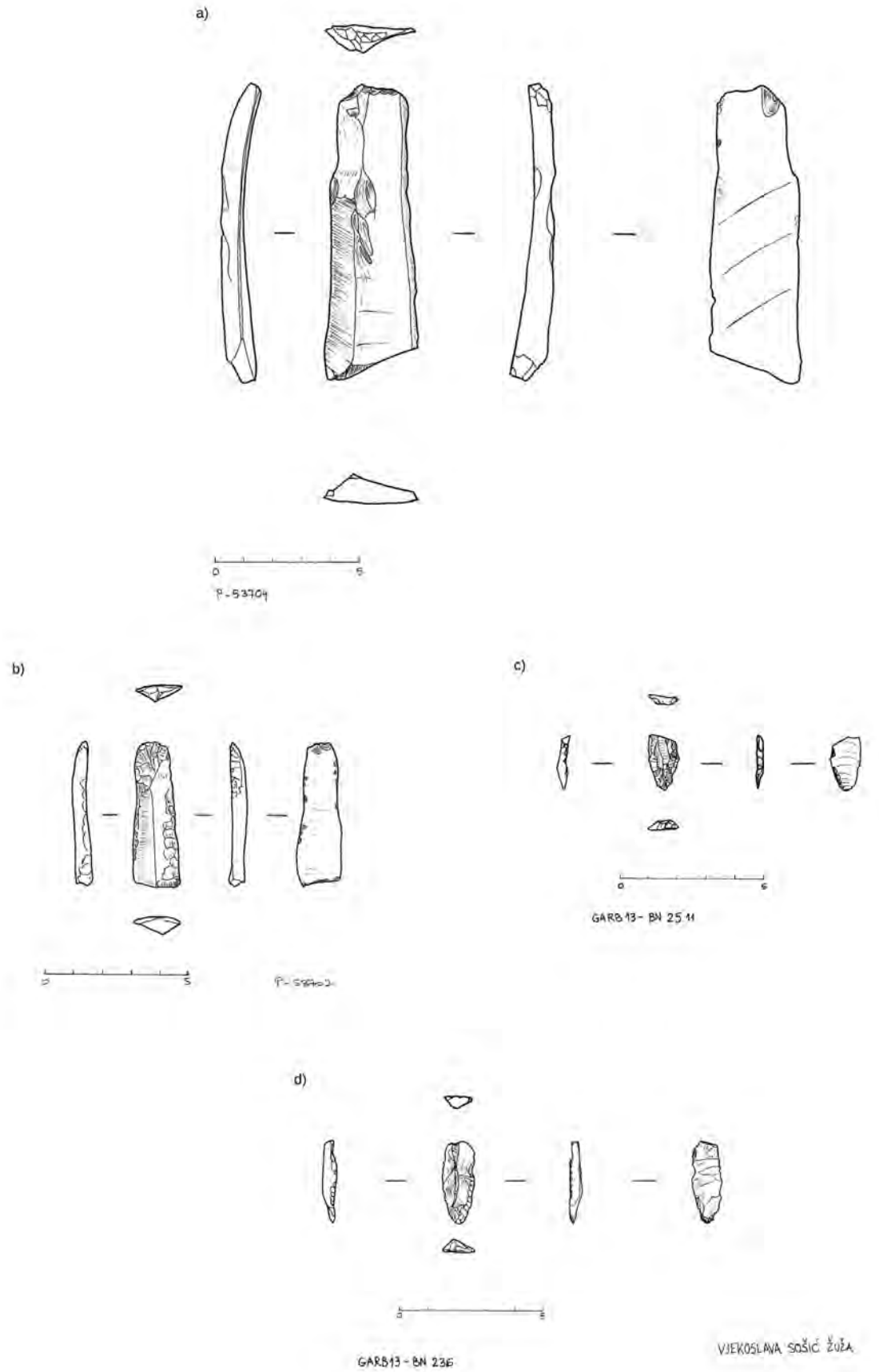
The production types are grouped into four phases of the knapped chert tool technology *chaîne opératoire*: the preparatory phase, which encompasses the acquisition and testing of the raw material; the first phase, in which the cortex is removed and the raw material is shaped; the second or production phase; and the third or final phase in which the tool is shaped. Categories 1 through 6 are from the first phase of production, while categories 7 through 17 are from the second phase. Categories 19 through 22 may be from any of the phases of production given in the list of technological types (Šošić & Karavanić 2004, 23-25).

Five finds, i.e., 14% of the total material from the Garbinovica site, are attributable to the first phase of production. Seventeen finds, i.e., 49% of the total number of lithic finds, are attributable to the second phase of production, while the remaining 13 finds, i.e., 37%, are from the "other" category. Although the find of cores and core fragments indicates that lithic material was produced in the cave during some phase of human occupation of the site, the small number of finds and the partial disturbance of the stratigraphy means that we cannot identify the period or intensity of production.

