Ivor Karavanić, Nikola Vukosavljević, Rajna Šošić Klindžić,
Dražen Kurtanjek, Jožica Zupanič

Litička i koštana industrija epigravetijenskih slojeva Šandalje II kod Pule

The lithic and bone industries of the Epigravettian layers from Šandalja II near Pula

Ivor Karavanić
Sveučilište u Zagrebu
Filozofski fakultet /
Odsjek za arheologiju
I. Lučića 3
HR, 10000 Zagreb
ikaravan@ffzg.hr

Nikola Vukosavljević
Sveučilište u Zagrebu
Filozofski fakultet /
Odsjek za arheologiju
I. Lučića 3
HR, 10000 Zagreb
nvukosav@ffzg.hr

Rajna Šošić Klindžić
Sveučilište u Zagrebu
Filozofski fakultet /
Odsjek za arheologiju
I. Lučića 3
HR, 10000 Zagreb
rsosic@ffzg.hr

Dražen Kurtanjek
Sveučilište u Zagrebu
Prirodoslovno-matematički
fakultet / Geološki odsjek
Horvatovac b. b.
HR, 10000 Zagreb
drkurtan@inet.hr

Jožica Zupanič
Sveučilište u Zagrebu
Prirodoslovno-matematički
fakultet / Geološki odsjek
Horvatovac b. b.
HR, 10000 Zagreb
izupanic@geol.pmf.hr

UDK: 903.3 (497.5 Šandalja)
903.01
Izvorni znanstveni članak
Primljeno: 8. 10. 2012.
Prihvaćeno: 25. 1. 2013.

Ivor Karavanić
University of Zagreb
Faculty of Humanities and
Social Sciences / Department
of Archaeology
I. Lučića 3
CROATIA, 10000 Zagreb
ikaravan@ffzg.hr

Nikola Vukosavljević
University of Zagreb
Faculty of Humanities and
Social Sciences / Department
of Archaeology
I. Lučića 3
CROATIA, 10000 Zagreb
nvukosav@ffzg.hr

Rajna Šošić Klindžić
University of Zagreb
Faculty of Humanities and
Social Sciences / Department
of Archaeology
I. Lučića 3
CROATIA, 10000 Zagreb
rsosic@ffzg.hr

Dražen Kurtanjek
University of Zagreb
Faculty of Science /
Department of Geology
Horvatovac b. b.
CROATIA, 10000 Zagreb
drkurtan@inet.hr

Jožica Zupanič
University of Zagreb
Faculty of Science /
Department of Geology
Horvatovac b. b.
CROATIA, 10000 Zagreb
izupanic@geol.pmf.hr

UDC: 903.3 (497.5 Šandalja)
903.01
Original scientific paper
Received: 8 October 2012
Accepted: 25 January 2013

Članak donosi rezultate analiza nalaza iz epigravetijenskih stratigrafskih jedinica Šandalje II kod Pule. Na temelju litičkog materijala analizirani su proizvodni postupci, tipologija alatki, petrografski sastav uzoraka i porijeklo sirovine. Koštane

This article presents the results of analysis of finds from the Epigravettian stratigraphic units of Šandalja II at Pula. Technology, tool typology, the petrographic composition of samples and the origin of the raw materials are analyzed based on the lithics. Bone

rukotvorine također su tipološki razvrstane. Uočene su razlike u tipologiji litičkih alatki između pojedinih razina epigravetijena. Usporedba s ostalim nalazištima omogućila je sagledavanje rezultata u okviru jadranskog konteksta.

Ključne riječi: litička industrija, koštana industrija, osobni ornamenti, epigravetijen, Šandalja II, Istra, Hrvatska

artifacts are also typologically classified. Differences between the typology of tools among individual Epigravettian levels are noted. A comparison with other sites from an Adriatic context was made.

Key words: lithic industry, bone industry, personal ornaments, Epigravettian, Šandalja II, Istria, Croatia

1. UVOD

Paleolitička nalazišta Hrvatske često se spominju u stranoj i domaćoj znanstvenoj literaturi. Ta se konstatacija ponajprije odnosi na špilje Hrvatskog zagorja poznate po nalazima fosilnog čovjeka i/ili njegovih materijalnih kultura (Krapina, Vindija, Velika pećina). Paleolitička nalazišta drugih hrvatskih regija, primjerice Istre i Dalmacije, zadnjih se petnaestak godina intenzivnije istražuju. Dugo je vremena Šandalja II kraj Pule bila jedino sustavno istraženo paleolitičko nalazište u okviru hrvatskog dijela jadranske regije (sl. 1). Istraživanjima je prikupljen mnogobrojan litički i faunski materijal, nalazi fosilnih ljudi iz pleistocenskih slojeva te ulomci brončanodobne keramike. Rezultati analiza faune objavljeni su u nekoliko radova,[1] fosilne je ljude ponajprije objavio M. Malez,[2] a u zadnje su vrijeme ti nalazi detaljnije analizirani i objavljeni.[3] Mnogobrojan litički materijal gornjeg paleolitika koji je prikupljen ponajprije je bio djelomično obrađen i objavljen,[4] a potom je cjelokupan litički materijal detaljnije analiziran s tehnološkoga i tipološkog aspekta, uz tipološku odredbu koštanih rukotvorina.[5] Još je Đ. Basler[6] u litičkom materijalu Šandalje II na temelju različite učestalosti određenih tipova alatki, uočio dvije faze epigravetijena (on rabi termin tardigravetijen), no pritom nisu izneseni detaljniji kvantitativni podaci o postotnoj zastupljenosti pojedinih tipova alatki. Dosta vremena nakon toga objavljeni su rezultati analize orinjasijenskih slojeva,[7] a rezultati dobiveni za epigravetijenske slojeve,[8] dorađeni i upotpunjeni analizom sirovina, prvi se put objavljuju u ovom članku, osim podataka za sloj B/s, koji su nedavno bili objavljeni zajedno s rezultatima detaljne analize ljudskih ostataka iz tog sloja.[9]

Velika većina litičkog materijala iz Šandalje II i sve koštane rukotvorine nalaze se u Zavodu za paleontologiju i geologiju kvartara Hrvatske akademije znanosti i umjetnosti u Zagrebu, a mali se dio litičkog materijala čuva u Arheološkome muzeju Istre u Puli. Tehnološka i tipološka analiza čiji se rezultati objavljuju u ovom članku obuhvatile su sav raspoloživi propisno označen litički materijal (jasna pripadnost stratigrafskoj jedinici) i sve koštane rukotvorine.