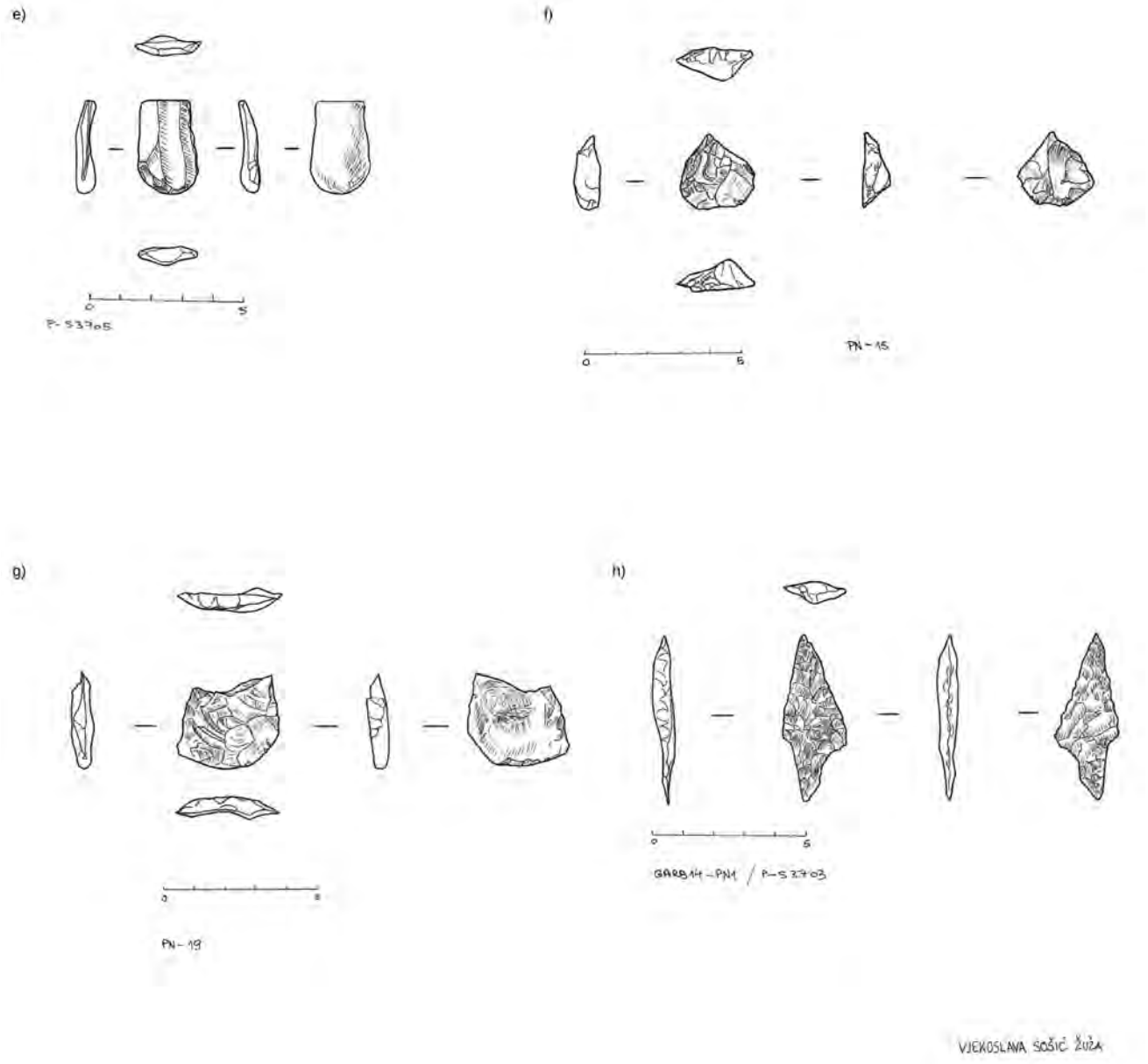
Among the basic types eight fragments exhibit final shaping: five blades, two chunks, and one bifacially retouched point that is from the category of indeterminate fragments. One core was found that is associated with the second phase of production.

The eight finds singled out can be typologically identified as tools (Karavanić *et al.* 2015, 131). One blade fragment exhibits retouch of one edge (Plate I e) and one chunk shows retouch on two edges (Plate I g). Both are partially retouched with a soft hammer and using the pressure technique. Two finds of blade fragments show retouch using the pressure method (Plate I c/d). One bifacially retouched point with tang, retouched using the pressure method (Plate I h), two endscrapers on a distal blade fragment (Plate I a/b), and one drill-endscraper on a core chunk (Plate I f), retouched using a soft hammer and additionally retouched using the pressure method are typologically more distinct. The point is of small dimensions and can be characterised as an arrowhead.

Retouched finds are typologically divided into six types: a piece with continuous retouch of one edge/two edges, a point, a blade, an endscraper, and a drill-endscraper.



T. I Oruđe od cijepanog rožnjaka s lokaliteta Garbinovica: a, b) grebalo; c, d) ulomci sječiva (crtež: Vjekoslava Sošić Žuža).
Plate I Knapped chert tools from the Garbinovica site: a, b) endscraper; c, d) blade fragments (drawings: Vjekoslava Sošić Žuža).



T. I Oruđe od cijepanog rožnjaka s lokaliteta Garbinovica: e) komadić s obradom na jednom rubu (ulomak sječiva); f) svrdlo grebalo; g) komadić s obradom na dva ruba (krhotina); h) bifacijalni šiljak (crtež: Vjekoslava Sošić Žuža).

Plate I Knapped chert tools from the Garbinovica site: e) piece with retouch of one edge (blade fragment); f) drill-endscraper; g) piece with retouch of two edges (chunk); h) bifacial point (drawings: Vjekoslava Sošić Žuža).

Osnovni tipovi nalaza s obradom:

TIP ORUĐA	KOLIČINA
Komadić s cjelovitom obradom na jednom rubu	1 (ulomak sječiva)
Komadić s cjelovitom obradom na dva ruba	1 (krhotina)
Šiljak	1 (bifacijalni šiljak)
Sječivo	2 (ulomka)
Grebalo	2 (dva grebala na ulomku sječiva)
Svrdlo grebalo	1
Ukupno	**8**

Basic find types with retouch:

TOOL TYPE	QUANTITY
Piece with continuous retouch of one edge	1 (blade fragment)
Piece with continuous retouch of two edges	1 (chunk)
Point	1 (bifacial point)
Blade	2 (fragments)
Endscraper	2 (two endscrapers on a blade fragment)
Drill-endscraper	1
Total	**8**

FUNKCIONALNA ANALIZA

Od 35 cijepanih litičkih nalaza s lokaliteta Garbinovica funkcionalna analiza provedena je na četiri nalaza s vidljivim tragovima uporabe. Ulomci su pregledani makroskopski i mikroskopski, a tragovi korištenja uočeni su na četiri ulomka, od kojih su dva na artefaktima s obradom, dok su dva na neobrađenim sječivima. Uočeni tragovi uspoređeni su s tragovima uporabe na eksperimentalnim odbojcima napravljenim na smeđem rožnjaku[2]. Kako su nalazi s lokaliteta Garbinovica od različitih rožnjaka, tako se i rožnjak upotrijebljen za referentnu zbirku ne poklapa s primjercima na kojima su pronađeni tragovi uporabe. Kao što je u uvodu objašnjeno, razlika u tipu rožnjaka postaje relevantna kod većih uvećanja, poglavito elektronskim mikroskopom, dok je kod povećanja od 200X zanemariva. Razlike koje se javljaju odnose se na boju i prozirnost rožnjaka, što ne utječe na tragove uporabe. Eksperimentalni materijal dobiven je obradom materijalima različite čvrstoće i vlažnosti, poput roga, kosti, drva (različite svježine), kože (štavljene i svježe), svježeg mesa (sa i bez kože i kostiju), povrtnica i žitarica. Uzorci su rezani, guljeni i svrdlani, odnosno dubljeni, ovisno o tipu uzorka[3]. Vrijeme obrade variralo je ovisno o brzini nastanka tragova uporabe i trošenja radnog ruba, od oko 10 minuta za najtvrđe uzorke suhog roga do dulje od tri sata intenzivnog rezanja žitarica.

[2] Prilikom obrade materijala korištena je postojeća dostupna referentna zbirka širokog raspona, napravljena prvenstveno na smeđem i crveno-smeđem slavonskom rožnjaku.

[3] Gdje je bilo moguće primijenjeni su svi načini obrade uzorka.

FUNCTIONAL ANALYSIS

Of the 35 knapped lithic artefacts recovered at the Garbinovica site functional analysis was performed on four exhibiting visible use-wear traces. The fragments were examined macroscopically and microscopically, with use-wear traces observed on four fragments, two on retouched artefacts, and two on blades without retouch. The observed traces were compared with use-wear traces on experimental flakes made on brown chert[2]. The finds from the Garbinovica site are of various cherts and the chert type used for the reference collection does not correspond with the chert type on which the use-wear traces were observed. As has been noted in the introduction, the difference in chert type only becomes relevant at greater levels of magnification, especially when using electron microscopy, while at 200× magnification the differences are negligible. The differences relate to the colour and translucency of the chert, which has no impact on use-wear traces. The experimental material was obtained by working materials of varying hardness and moisture levels, including horn, bone, wood (at varying stages of dryness), hides (tanned and fresh), fresh flesh (with and without skin and bone), vegetables, and cereals. The sample materials were cut, peeled, and drilled/bored, contingent on the sample type[3]. The processing period varied depending on the speed at which use-wear traces formed and on the wearing down of the working edge, from about 10 minutes for the hardest samples of dry horn to over three hours of intensive cutting of cereal crops.

The finds were examined macroscopically under the naked eye and loupes with up to 10× magnification, and

[2] An existing and accessible broad range reference collection was used during the processing of the material, created primarily with brown and reddish-brown Slavonian chert.

[3] Where possible all methods of sample processing were applied.

T. II Položaj tragova uporabe na nalazima s lokaliteta Garbinovica: a) AMI P-53704; b) GARB13 S3 BN16 (PN 15); c) GARB13 S4 BN25-2; d) GARB13 S2 PN1 (fotografija: Dunja Martić Štefan). Plate II The position of use-wear traces on finds recovered at the Garbinovica site: a) AMI P-53704; b) GARB13 S3 BN16 (SF 15); c) GARB13 S4 BN25-2; d) GARB13 S2 SF1 (photo: Dunja Martić Štefan).

Makroskopski su nalazi pregledani golim okom i lupom s uvećanja do 10X, dok su mikroskopski pregledani metalurškim trinokularnim mikroskopom AmScope ME300TZB-2L-9M 40X-2000X pri povećanju od 200X (objektiv 10X i okulari 20X). Pri izradi fotografija korišten je Olympus E-3 10.1 megapikselni fotoaparat s objektivom za trinokularni mikroskop bez dodatnog uvećanja i CombineZP program za spajanje fotografija.

Izraziti tragovi korištenja pronađeni su na grebalu, na distalnom ulomku drugotnog sječiva od bijelog rožnjaka AMI P-53704 (T. II a)[4]; svrdlu grebalu na ulomku jezgre ružičastog rožnjaka GARB13 S3 BN16 PN 15 (T. II b); središnjem ulomku sječiva svijetlog providnog rožnjaka GARB13 S4 BN25-2 (T. II c) i distalnom ulomku sječiva od svjetlosivog rožnjaka GARB13 S2 PN1 (T. II d).

Grebalo na distalnom ulomku drugotnog sječiva od bijelog rožnjaka AMI P-53704 (sl. 4) pokazuje izrazit, ujednačen sjaj, jako zaobljivanje ruba i sitno lomljenje koje je vidljivo i prilikom makroskopskog pregleda. Strijacije pokazuju različita usmjerenja, što je posljedica naknadnih oštećenja, međutim razlikuju se podređene mekše strijacije pod kutom od 45 stupnjeva u odnosu na rub te njima superponirane jače, ali rjeđe strijacije pod pravim kutom u odnosu na prvotne strijacije. Sjaj je mrežast, prekriva cijelu površinu radnog ruba u širokom pojasu. Ovakav raspored oštećenja ukazuje na struganje mekih i vlažnih materijala poput svježe kože. Slična oštećenja uočena su na eksperimentalnom materijalu prilikom uklanjanja supkutanog masnog tkiva sa svinjske kože, iako je boja sirovinskog materijala eksperimentalnog alata različita od boje rožnjaka.

Svrdlo grebalo na ulomku jezgre ružičastog rožnjaka GARB13 S3 BN16 PN15 (sl. 5) ima slične tragove uporabe na oba alata. Sjaj je izrazit, svijetao i mrežast, razvija se na vrhovima reljefa intenzivnije nego u dubljim dijelovima. Izrazito zaobljivanje ruba prekriva sitno lomljenje. Kratke strijacije okomite na lateralne rubove prisutne su na strani svrdla. Ostataka nema. Na grebalu se sjaj udaljava od radnoga ruba, što sugerira grebanje. Tragovi sugeriraju uporabu na srednje čvrstom i umjereno suhom materijalu poput drva. Kombinacija svrdla i grebala korištenih na istom materijalu također govori u prilog obradi srednje tvrdog do tvrdog materijala. Na eksperimentalnom oruđu ovakav je sjaj, s više sitnog

[4] Oznake označavaju lokalitet (GARB za Garbinovica), godinu istraživanja (13 ili 14 za 2013. ili 2014.), broj vrećice (BN) i broj posebnog nalaza (PN) ukoliko postoje. Ako je nalaz inventariziran koristi se oznaka AMI (Arheološki muzej Istre) P- (prapovijesna zbirka) te broj. Nalazi koji nisu uvedeni u inventarnu knjigu dio su studijske zbirke.