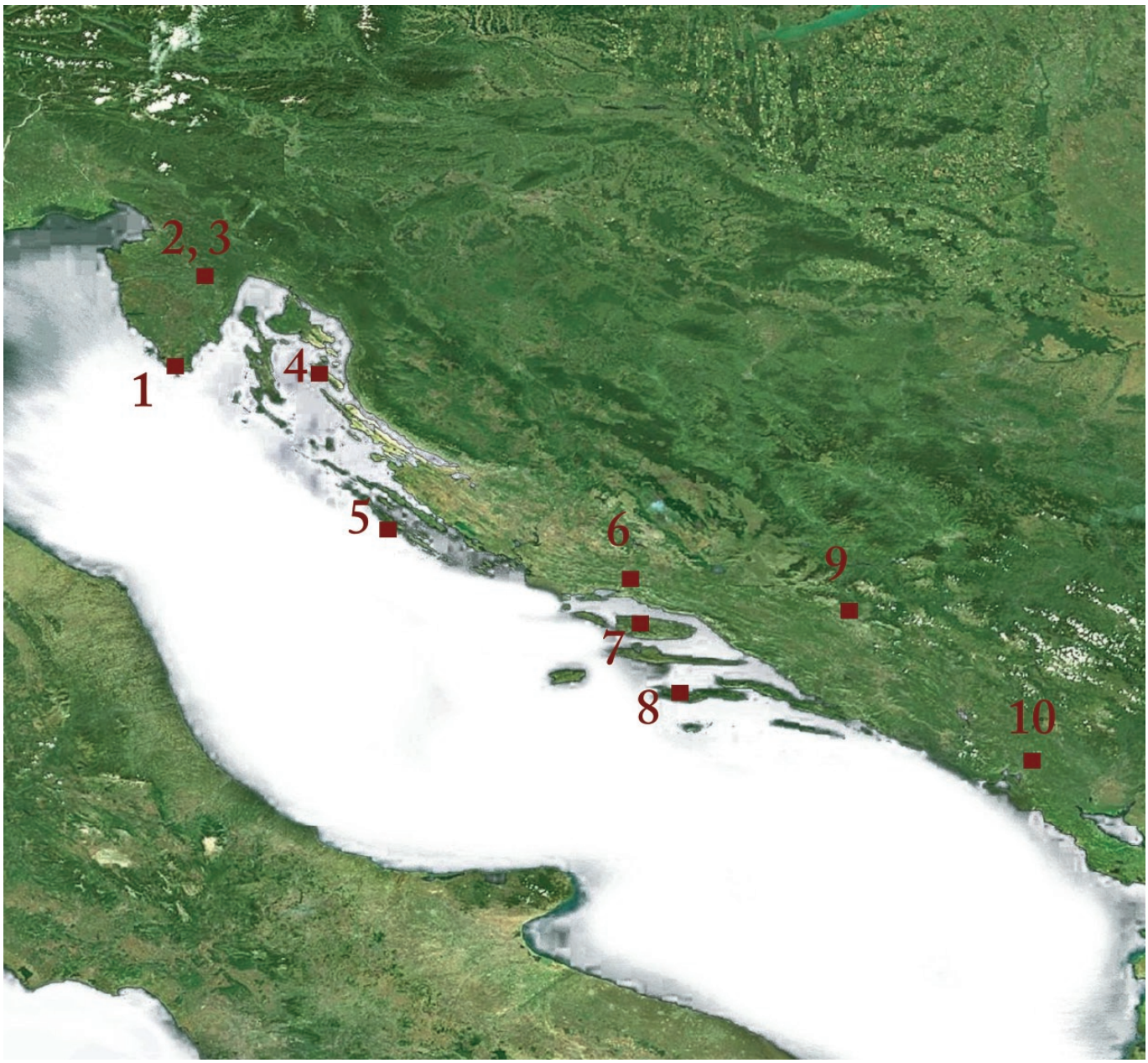
1 Miracle 1995; 1996; Brajković, Miracle 1997; Brajković 1998.
2 Malez 1972.
3 Janković *et al.* 2011; 2012.
4 Malez 1969; 1974a; 1979b; 1987 ; Basler 1983.
5 Karavanić 1999.
6 Basler 1983, str. 55.
7 Karavanić 2003; Karavanić , Janković 2010.
8 Karavanić 1999.
9 Janković *et al.* 2011; 2012.

1. INTRODUCTION

Croatian Palaeolithic sites are often highlighted in both the domestic and international scholarly literature. This primarily pertains to the caves of Hrvatsko zagorje region, known for the fossilized remains of hominins and/or their material culture (Krapina, Vindija, Velika Pećina). The Palaeolithic sites of other Croatian regions, such as Istria and Dalmatia, have been more intensively researched over the past fifteen years. For a considerable period, Šandalja II, near Pula, was the only researched Palaeolithic site in the Croatian part of the Adriatic coast (Fig. 1). In the course of this research, numerous lithics, faunal remains, fossilized humans from Pleistocene layers and fragments of Bronze Age pottery were found. The results of analysis of faunal remains have been published in numerous publications,[1] fossilized humans were published first and foremost by M. Malez,[2] while in more recent years these finds were analyzed and published in more detail.[3] Numerous initially gathered lithics from the Upper Palaeolithic were partially processed and published,[4] and then the entire lithic assemblage underwent more thorough technological and typological analyses, with typological classification of the bone artifacts.[5] On the basis of varying frequencies of certain tool types in the lithic assemblage, Đ. Basler[6] first observed two phases of the Epigravettian (he used the term Tardigravettian). However, he did not provide more detailed quantitative data on the percentages of individual tool types. A considerable time afterward, the results of analysis of the Aurignacian layers were published,[7] while the results from the Epigravettian layers,[8] refined and supplemented by analysis of the raw materials, were published in this article for the first time, with the exception of the data from layer B/s, which were recently published together with the results of a more detailed analysis of the human remains from this layer.[9]

The vast majority of the lithics from Šandalja II and all of the bone artifacts are held in the Institute for Quaternary Palaeontology and Geology of the Croatian Academy of Sciences and Arts in Zagreb, while a smaller portion of these lithics is held in the Archaeological Museum of Istria in Pula. The technological and typological analyses, of which the results are being published herein, encompassed all available properly marked lithic artifacts (clear belonging to the stratigraphic unit) and all bone artifacts.

1 Miracle 1995; 1996; Brajković, Miracle 1997; Brajković 1998.
2 Malez 1972.
3 Janković et al. 2011; 2012.
4 Malez 1969; 1974a; 1979b; 1987; Basler 1983.
5 Karavanić 1999.
6 Basler 1983, p. 55.
7 Karavanić 2003; Karavanić , Janković 2010.
8 Karavanić 1999.
9 Janković et al. 2011; 2012.



Slika 1.
Značajnija epigravetijenska nalazišta istočne jadranske obale:
1. Šandalja, 2. Pupičina peć, 3. Vešanska peć, 4. Lopar, 5. Vlakno,
6. Zemunica, 7. Kopačina, 8. Vela spila, 9. Badanj, 10. Crvena stijena

Figure 1.
Important Epigravettian sites on the eastern Adriatic coast:
1. Šandalja, 2. Pupičina peć, 3. Vešanska peć, 4. Lopar, 5. Vlakno,
6. Zemunica, 7. Kopačina, 8. Vela spila, 9. Badanj, 10. Crvena stijena

2. SMJEŠTAJ, POVIJEST ISTRAŽIVANJA, STRATIGRAFIJA I KRONOLOGIJA NALAZIŠTA

2.1. Smještaj

Nalazište Šandalja udaljeno je približno 4 km sjeveroistočno od središta Pule (44° 52′ 57″ N, 13° 53′ 48″ E). Nazivom su obuhvaćene pukotine u krednim vapnencima ispunjene sedimentima (nekoć dio podzemnog prostora - tzv. fosilne špilje), na istočnoj padini manjeg brda zvanog Sv. Daniel, po kojem je nalazište i nazvano Šandaljom.[10] Osim paleolitičkih nalaza na lokalitetima poznatim pod nazivima Šandalja I i Šandalja II, na širem okolnom

10 Malez 1975a.

2. LOCATION, RESEARCH HISTORY, STRATIGRAPHY AND CHRONOLOGY OF THE SITE

2.1. Location

The Šandalja site is approximately 4 km north-east of downtown Pula (44° 52′ 57″ N, 13° 53′ 48″ E). The designation encompasses fissures in the Cretaceous limestone filled with sediments (formerly part of a subterranean space - so-called fossil caves), on the eastern slope of a small hill called Sveti Daniel (St. Daniel), which is why the site is in fact called Šandalja.[10] Besides the Palaeolithic finds at the sites known under the names Šandalja I and Šandalja II, in the

10 Malez 1975a.

prostoru prikupljen je arheološki materijal iz neolitika, bakrenog i brončanog doba te iz kasnijih razdoblja.

2.2. Povijest istraživanja

Na brdu Sv. Daniel postojao je kamenolom u antici, točnije u vremenu gradnje Vespazijanove arene u Puli. Ponovno korištenje započeto je 1954. godine.[11] Prilikom miniranja u kamenolomu, 1961. godine, otvorena je šupljina u kršu, ispunjena kvartarnim sedimentima i nazvana Šandaljom I.[12] I. Crnolatac i M. Malez bili su na tom nalazištu i te iste godine objavili su izvješće o rezultatima istraživanja.[13] Nakon prve sezone istraživanja, sljedeće se godine (1962.) naišlo na drugu šupljinu, koja je nazvana Šandaljom II. Istraživanja Šandalje I započeo je B. Bačić, a zatim ih je preuzeo i vodio M. Malez. Čini se da je Bačić bio prisutan i tijekom prvih godina istraživanja Šandalje II.[14] Gornjopaleolitičko nalazište Šandalja II iskopavano je 22 puta od 1962. do 1989. godine pod vodstvom M. Maleza.[15]

2.3. Sedimentološke značajke slojeva i rezultati datiranja metodom radioaktivnog ugljika

Tijekom dvogodišnjih radova na Šandalji II (u daljnjem tekstu Šandalja) dobiven je cjelovit profil, čije je sedimentološke značajke prvi opisao i pojedine slojeve geokronološki relativno datirao M. Malez.[16] Profil (sl. 2) taložina Šandalje sadrži 8 naslaga debljine iznad 8 m. Naslage C i B deblje su te čine komplekse koji su razdijeljeni na više slojeva. Kompleks B sastoji se od slojeva B/g (gore), B/s (sredina), B/d (dolje), a isti je slučaj i s kompleksom C. Oznake za stratigrafske jedinice unutar navedena dva kompleksa postavljene su superpozicijski i ne odražavaju drukčiju sedimentaciju ili promjenu u boji sedimenta.[17] Naslage, od A do H, moguće je na profilu makroskopski razlikovati, i njihove stratigrafske sekvence gotovo su konstantne kroz cijelo nalazište. Fizička obilježja sedimenta na cijelom su nalazištu vrlo slična, u raznim dijelovima špilje dolazi do jasne razlike u relativnim debljinama naslaga, a znatne promjene debljine pojedinog sloja uočljive su i pri vodoravnim udaljenostima od samo nekoliko metara.[18]

11 Malez 1975a.
12 Malez 1963a; 1979a.
13 Crnolatac, Malez 1961.
14 Šandalja I i Šandalja II vrlo su vjerojatno pripadale istom podzemnom kompleksu, odnosno gornjopleistocenski sedimenti obiju pećina nekoć su vjerojatno pripadali istoj cjelini. Jedino izolirana koštana breča čini zasebnu cjelinu u kronološkom i paleontološkom smislu i za nju se danas obično rabi naziv Šandalja I. Vidi Karavanić 1999, Karavanić, Janković 2010.
15 Miracle 1995.
16 Malez 1963b ; 1964; 1979a; Malez, Vogel 1969.
17 Usmeno priopćenje D. Rukavine. Kasnije je M. Malez definirao i najstariji 9. sloj koji je označen s *i* (Miracle 1995).
18 Miracle 1995.

wider area archaeological materials from the Neolithic, Copper and Bronze Ages, as well as later periods, were gathered.