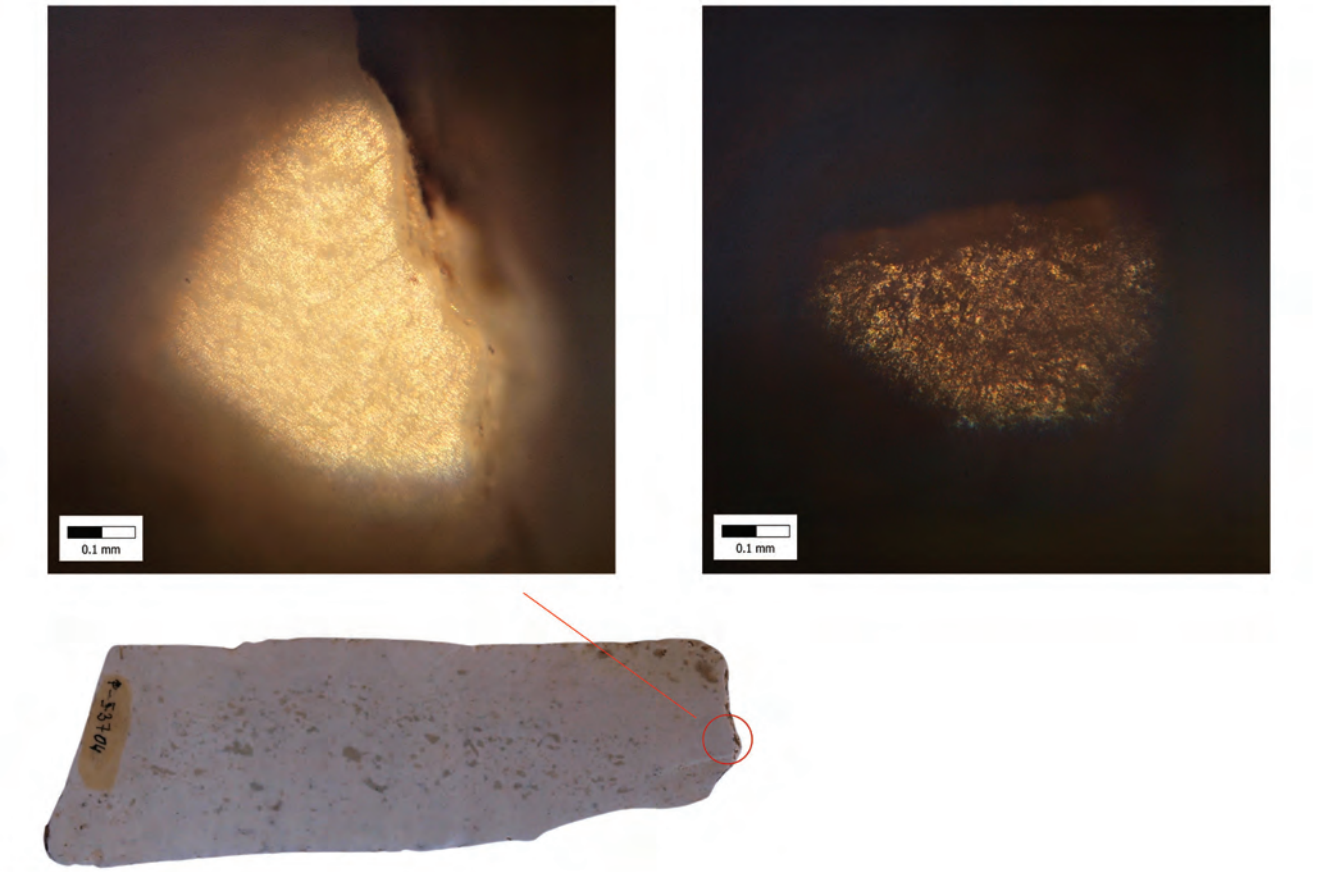
microscopically examined under an AmScope ME300TZB-2L-9M 40× to 2 000× metallurgical trinocular microscope at 200× magnification (with 10× magnification at the objective and 20× at the eyepiece). Photographs were taken with an Olympus E-3 10.1-megapixel camera with a trinocular microscope photo eyepiece mount without additional magnification, and were processed with the CombineZP software package for the merger of the photographs.

Pronounced use-wear traces were identified on the endscraper, a distal secondary decortication blade fragment of white chert AMI P-53704 (Plate II a)[4]; a drill-endscraper on a core fragment of pink chert GARB13 S3 BN16 SF 15 (Plate II b); a medial fragment of a blade of light translucent chert GARB13 S4 BN25-2 (Plate II c); and on a blade distal fragment of light grey chert GARB13 S2 SF1 (Plate II d).

Endscraper on a distal secondary decortication blade fragment of white chert AMI P-53704 (Fig. 4) exhibits pronounced and uniform gloss, a high degree of edge rounding, and fine chipping visible even under macroscopic examination. The striations exhibit multiple orientations, which is the result of later damage, however we see a differentiation between the lower softer striations at an angle of 45 degrees in relation to the edge and the more pronounced but rarer superimposed striations at a right angle to the initial striations. The gloss is reticulate, covering the entire surface of the working edge in a broad zone. This distribution of damage is indicative of scraping against soft and moist materials such as fresh hides. Similar damage was observed on the experimental material when removing subcutaneous fatty tissue from pig skin, despite the colour of the raw material of the experimental tools being different from that of the recovered chert.

Drill-endscraper on a core fragment of pink chert GARB13 S3 BN16 SF15 (Fig. 5) has similar use-wear traces on both tools. The gloss is pronounced, bright, and reticulate, exhibiting more intense development on the raised peaks in comparison with the deeper areas. Pronounced edge rounding covers the fine chipping. Short striations perpendicular to the lateral edges are present on the drill side. There is no residue. On the endscraper the gloss runs further from the working edge, which suggests scraping. The traces suggest use on medium hard and

[4] The code indicates the site (GARB for Garbinovica), the year of investigation (13 or 14 for 2013 or 2014), the bag number (BN) and the special find number (SF) if they have been assigned. If the recovered artefact has been inventoried, we used the AMI (Archaeological Museum of Istria) P- (prehistoric collection) code and the assigned number. Finds that have not been registered in the inventory book are part of the study collection.



Sl. 4 Makroskopski i mikroskopski snimak ulomka sječiva AMI P-53704 te mikroskopski snimak eksperimentalnog oruđa korištenog za uklanjanje supkutanog masnog tkiva sa svinjske kože (fotografija: Dunja Martić Štefan).
Fig. 4 Macroscopic and microscopic images of blade fragment AMI P-53704 and a microscopic image of the experimental tool used to remove subcutaneous fatty tissue from pig skin (photo: Dunja Martić Štefan).