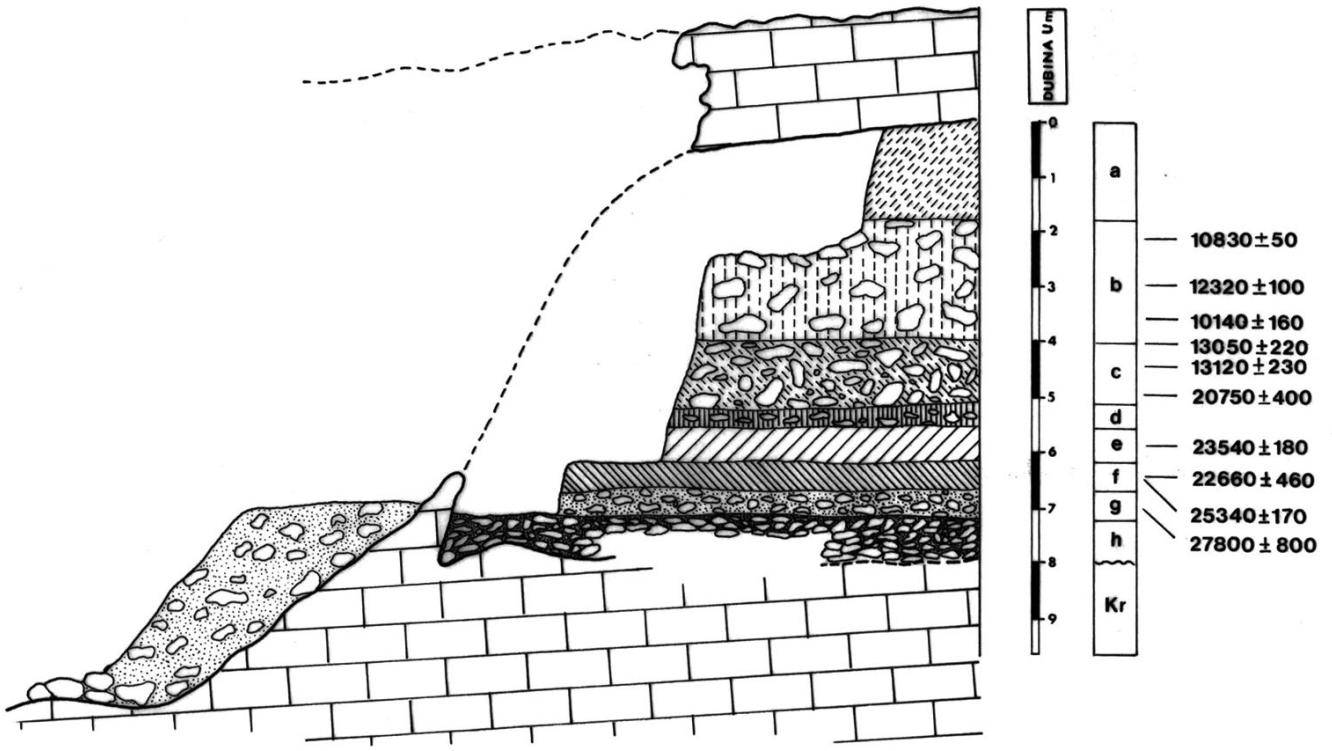
2.2. Research history

There was a quarry on Sveti Daniel in Roman times, more precisely during construction of Vespasian's arena in Pula. Its use resumed in 1954.[11] During blasting in the quarry in 1961, a cavity in the karst opened; it was filled with quaternary sediments and called Šandalja I.[12] I. Crnolatac and M. Malez were at the site, and in that same year they released a report on their research results.[13] After the first season of research, in the following year (1962) another cavity was found that was designated Šandalja II. Research into Šandalja I was initiated by B. Bačić, and then continued and led by M. Malez. It would appear that Bačić was present during the first years of research at Šandalja II.[14] The Upper Palaeolithic Šandalja II site had been excavated 22 times from 1962 to 1989 under the supervision of Malez.[15]

2.3. Sedimentological characteristics of the layers and results of radiocarbon dating

During two years of work at Šandalja II (hereinafter referred to as Šandalja), a statigraphic profile was obtained, with sedimentological characteristics first described and geochronologically relatively dated by Malez.[16] The stratigraphic profile (Fig. 2) of Šandalja contains 8 units, over 8 m thick. Units C and B are thicker and have been sub-divided into several layers. Complex B consists of layers B/g (top), B/s (middle), B/d (bottom), while the same is the case with complex C. The designations for stratigraphic units inside the aforementioned two complexes were set one on top of the other and do not reflected a different sedimentation or changes in the colour of the sediments.[17] Units A through H can be macroscopically distinguished in the profile and their stratigraphic sequences are almost constant throughout the entire site. The physical features of the units at the entire site are quite similar. At different parts of the cave there are clear differences in the relative thicknesses of the units, and considerable changes in the thickness of individual layers are visible even at horizontal distances of just a few meters.[18]

11 Malez 1975a.
12 Malez 1963a; 1979a.
13 Crnolatac, Malez 1961.
14 Šandalja I and Šandalja II very likely belonged to the same subterranean complex, i.e., the Upper Palaeolithic sediments of both caves were once probably components of the same whole. Only the isolated bone breccia constitutes a separate unit in the chronological and paleontological sense, and today the term Šandalja I is normally used for it. See Karavanić 1999, Karavanić, Janković 2010.
15 Miracle 1995.
16 Malez 1963b ; 1964; 1979a; Malez, Vogel 1969.
17 D. Rukavina personal communication. Afterwards M. Malez defined the oldest layer which he marked as layer *i* (Miracle 1995).
18 Miracle 1995.



Slika 2.
Stratigrafski profil Šandalje II (modificirano prema: Malez 1979b, slika 15)

Figure 2.
Stratigraphic profile of Šandalja II (modified after Malez 1979b, Fig. 15)

Opis sedimentoloških značajka i debljine naslaga dao je M. Malez[19] prema prvom istočnom profilu iz 1962. godine. Ovdje su naslage, iz kojih potječe materijal objavljen u ovom članku (C, B i A/d), detaljnije opisane prema P. T. Miracleu,[20] koji se koristio devetmetarskim profilom na području prirodnog ulaza u špilju. Profil je prvotno opisao D. Rukavina 1976. i on je primjenljiv za cijelo nalazište.[21] Za opis sloja D, koji sadrži elemente orinjasijena i epigravetijena te starije slojeve, vidi ranije radove.[22]

KOMPLEKS C čini maslinastosmeđ, tinjčast, lesu sličan sediment vjerojatno eolskog podrijetla. Kameno kršje je rijetko, osim uz špiljske stijene. U donjem dijelu kompleksa (C/d) prisutni su veći blokovi. Debljina kompleksa varira između 120 i 150 cm na istočnom profilu[23] te između 80 i 225 cm na ulaznom profilu.[24] Kompleks je razdijeljen na slojeve C/d (dolje), C/s (sredina), C/g (gore). Rezultat radiokarbonskog datiranja uzoraka ugljena (Z-193) iz donjeg dijela ovoga sloja (C/d) iznosi 20750±400 godina prije sadašnjosti.[25] Rezultat od

Malez provided a description of the sedimentological characteristics and thicknesses of the units[19] based on the first eastern profile from 1962. Here the units, whence the materials published in this article (C, B and A/d) are derived, were mostly described according to P. T. Miracle,[20] who used a nine-meter profile in the area of the natural entrance to the cave. The profile was first described by D. Rukavina in 1976, and it is applicable to the entire site.[21] Earlier works should be consulted for a description of layer D, which contains elements of the Aurignacian and Epigravettian, and older layers.[22]

COMPLEX C consists of an olive-green/brown, mica-like loess similar to sediment that is probably Aeolian in origin. Stone debris is rare, except along the cave walls. Larger blocks are present in the lower section of the complex (C/d). The thickness of the complex varies between 120 and 150 cm in the eastern profile,[23] and between 80 and 225 cm at the entrance profile.[24] The complex is divided into layers C/d (bottom), C/s (middle) and C/g (top). The result of radiocarbon dating of charcoal samples (Z-193) from the lower section of this layer (C/d) is 20750±400 years BP.[25] The result of 21740±450 BP was published for the

19 Malez 1963b; 1979a.
20 Miracle 1995, str. 92, sl. 3.17.
21 Miracle 1995, str. 90.
22 Malez 1979a; Miracle 1995; Karavanić 2003.
23 Malez 1979a.
24 Miracle 1995.
25 Srdoč *et al.* 1973. Svi rezultati kronometrijskog datiranja i izražavanja približnih apsolutnih starosti u ovom radu navode se u nekalibriranom obliku.

19 Malez 1963b; 1979a.
20 Miracle 1995, p. 92, Fig. 3.17.
21 Miracle 1995, p. 90.
22 Malez 1979a; Miracle 1995; Karavanić 2003.
23 Malez 1979a.
24 Miracle 1995.
25 Srdoč et al. 1973. All results of chronometric dating and approximate absolute ages in this work are cited in uncalibrated form.

21740±450 objavljen je za datiranje uzorka s granice između C i D kompleksa, ali navedeni laboratorijski broj (Z-193) zapravo je broj uzorka iz sloja C/d.[26] Budući da datiranje uzorka s granice kompleksa C i D nije navedeno u časopisu *Radiocarbon*, može se pretpostaviti da se radi o jednom te istom uzorku (Z-193) koji potječe iz sloja C/d, ali je prilikom prepiske rezultata moglo doći do pogreške, ili rezultat još nije bio zaključno izražen kada je Malezov rukopis već otišao u tisak. Provedeno je i datiranje srednjeg dijela ovoga kompleksa na temelju kostiju s oznakom C/s (Z-2424), uzetih iz laboratorija ZPGK HAZU, i dobiven je rezultat od 13120±230 godina prije sadašnjosti.[27] Usporedimo li taj rezultat s datumom dobivenim za "granicu" između kompleksa C i B (datirane su kosti Z-2423, uzete iz laboratorija ZPGK HAZU), koji iznosi 13050±220 godina prije sadašnjosti,[28] zamijetit ćemo da je on sasvim realan. Uzrok tako velike vremenske razlike između donjega i srednjeg dijela kompleksa C vjerojatno je stratigrafska praznina između navedenih slojeva.

KOMPLEKS B sastoji se od tamne crvenkastosmeđe pjeskovite rahle ilovače s većim i manjim kamenim blokovima. Kršje duž bočnih stijena nataloženo je poslije naslage. Debljina kompleksa iznosi između 190 i 220 cm na istočnom profilu[29] te od 110 do 240 cm na ulaznom profilu.[30] Ovaj je kompleks izuzetno bogat paleolitičkim nalazima, a budući da njegova debljina iznosi i više od dva metra, podijeljen je u tri zone označene s b/1, b/2 i b/3.[31] Na litičkom materijalu te su oznake obično napisane drukčije, B/d, B/s i B/g, što (kao kod kompleksa C) označava donji, srednji i gornji dio. Donji dio sloja B datiran je dva puta. Rezultat datiranja kostiju (Z-2421) iz laboratorija ZPGK HAZU s oznakom navedenog sloja iznosi 10140±160 godina prije sadašnjosti,[32] dok je datacija AMS metodom na ugljenu (CAMS-12062), uzetom iz uzorka sedimenta, dala rezultat od 10990±60 godina prije sadašnjosti.[33] Iz središnjeg dijela kompleksa B (zona b/2 odnosno B/s), iz vatrišta pokraj kojeg su otkriveni nalazi ljudskih kostiju, prikupljeni uzorci drvenog ugljena (Grn-4978) dali su rezultat od 12320±100 godina prije sadašnjosti.[34] Pougljenjene kosti raznih životinja (GrN-4976) uzete u zoni vatrišta sloja B/g također su datirane, a dobivena apsolutna starost iznosi 10830±50 godina prije sadašnjosti.[35]

SLOJ A/d je crvenkastosmeđa šupljikava zemlja s vrlo trošnim većim i manjim kamenjem, debljine između 100 i 160 cm na istočnom profilu[36] te između 160 i 240 cm na ulaznom profilu. To

dating of samples from the boundary between the C and D complexes, but the specified laboratory number (Z-193) is actually the number of the sample from layer C/d.[26] Since dating of the sample from the C and D complex boundary was not cited in the journal *Radiocarbon*, it may be assumed that this is one and the same sample (Z-193) which originated from layer C/d, with a possible error occurring during transcription of the results, or the result was still not conclusively expressed when Malez's manuscript had already been submitted for print. The dating of the middle section of this complex was also done on the basis of bones designated C/s (Z-2424), taken from the laboratory of the Institute for Quaternary Palaeontology and Geology of the Croatian Academy of Sciences and Arts in Zagreb and a result of 13120±230 years BP was obtained.[27] If this result is compared to the date obtained for the "boundary" between complexes C and B (bones Z-2423, taken from the laboratory, were dated), which is 13050±220 years BP,[28] it is noticeable that it is entirely realistic. The cause of such an immense chronological discrepancy between the upper and middle sections of complex C is probably the stratigraphic hiatus between the aforementioned layers.

COMPLEX B consists of dark reddish-brown, friable sandy loam with larger and smaller stone blocks. The debris all along the lateral wall was built up after the sediment. The thickness of the complex is between 190 and 220 cm on the eastern profile[29] and from 110 to 240 cm on the entrance profile.[30] This complex is exceptionally rich in paleontological finds, and since its thickness even exceeds two meters, it has been divided into three zones designated b/1, b/2 and b/3.[31] These designations are normally written differently on the lithics: B/d, B/s and B/g, which (as with complex C) indicates the lower, middle and upper parts. The lower part of layer B has been dated twice. The result of dating bones (Z-2421) from the laboratory bearing the designation of the aforementioned layer is 10140±160 years BP,[32] while AMS dating on the charcoal (CAMS-12062), taken from a sediment sample, yielded a result of 10990±60 years BP.[33] From the middle section of complex B (zone b/2 and B/s), from a firing place next to which human bones were discovered, the gathered samples of charcoal (Grn-4978) yielded a result of 12320±100 years BP.[34] The charred bones of various animals (GrN-4976) taken in the firing zone of layer B/g were also dated, and the absolute age value obtained is 10830±50 years BP.[35]

LAYER A/d is reddish-brown porous soil with very worn large and small stones, between 100 and 160 cm thick in the eastern profile[36] and between 160 and 240 cm thick on the entrance profile.

26 Malez 1974a, str. 28.
27 Obelić *et al*. 1994; Miracle 1995.
28 Obelić *et al*. 1994.
29 Malez 1979a.
30 Miracle 1995.
31 Malez, Vogel 1969.
32 Obelić *et al*. 1994.
33 Miracle 1995.
34 Malez, Vogel 1969.
35 Malez, Vogel 1969.
36 Malez 1979a.

26 Malez 1974a, p. 28.
27 Obelić et al. 1994; Miracle 1995.
28 Obelić et al. 1994.
29 Malez 1979a.
30 Miracle 1995.
31 Malez, Vogel 1969.
32 Obelić et al. 1994.
33 Miracle 1995.
34 Malez, Vogel 1969.
35 Malez, Vogel 1969.
36 Malez 1979a.

je jedini sloj nataložen tijekom holocena.

Radiokarbonske datacije pokazale su da ne postoji kontinuirani slijed između svih stratigrafskih jedinica, već su prisutne stratigrafske praznine, posebice između sloja C/d i C/s (približno 7000 radiokarbonskih godina). Naslage G, F i E nataložene su približno između 30000 i 23000 godina prije sadašnjosti. Sloj C/d nataložen je prije više od 20000 godina te je on, kao i svi stariji slojevi, nastao prije zadnjega glacijalnog maksimuma, koji se obično datira između 18000 i 20000 godina prije sadašnjosti. Granulometrijske analize sugeriraju stratigrafski hijat između slojeva D i C/d, dok sloj C/d pokazuje promjene u sedimentaciji, od šljunčanih oblutaka prema siltovitoj glini, što je možda povezano sa stratigrafskim prekidom između slojeva C/d i C/s koji pokazuju rezultati datiranja.[37] Slojevi C/s, C/g i prijelaz na B kompleks stari su 13000 godina, dok je cijeli B kompleks najvjerojatnije stariji od 10000 godina, pa se može zaključiti da su svi slojevi od C/s do B/g nastali tijekom kasnog glacijala između 13600 i 10700 godina prije sadašnjosti.[38]

3. METODE

Analiza je obuhvatila sav litički materijal koji je bio propisno signiran (s oznakom stratigrafske jedinice) ili pohranjen u vrećice ili kutije u kojima je bila napisana oznaka sloja.[39] Osim materijala iz Zavoda za paleontologiju i geologiju kvartara HAZU u Zagrebu analiziran je i malobrojan materijal s oznakom sloja koji se nalazi u Arheološkome muzeju Istre u Puli. Valja napomenuti da dio nalaza nije imao napisanu oznaku sloja, već samo broj, po kojem nije moguće pouzdano utvrditi iz kojeg sloja taj materijal potječe, niti je u asocijaciji s tim nalazima bio podatak o stratigrafskoj jedinici. Potrebnu oznaku sloja nije imalo 3359 komada iz Zavoda za paleontologiju i geologiju kvartara HAZU u Zagrebu i dio nalaza iz Arheološkog muzeja Istre u Puli, te oni nisu obuhvaćeni ovom analizom. Ti nalazi vjerojatno potječu iz prvih godina iskopavanja (ili samo iz 1961.) gornjih slojeva, koja su vjerojatno obavljana pod vodstvom B. Bačića. S obzirom na mnogobrojnost analiziranih nalaza iz tih slojeva s oznakom stratigrafske jedinice, izostavljanje nalaza bez oznake ne može statistički značajnije utjecati na dobivene rezultate.