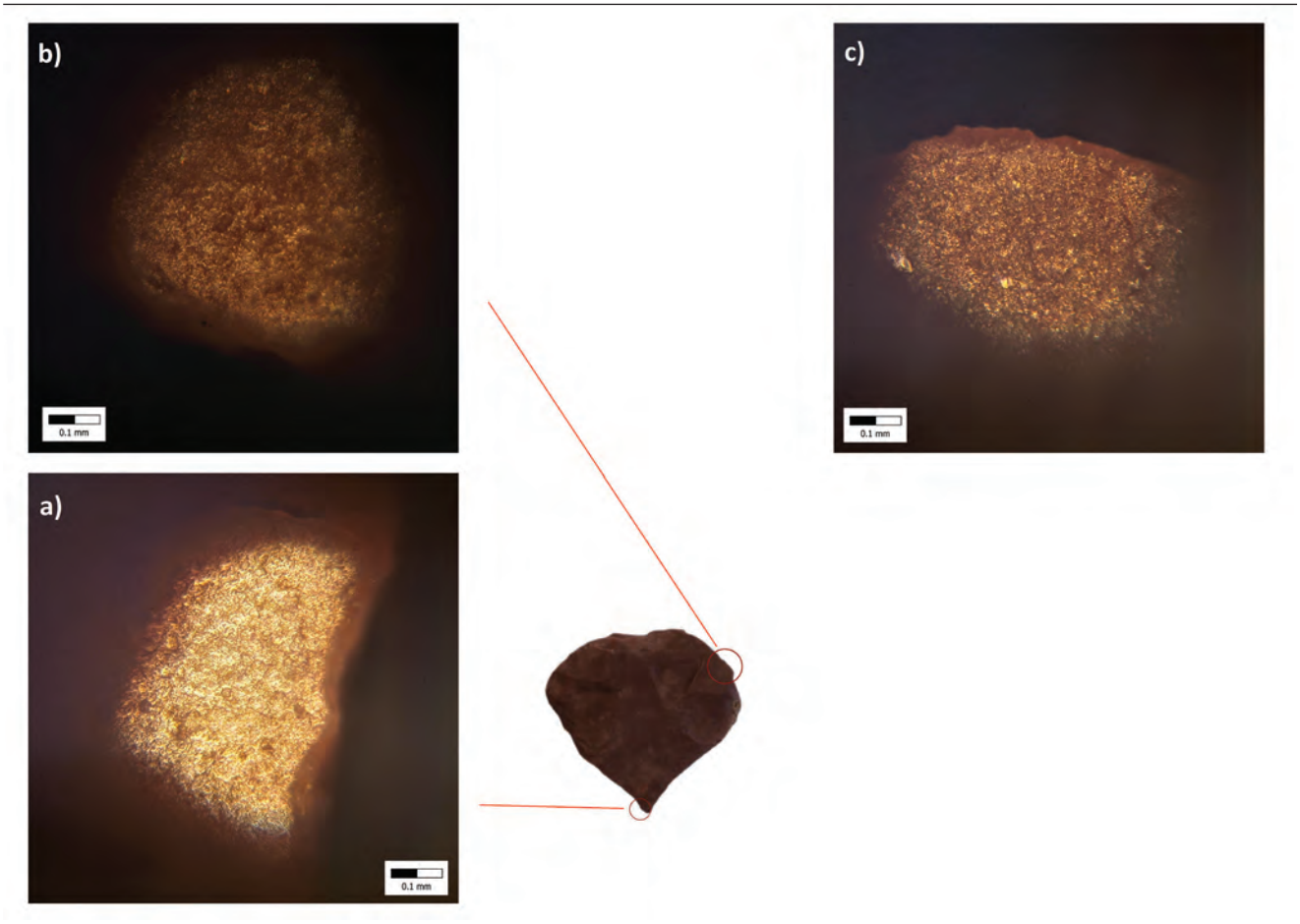
lomljenja i nešto manje zaobljivanja ruba, uočen kod guljenja kore sa svježeg mokrog drva u trajanju od oko 20 minuta. Ovakva oštećenja mogu biti i posljedica rezanja trske (Vaughan 1985).

Središnji ulomak sječiva svijetlog providnog rožnjaka GARB13 S4 BN25-2 (sl. 6) nema obrade, a radni rub je prekriven tamnim, mrežastim, jednoličnim sjajem, koji prekriva malo sitnog lomljenja na jako zaobljenom rubu. Strijacija i ostataka nema. Taman i jednoličan sjaj odgovara rezanju mokrih materijala poput mesa ili obradi mokre kože.

Distalni ulomak sječiva svjetlosivog rožnjaka GARB13 S2 PN1 (sl. 7) pokazuje svijetao, mrežast sjaj koji prati reljef, ali je najizraženiji na vrhovima reljefa. Sitno lomljenje, ali i zaobljivanje ruba su jaki, što daje rubu valovit izgled. Sitno lomljenje je vidljivo i golim okom. Javljaju se kratke strijacije okomite na rub. Nisu uočeni ostaci. Ovakva oštećenja odgovaraju oštećenjima na eksperimentalnim odbojcima rožnjaka korištenim moderately dry materials like wood. The combination of a drill and endscraper used on the same material also supports the processing of medium hard to hard materials. On the experimental tool this kind of gloss, with more fine chipping and somewhat less edge rounding, is observed in the removal of bark from fresh and moist wood over a period of about 20 minutes. This kind of damage may also be the result of cutting reeds (Vaughan 1985).

A medial blade fragment of light translucent chert GARB13 S4 BN25-2 (Fig. 6) shows no retouch, with the working edge covered in dark, reticulate, and uniform gloss, which covers very modest fine chipping on a very rounded edge. There are no striations or residues. The dark and uniform gloss is consistent with cutting moist materials such as flesh or the processing of moist hides.

Blade distal fragment of light grey chert GARB13 S2 SF1 (Fig. 7) exhibits bright, reticulate gloss that follows the relief, but is most pronounced on raised peaks. Fine chipping and edge rounding are pronounced, which gives