Sve litičke rukotvorine razvrstane su prema uobičajenim kategorijama proizvodnog postupka.[40] Te su kategorije postavljene na temelju značajki šandaljskog lomljevinskog materijala, a kao osnova je poslužila podjela što su je primjerice L. G. Straus i G. Clark[41] koristili pri analizi gornjopaleolitičkog materijala s nalazišta La Riera u Španjolskoj. Sastavljena je lista od 19 kategorija. S tehnološkog aspekta analizirani su i obrađeni komadići (alatke), odnosno uvršteni su u statističku analizu

This is the only layer that was deposited during the Holocene.

Radiocarbon dating has shown that there is no continuous sequence between all stratigraphic units, rather stratigraphic gaps are present, particularly between layers C/d and C/s (roughly 7,000 radiocarbon years). Units G, F and E were built up between approximately 30,000 and 23,000 years BP. Layer C/d formed over 20,000 years ago , and it, like all older layers, emerged prior to the last glacial maximum, which is normally dated between 18,000 and 20,000 years BP. Granulometric analysis suggests a stratigraphic hiatus between layers D and C/d, while layer C/d exhibits changes in sedimentation, from gravel cobbles toward silty clay, which may be tied to the stratigraphic hiatus between layers C/d and C/s that is shown by dating results.[37] Layers C/s, C/g and the transition to complex B are 13,000 years old, while the entire complex B is probably older than 10,000 years, so it may be concluded that all layers from C/s to B/g emerged during the last glacial between 13,600 and 10,700 years BP.[38]

3. METHODS

The analysis encompassed all lithics which were properly designated (with indication of the stratigraphic unit) or stored in sacks or boxes in which the designation of the layer was written.[39] Besides the materials from the Institute for Quaternary Palaeontology and Geology of the Croatian Academy of Sciences and Arts in Zagreb, the small quantity of materials with designation of layer held in the Archaeological Museum of Istria in Pula was also analyzed. It is noteworthy that part of the finds did not bear any written designation of layer, rather only a number which did not facilitate a reliable assessment of the layer from which these materials originated, nor were there any data on the stratigraphic unit in association with these finds. 3,359 pieces from the Institute for Quaternary Palaeontology and Geology of the Croatian Academy of Sciences and Arts in Zagreb and some of the finds from the Archaeological Museum of Istria in Pula lacked the necessary designation of layer, and they were not encompassed by this analysis. These finds probably originated from the first years of excavations (or only from 1961) of the upper layers, which were probably conducted under the leadership of B. Bačić. Given the high number of analyzed finds from these layers bearing the designation of stratigraphic unit, the omission of finds without designation cannot statistically impact the results obtained.

All lithic artifacts have been classified according to the standard categories of technological analysis.[40] These categories were set on the basis of the features of the Šandalja débitage, such as those L. G. Straus and G. Clark[41] used when analyzing the Upper Palaeolithic materials from the La Riera site in Spain served as a basis. A list of 19 categories was compiled. Retouched pieces (tools) were analyzed

37 Miracle 1995, str. 94, 95.
38 Miracle 1995.
39 Opširnije vidi u: Karavanić 1999.
40 Brézillon 1983; Straus, Clark 1986; Inizan *et al*. 1992
41 Straus, Clark, 1986.

37 Miracle 1995, pp. 94, 95.
38 Miracle 1995.
39 For more, see Karavanić 1999.
40 Brézillon 1983; Straus, Clark 1986; Inizan et al. 1992
41 Straus, Clark, 1986.

zajedno s neobrađenima uz podatak o njihovoj brojnosti unutar cjelokupnoga litičkog materijala. Obrađeni komadići potom su analizirani zasebno s tipološkog aspekta. Granica između sječiva i pločica određena je na 3 cm duljine, odnosno takvi nalazi dulji od 3 cm smatraju se sječivima. Ta je granica proizvoljna, ali je za Šandalju uzeta kao najpogodnija jer se čini da ona jasno i objektivno odvaja dvije skupine, koje se po dimenzijama uistinu vidno razlikuju.

Pri analizi rukotvorina nastalih u različitim fazama proizvodnog postupka i tipološkoj analizi finalnih proizvoda (alatki) korištena je terminologija na hrvatskom jeziku koju je predložio I. Karavanić,[42] a na engleskom su korišteni ustaljeni nazivi.[43]

Budući da slojevi Šandalje sadrže mnogobrojan i tipičan gornjopaleolitički materijal, odlučeno je da se metoda D. de Sonneville-Bordesa i J. Perrota[44] primijeni za tipološko razvrstavanje alatki ovog nalazišta, i to u izvornom obliku koji sadrži 92 tipa, što se pokazalo nedovoljnom, pa je izvorna lista tipova modificirana dodavanjem novih tipova. Već postojeće proširene liste tipova nisu bile adekvatne za primjenu te je dodano pet novih tipova. Ustaljenoj listi od 92 tipa dodani su sljedeći tipovi: djelomično obrađen komadić (92), komadić s djelomičnom sitnom obradbom (93), pločica s obradbom (94), pločica sa sitnom obradbom (95), neodredivi obradak (96), a kategorija razno, tj. oruđa koja ne ulaze ni u jednu od definiranih kategorija, pomaknuta je po pravilu na kraj popisa pod broj 97.[45]

Više komada pločica s hrptom bilo je malo veće od 3 cm, ali oni su vrlo tanki i imaju strmu obradbu, te (premda su veći od 3 cm) ne mogu pripadati ni jednom drugom tipu osim pločicama s hrptom. Stoga je odlučeno da nalazi čija dužina prelazi 3 cm, a ostale značajke odgovaraju pločici s hrptom, mogu biti uvršteni u tu kategoriju ako njihova širina nije veća od 8 mm. Ako je pak njihova širina veća od 8 mm, uvršteni su u sječiva s cjelovito zatupljenim rubom (58). Međutim, takvi primjerci bili su iznimno rijetki.[46] Valja također napomenuti da prisutnost azilijenskih šiljaka (91) u kontekstu Šandalje ne upućuje na azilijen, već, s obzirom na druge alatke i zemljopisni smještaj nalazišta, na epigravetijen.

Makroskopski prema boji i prozirnosti uspostavljeno je 11 kategorija sirovine i kategorija razno. Litički materijal razvrstan je prema tim kategorijama. Odabrani uzorci kamenih artefakata dodatno su pregledani makroskopski i pomoću binokularnog povećala s povećanjem 4x, 6,3x, 10x, 16x, 25x. Deset uzoraka odabrano je za izradu mikroskopskih preparata. Preparati su pregledani pomoću polarizacijskog mikroskopa.

Koštane rukotvorine nisu mnogobrojne. Tipološki su razvrstane prema standardnim klasifikacijskim sustavima.[47]

from the technological standpoint, i.e., they were incorporated into the statistical analysis together with unretouched pieces with data on their numbers inside the overall lithic materials. Retouched pieces were then analyzed separately from the typological aspect. The boundary between blades and bladelets was established at 3 cm in length, i.e., such finds longer than 3 cm were categorized as blades. This boundary is arbitrary, but for Šandalja it was taken as the most suitable because it appears that it clearly and objectively separates two groups which visibly differ in terms of dimensions.

During lithic analysis the Croatian terminology proposed by I. Karavanić was used,[42] while established terms were used for English.[43]

Since the layers of Šandalja contain numerous and typical Upper Palaeolithic materials, it was decided that the method devised by D. de Sonneville-Bordes and J. Perrot[44] be applied to the typological classification of this site's tools, in the original form which contains 92 types, which has proven insufficient, so the original list of types was modified with the addition of new types. The already existing expanded list of types were not adequate for application, so five new types were added. The established list of 92 was supplemented with the following types: partially retouched piece (92), piece with partial marginal retouch (93), retouched bladelet (94), bladelet with marginal retouch (95), unidentifiable retouched piece (96), while the miscellaneous category, i.e., implements which do not belong to any defined category, has been moved to the end of the list at number 97.[45]

Several backed bladelets were slightly longer than 3 cm, but they are very thin and steeply retouched, and (although longer than 3 cm) cannot belong to any other type except backed bladelets. Thus it was decided that finds longer than 3 cm but with remaining features corresponding to backed bladelets be classified in that category, insofar as their width does not exceed 8 mm. If their width does exceed 8 mm, they were classified as complete backed blade (58). However, such examples were exceptionally rare.[46] Also noteworthy is that the presence of Azilian points (91) in the context of Šandalja does not indicate the Azilian but rather, given the other tools and geographic location of the finds, the Epigravettian.

Based on colour and translucence, 11 categories of raw materials and the miscellaneous category were established macroscopically. Lithics were classified according to these categories. Selected samples of stone artefacts were additionally inspected macroscopically and with the help of a stereo magnifier at magnifications of 4x, 6.3x, 10x, 16x, and 25x. Ten samples were selected for the microscope thin-sections. The thin-sections were examined with the help of a polarizing microscope.

The bone artifacts are not numerous. They were typologically broken down according to standard classification systems.[47]

42 Karavanić 1993; 1994; 1999; 2008; Janković, Karavanić 2009.
43 Straus, Clark 1986; Inizan *et al.* 1992
44 Sonnevile-Bordes, Perrot 1953; 1954; 1955; 1956a; 1956b.
45 Tumačenje ovih tipova vidi u: Karavanić 1999.
46 Podrobnije o kriterijima vidi u: Karavanić 1999.
47 Camps-Fabrer 1974, 1988; Piel-Desruisseaux 1986.

42 Karavanić 1993; 1994; 1999; 2008; Janković, Karavanić 2009.
43 Straus, Clark 1986; Inizan et al. 1992
44 Sonnevile-Bordes, Perrot 1953; 1954; 1955; 1956a; 1956b.
45 For an interpretation of these types, see Karavanić 1999.
46 For more details on the criteria, see Karavanić 1999.
47 Camps-Fabrer 1974, 1988; Piel-Desruisseaux 1986.

Kod objave crteža nastojalo se prezentirati materijal koji većinom dosad nije bio objavljen te izbjeći ponovno objavljivanje materijala.[48] Stoga primjerice materijal iz sloja C/d nije ilustriran. U nekoliko slučajeva (primjerice litika iz sloja B/s, koštane rukotvorine iz više slojeva) došlo je do ponovnog objavljivanja dijela ilustracija jer držimo da je to nužno za bolju prezentaciju i razumijevanje značajka tih slojeva.

4. REZULTATI ANALIZA

4.1. Proizvodni postupci i tipologija litike

Sloj D

Ovaj sloj sadrži 408 primjeraka odbijenog kamena. Od toga 368 kom. (90,2 %) je neobrađeno, a alatki je 40 (9,8 %). Odbojaka ima najviše. Vidljiva je promjena u smislu proizvodnje sječiva i pločica, u odnosu na orinjasijenski sloj E.[49] U sloju D proizvodnja pločica veća je od proizvodnje sječiva, što je već bio slučaj u orinjasijenskom sloju F. Komadića s obradbom na jednom rubu ima sedam, dok je samo jedan s obradbom na dvama rubovima, pet ih je s djelomičnom obradbom i jedan s djelomičnom sitnom obradbom. Osim epigravetijenskih ima i orinjasijenskih tipova oruđa. To su ponajprije kobilično i njuškasto grebalo. Od grebala su također prisutni jednostavno grebalo i grebalica, noktoliko grebalo, grebalo na odbojku, jezgroliko grebalo. Elementi koji zasigurno nisu orinjasijenski su noktoliko grebalo, dvije gravetice, pločica s hrptom i komadić s udubljeno obrađenim zarupkom. Samo je jedno dubilo (diedrično kutno dubilo na sječivu). Pronađeno je i jedno svrdlo te kombinirano oruđe - svrdlo-grebalo. Zbog miješanja elemenata dviju različitih industrija u ovom sloju ovdje nam se ne čini potrebnim tablično prikazati učestalost svih proizvodnih kategorija i alatki, što će biti učinjeno za mlađe slojeve, premda detaljni podaci za sloj D postoje.[50]

Premda industrija sloja D, kao što smo vidjeli, nije homogena, ne čini se uputnim odrediti je kao prijelaz kasnog orinjasijena u epigravetijen, već ju je bolje neodređenije opisati, kao mješavinu orinjasijenskih i epigravetijenskih elemenata.

Sloj C/d

Donji dio kompleksa C nosi oznaku C/d. Litički materijal ove razine sadrži 630 komada, od čega 496 komada (78,73 %) pripada neobrađenim nalazima, a 134 (21,27 %) su alatke (tablica 1). Odbojaka ima najviše. Pločica je znatno manje od odbojaka, dok su sječiva zastupljenija od pločica. U lomljevinskom materijalu nema više izrazito širokih sječiva koja su bila prisutna u orinjasijenskim

When publishing drawings, an attempt was made to present materials which had until now largely not been presented, and to avoid republishing materials.[48] Thus, for example, the materials from layer C/d were not illustrated. In several cases (e.g., the lithics from layer B/s, bone artifacts from several layers), some of the illustrations were once more published, because we believe that it is necessary for a better presentation and understanding of the features of these layers.