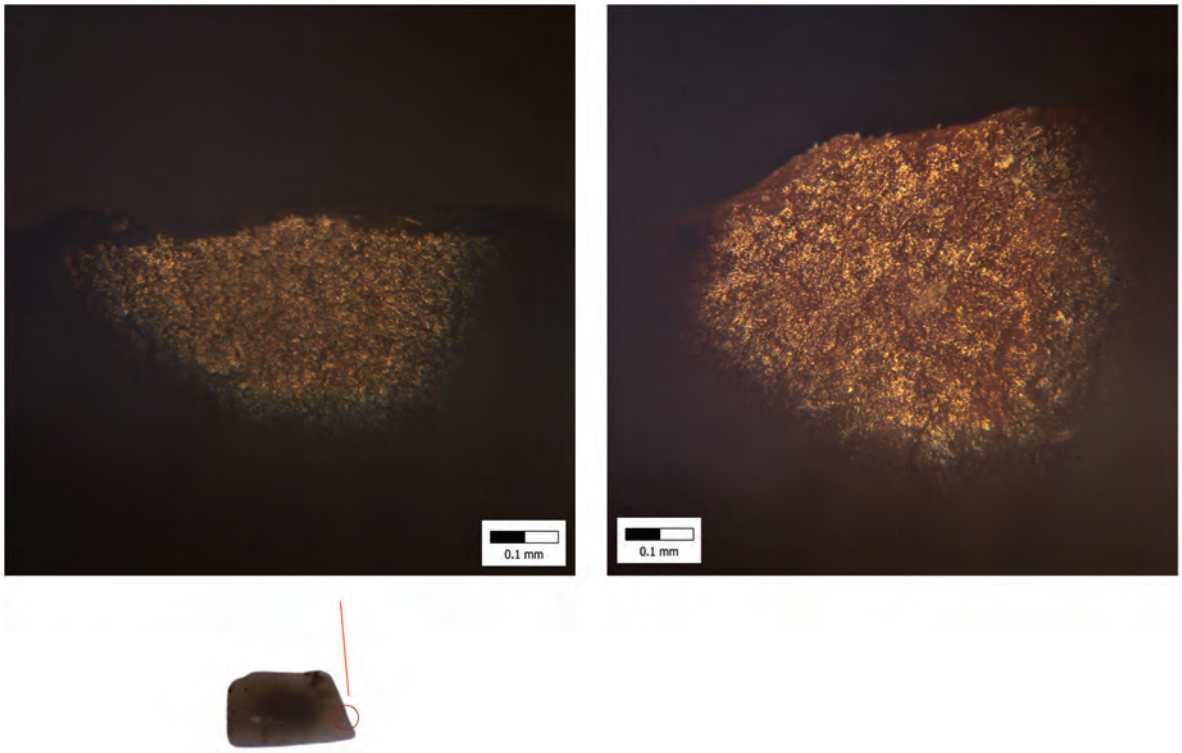
Sl. 5 Makroskopski i mikroskopski snimak svrdla grebala GARB13 S3 BN16 PN15 te mikroskopski snimak eksperimentalnog oruđa (c) korištenog za guljenje kore sa svježe smokvine grane - a) na svrdlu i b) na grebalu (fotografija: Dunja Martić Štefan).
Fig. 5 Macroscopic and microscopic images of drill-endscraper GARB13 S3 BN16 SF15 and a microscopic image of the experimental tool (c) used to remove bark from a fresh fig tree branch; a) on the drill, and b) on the endscraper (photo: Dunja Martić Štefan).

za struganje roga, prethodno namakanog u vodi, u razdoblju od 10 minuta. Prilikom eksperimenta sjaj je brzo nastajao, a oruđe se brzo trošilo uslijed struganja po tvrdom i suhom materijalu. Po Vaughanu (1985) sjaj dobiven obradom roga podsjeća na sjaj od piljenja drva i rezanja kosti. Sličnost je uočena i na eksperimentalnom materijalu.

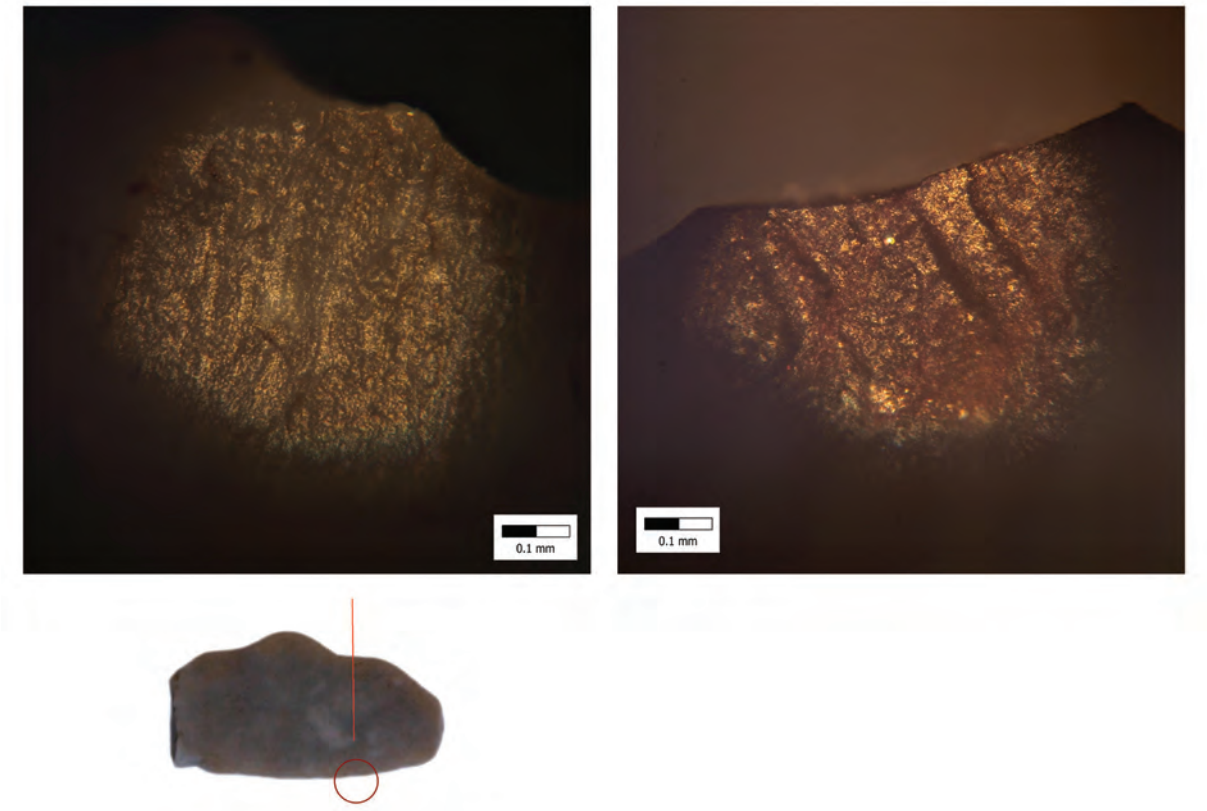
Tragovi uporabe na nalazima iz pećine Garbinovica upućuju na obradu srednje do jako tvrdih i mekih vlažnih i poluvlažnih materijala životinjskog podrijetla te drva. Nema indikacija da je oruđe korišteno na vlažnim i mekim materijalima biljnog podrijetla niti biljnim materijalima s visokim udjelima silikatnih spojeva koji rezultiraju nastankom sjaja srpa, što u razdoblju neolitika i kasnijim razdobljima indicira uzgoj žitarica i leguminoza (Darvill 2002, 389). Također, nema indikacija za obradu izrazito tvrdih i suhih materijala (izuzev obrade roga) koji rezultiraju jakim

the edge a wavy appearance. The fine chipping is visible to the naked eye. Short striations are perpendicular to the edge. No residues were observed. This kind of damage is consistent with damage on experimental flakes of chert used to scrape horn, that had been soaked in water, for a 10-minute period. The gloss formed quickly during the experiment and the tool was quickly worn when scraping hard and dry materials. According to Vaughan (1985) the gloss obtained when processing horn is reminiscent of the gloss that forms when sawing wood and cutting bone. The similarity was also observed on the experimental material.

The use-wear traces on finds recovered at the Garbinovica cave site are indicative of the processing of medium to very hard and soft moist and semi-dry materials of animal origin, and wood. There is no indication that the tools were used on moist and soft materials of plant origin nor on silica-rich plant materials that produce sickle gloss, which in the Neolithic and later periods is indicative of



Sl. 6 Makroskopski i mikroskopski snimak ulomka sječiva GARB13 S4 BN25-2 i mikroskopski snimak eksperimentalnog oruđa korištenog pri rezanju mesa i uklanjanju kože.
Fig. 6 Macroscopic and microscopic images of blade fragment GARB13 S4 BN25-2 and a microscopic image of the experimental tool used to cut flesh and remove skin.



Sl. 7 Makroskopski i mikroskopski snimak ulomka sječiva GARB13 S2 PN1 i mikroskopski snimak eksperimentalnog oruđa korištenog za struganje roga.
Fig. 7 Macroscopic and microscopic images of blade fragment GARB13 S2 SF1 and a microscopic image of the experimental tool used to scrape horn.

zaglađivanjem površine radnog ruba.

Ovakvi rezultati pokazuju da su očuvani litički nalazi na lokalitetu Garbinovica bili pretežno korišteni pri obradi materijala životinjskog podrijetla i drva. Pritom valja imati na umu da obrada drva, kosti i roga može ostaviti slične tragove korištenja na površini oruđa (Vaughan 1985, 30-34).

ZAKLJUČAK

Nalazi s lokaliteta Garbinovica ne čine zatvoreni skup nalaza. Poremećena stratigrafija nalazišta dozvoljava smještaj tek dijela nalaza unutar zatvorenih neolitičkih slojeva. Tipovi oruđa koje je moguće vremenski odrediti otprilike prate postojeću kronologiju, koja određuje rani i srednji neolitik kao vrijeme početka nastanjivanja pećine. S obzirom na to da litičke nalaze nije moguće sagledati unutar zatvorene cjeline, bilo ih je potrebno zasebno definirati tipološki, tehnološki i funkcionalno. Unatoč nepouzdanoj stratigrafiji i malom broju nalaza, litički nalazi iz pećine Garbinovica nedvosmisleno pokazuju ljudsku aktivnost u pećini i njenoj bližoj okolici.

Iako nalazi tipološki i tehnološki barem djelomično odgovaraju nalazima sa sličnih neolitičkih lokaliteta u Istri (Forenbaher 2006; Forenbaher 2008), njihov mali broj onemogućuje direktnu usporedbu oruđa iz Garbinovice sa skupovima nalaza s okolnih lokaliteta. Paralele su vidljive u Veloj i Pupićinoj peći, gdje se javlja veći broj strugala, iako na tim lokalitetima prevladava oruđe na odbojcima (Forenbaher, Nikitović 2009). Nalaz bifacijalno obrađenog šiljka s trnom koji odgovara vrhu strelice u južnoj se Europi javlja od neolitika do brončanog doba, dok se na istočnoj obali Jadrana prva pojava ovakvih šiljaka vezuje uz Danilsku kulturu (Forenbaher 2008, 76). Prema Forenbaheru (2008, 76) na području Krasa, Dalmacije i Hercegovine šiljci s trnom čija je površina u potpunosti bifacijalno obrađena, kakav je i šiljak iz Garbinovice, javljaju se u kasnom neolitiku, dok je za područje Istre vrijeme njihove prve pojave nejasno. U slučaju nalaza s Garbinovice bifacijalni šiljak pronađen je u humusnom sloju te mu nije moguće odrediti vrijeme nastanka. Treba izdvojiti analogiju s bifacijalno obrađenim šiljkom iz Pupićine peći, čije je vrijeme nastanka nepoznato (Forenbaher 2006, tabla 6.2: 11).

Funkcionalna analiza omogućuje interpretaciju funkcije pojedinog nalaza. Međutim, analiza neolitičkog litičkog materijala za područje istočnog Jadrana, ali i šire okolice, rijetko uključuje funkcionalnu analizu tragova uporabe.

the cultivation of cereal crops and legumes (Darvill 2002, 389). There are also no indicators of the processing of very hard and dry materials (with the exception of horn) which result in a high degree of smoothing of the working edge.

These results show that the surviving lithic artefacts from the Garbinovica site were used predominantly to work materials of animal origin and wood. It should also be noted that the processing of wood, bone, and horn may produce similar use-wear traces on tool surfaces (Vaughan 1985, 30-34).

CONCLUSION

The finds recovered at the Garbinovica site do not constitute a closed context assemblage. The disturbed stratigraphy of the site allows for the placing of only a part of the finds within closed Neolithic strata. The types of tools that can be chronologically determined roughly follow the existing chronology, which sees the early and middle Neolithic periods as the time in which the cave was first occupied by humans. Given that the lithic finds could not be considered within a closed context, they were individually defined in terms of typology, technology, and function. Notwithstanding the unreliable stratigraphy and the modest number of recovered artefacts the lithic finds from the Garbinovica cave unequivocally show human activity in the cave and its proximate environs.

Although the finds typologically and technologically correspond at least partially to finds from similar Neolithic sites in Istria (Forenbaher 2006, Forenbaher 2008) the modest number precludes direct comparison of the tools from Garbinovica with assemblages from surrounding sites. Parallels are evident at the Vela peć and Pupićina peć cave sites, where we see a significant number of sidescrapers, although tools on flakes predominate at these sites (Forenbaher & Nikitović 2009). Finds of bifacially retouched tanged points consistent with an arrowhead appear in the south of Europe from the Neolithic to the Bronze Age, while on the eastern shores of the Adriatic the first appearance of these points is associated with the Danilo culture (Forenbaher 2008, 76). According to Forenbaher (2008, 76) tanged points with a surface entirely bifacially retouched—like the point from Garbinovica—appear in the Karst plateau and the Dalmatia and Herzegovina regions in the late Neolithic, while in Istria the time of their initial appearance remains unclear. In the case of the finds made at Garbinovica the bifacial point was recovered in a layer of humus and its period of creation cannot be determined. Noteworthy is an analogous bifacially retouched point from the Pupićina peć site, the creation

Najčešći oblik ove analize vezan uz neolitički materijal jest analiza sjaja srpa, koja se često izvodi isključivo makroskopski i bez referentnih eksperimentalnih primjera, a samo se rjeđe provodi mikroskopski, uz korištenje referentnog materijala (Kačar, Philiberth 2022; Mazzucco *et al.* 2016; Mazzucco *et al.* 2020; Mazzucco *et al.* 2022). Na lokalitetu je zabilježen izostanak seta alata koji se vezuje uz poljoprivredu, koji inače čini većinu materijala podvrgnutog funkcionalnoj analizi na širem području jadranske obale (Kačar, Philiberth 2022; Mazzucco *et al.* 2016; Mazzucco *et al.* 2020; Mazzucco *et al.* 2022). Nalazi s lokaliteta Garbinovica usporedivi su s nalazima s ranoneolitičkog lokaliteta Crno Vrilo, na kojem su pronađena ranoneolitička sječiva koja pokazuju tragove uporabe (Kačar, Philiberth 2022). Na sječivima iz Crnog Vrila nije zamijećena specijalizacija, već su ona bila korištena na različitim materijalima, poput tvrdih i mekih materijala biljnog i životinjskog podrijetla te nepoznatih abrazivnih materijala (Kačar, Philiberth 2022, 266). Od četiri nalaza s čitkim tragovima uporabe s lokaliteta Garbinovica barem su tri korištena pri obradi materijala životinjskog podrijetla, dok je jedan najvjerojatnije korišten za obradu drva. Zbog broja nalaza nije moguće isključiti obradu biljnog materijala korištenog za prehranu, poput onog pronađenog na lokalitetu Crno Vrilo (Kačar, Philiberth 2022, 266), ali i drugim neolitičkim mediteranskim lokalitetima na kojima se javlja sjaj srpa na sječivima (Mazzucco *et al.* 2020; Mazzucco *et al.* 2022). Međutim, s obzirom na to da je lokalitet Garbinovica relativno mali pećinski lokalitet, na kojem nisu pronađeni tragovi stalnog naselja, moguće je da obrada mesa i drva vidljiva u malobrojnim tragovima na litičkom materijalu predstavlja djelatnost koja se može povezati s privremenim lovnim ili pastirskim kampom. Oruđe vezano za pastirsku djelatnost na pećinskim lokalitetima u Istri već je uočeno u kontekstu Vele i Pupićine peći (Forenbaher, Nikitović 2009). Set nalaza s lokaliteta Garbinovica kroz funkcionalnu analizu ukazuje na to da je pećina barem u nekom razdoblju služila kao mjesto na kojem se obrađivala sirovina životinjskog podrijetla.

Funkcionalna analiza provođena kroz makroskopsko i mikroskopsko promatranje tragova uporabe, uz komparaciju s eksperimentalnim materijalom referentnih zbirki, važan je alat pri litičkoj analizi. Rijetko provođenje analiza onemogućuje komparaciju funkcije kamenog oruđa s različitih lokaliteta, kao i načina njihovog korištenja na različitim materijalima. S druge strane, problematika krnjih referentnih zbirki, a samim time i točnosti analize, može se riješiti samo proširenjem zbirki na različite vrste, ali i podvrste kamena, kao i

period of which is also unknown (Forenbaher 2006, Plate 6.2: 11).

Functional analysis allows for an interpretation of the function of an individual find. The analysis of Neolithic material in the eastern Adriatic, and its broader neighbourhood, rarely includes functional analysis of use-wear traces. The most frequent form this analysis takes in relation to Neolithic material is the analysis of sickle gloss, which is often performed only with macroscopic examination and without reference experimental specimens, and only rarely under microscopic examination and using reference material (Kačar & Philibert 2022; Mazzucco *et al.* 2016, Mazzucco *et al.* 2020, Mazzucco *et al.* 2022). An absence of a set of tools associated with agriculture, which otherwise constitute the bulk of material from the broader Adriatic coastal area on which functional analysis has been performed (Kačar & Philibert 2022; Mazzucco *et al.* 2016, Mazzucco *et al.* 2020, Mazzucco *et al.* 2022), was observed at the site. The finds recovered at the Garbinovica site are comparable with finds from the early Neolithic Crno Vrilo site, at which early Neolithic blades that exhibit use-wear traces were recovered (Kačar & Philibert 2022). Specialisation was not observed on the Crno Vrilo blades, rather they were used on various materials, including hard and soft materials of plant and animal origin, and unknown abrasive materials (Kačar & Philibert 2022, 266). Of the four finds from the Garbinovica site with readable use-wear traces at least three were used to work materials of animal origin, and one was most likely used to work wood. The number of finds means that we cannot rule out the processing of plant materials used as foodstuffs, such as those found at the Crno Vrilo site (Kačar & Philibert 2022, 266), and at other Mediterranean Neolithic sites at which we see sickle gloss on blades (Mazzucco *et al.* 2020, Mazzucco *et al.* 2022). Given, however, that Garbinovica is a relatively small cave site, at which traces of a permanent settlement were not identified, it is possible that the processing of meat and wood evident in the few traces on the lithic material relates to activity that can be associated with the intermittent use of a hunting or pasturing camp. Tools associated with pasturing at cave sites in Istria have already been observed in the contexts of the Vela peć and Pupićina peć cave sites (Forenbaher & Nikitović 2009). Through functional analysis the set of finds from the Garbinovica site indicates that the cave served at some point as a site where raw materials of animal origin were processed.

Functional analysis performed using macroscopic and microscopic observation of use-wear traces, with comparison against experimental material in reference

djelatnosti koje se njime izvode. Daljnja istraživanja arheološkog i eksperimentalnog materijala povećat će uspješnost određivanja funkcije kamenog oruđa. To je vidljivo razvojem funkcionalne analize u posljednjih 50-ak godina, pri čemu ne treba zanemariti ni napredak u tehnologiji vezanoj uz mikroskopiju.

Daljnje provođenje litičke analize koja obuhvaća i funkcionalnu analizu upotpunit će saznanja o litičkoj industriji, ali i drugim industrijama kojih je litički materijal sastavni dio.

collections, is an important tool in lithics analysis. The infrequent performance of this analysis precludes the comparison of the functions of lithic tools from different locations, and the manner in which they were used on various materials. The issue of limited reference collections—and consequently of the accuracy of the analysis—can only be resolved by expanding the collections with different types and subtypes of rock, and to the range of activities performed with them. Further investigation of the archaeological and experimental material will increase success in the identification of the functions of lithic tools. This is evident in the development of functional analysis over the past five decades, a process in which the advances made in microscopy technology should not be overlooked.

Further performance of lithics analysis that includes functional analysis will fill the gaps in our understanding of lithic industries, and of other industries in which lithic materials are an integral component.

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