4. RESULTS OF ANALYSIS

4.1. Technology and typology of lithic assemblage

Layer D

This layer contains 408 pieces of knapped stone. Of this, 368 pieces (90.2%) are not retouched, while there are 40 tools (9.8%). Flakes are the most numerous. Change in the sense of blade and bladelet production is apparent in comparison to the Aurignacian layer E.[49] In layer D, bladelet production is higher than blade production, which was already the case in Aurignacian layer F. There are seven pieces retouched on a single edge, while there is only one with retouch on both edges, five that are partially retouched and one with partial marginal retouch. Besides Epigravettian, there are also Aurignacian tool types. These are first and foremost keeled and atypical nosed endscrapers. Among the endscrapers, also present are the simple endscraper and atypical endscraper, thumbnail endscraper, endscraper on flake, and nucleiform endscraper. The elements that are certainly not Aurignacian are the thumbnail endscraper, two micro-Gravettes, a backed bladelet and a piece with concave truncation. There is only one burin (a dihedral angle burin on a blade). A perforator was also found, as well as a combined tool - a perforator-endscraper. Due to the mixed elements of two different industries in this layer, here it does not seem necessary to provide a table with the frequency of all production categories and tools, which will be done for the younger layers, although there are more detailed data for layer D.[50]

Although the industry of layer D is not - as already seen - homogenous, it does not seem prudent to designate it as a transition from the late Aurignacian to the Epigravettian, rather a more ambiguous description should be used, as a combination of Aurignacian and Epigravettian elements.

Layer C/d

The lower part of complex C bears the designation C/d. The lithic assemblage at this level contain 630 pieces, of which 496 pieces (78.73%) are not retouched, while 134 (21.27%) are tools (Table 1). Most are flakes. There are far fewer bladelets than flakes, while blades are more common than bladelets. In the débitage there are no more prominent wide blades which were present in the Aurignacian layers.

48 Za ranije objavljene crteže vidi primjerice Malez 1987.
49 Karavanić 1999, 2003.
50 Karavanić 1999.

48 For the earlier published sketches, see, for example, Malez 1987.
49 Karavanić 1999, 2003.
50 Karavanić 1999.

	Šandalja II C/d	**neobrađenih**		**obrađenih**		**neobrađenih**	**obrađenih**
		količina	**%**	**količina**	**%**	**težina (g)**	**težina (g)**
0	gomolj/valutica		0,00%		0,00%		
1	odbojak s okorinom	64	10,16%	13	2,06%	267,0	61,6
2	sječivo s okorinom	4	0,63%	14	2,22%	19,3	50
3	pločica s okorinom	7	1,11%	4	0,63%	4,3	2,8
4	odbojak	218	34,60%	16	2,54%	440,5	114,2
5	sječivo	67	10,63%	47	7,46%	207,4	155,4
6	pločica	53	8,41%	33	5,24%	26,2	12,3
7	jezgra za odbojke	4	0,63%		0,00%	121,7	
8	jezgra za sječiva		0,00%		0,00%		
9	jezgra za pločice	5	0,79%		0,00%	83,4	
10	mješovita jezgra	13	2,06%		0,00%	668,0	
11	ulomak jezgre		0,00%	1	0,16%		14,7
12	iskrzani komad		0,00%		0,00%		
13	krijestasti komad	1	0,16%	3	0,48%	2,5	42,1
14	dotj. odbojak jezgre	2	0,32%	1	0,16%	4,1	
15	odbojčić	4	0,63%		0,00%	0,5	
16	iver dubila		0,00%		0,00%		
17	krhotina	54	8,57%	1	0,16%	347,1	2,2
18	okrhak		0,00%		0,00%		
19	neodredivo		0,00%	1	0,16%		0,3
	ukupno	496	78,73%	134	21,27%	2192,0	455,6
	ukupno neobr.+obr.	630					

	Šandalja II C/d	unretouched		retouched		unret.	ret.
		No	%	No	%	weight (g)	weight (g)
0	pebble/nodule/cobble		0.00%		0.00%		
1	decortication flake	64	10.16%	13	2.06%	267.0	61.6
2	decortication blade	4	0.63%	14	2.22%	19.3	50
3	decortication bladelet	7	1.11%	4	0.63%	4.3	2.8
4	flake	218	34.60%	16	2.54%	440.5	114.2
5	blade	67	10.63%	47	7.46%	207.4	155.4
6	bladelet	53	8.41%	33	5.24%	26.2	12.3
7	flake core	4	0.63%		0.00%	121.7	
8	blade core		0.00%		0.00%		
9	bladelet core	5	0.79%		0.00%	83.4	
10	mixed core	13	2.06%		0.00%	668.0	
11	core fragment		0.00%	1	0.16%		14.7
12	splintered piece		0.00%		0.00%		
13	crest	1	0.16%	3	0.48%	2.5	42.1
14	core renewal flake	2	0.32%	1	0.16%	4.1	
15	small flakes	4	0.63%		0.00%	0.5	
16	burin spall		0.00%		0.00%		
17	chunk	54	8.57%	1	0.16%	347.1	2.2
18	shatter		0.00%		0.00%		
19	unidentified		0.00%	1	0.16%		0.3
	total	496	78.73%	134	21.27%	2192.0	455.6
	total unret. + ret.	630					

Tablica 1.
Brojčana i postotna zastupljenost proizvodnih kategorija u sloju C/d

Table 1.
Numerical and percentage share of production categories in layer C/d

slojevima. Usnati plohak često dolazi na sječivima. U uporabi je i dalje izravno odbijanje mekanim čekićem. Jedna jezgra za sječiva je velika prizmatična s jednom udarnom plohom, većim dijelom prekrivena okorinom. Prisutan je okorinski materijal koji upućuje na postojanje početne faze proizvodnje, tj. početak oblikovanja jezgara *in situ* (prvotni odbojci), dok ostali lomljevinski materijal (odbojci, sječiva, pločice, jezgre) i oruđa jasno upućuju na postojanje više faza, tj. cjelovitog proizvodnog procesa na ovoj stanišnoj razini.

Od alatki (tablica 2) najbrojniji su komadići s obradbom na jednom rubu. Učestalost grebala je velika. Jednostavna grebala prevladavaju, a zastupljeno je još nekoliko tipova

Blades often have lipped butts. The direct soft-hammer percussion technique was still in use. One blade core is large and prismatic with a single striking platform, mostly covered with cortex. Decortication material is present, which indicates the existence of an initial phase of production, i.e., the beginning of core formation *in situ* (primary flakes), while the remaining débitage (flakes, blades, bladelets, cores) and tools clearly indicate the existence of several phases, i.e., the entire production process at this habitat level.

Among the tools (Table 2), the most numerous are pieces retouched on one edge. The frequency of endscrapers is high. Simple endscrapers predominate, while several other types of

	Šandalja II sloj C/d		
	tip	**količina**	**postotak**
1	jednostavno grebalo	13	9,70%
2	grebalica	2	1,49%
5	grebalo na obrađenom sječivu ili odbojku	5	3,73%
7	lepezno grebalo	1	0,75%
8	grebalo na odbojku	1	0,75%
10	noktoliko grebalo	4	2,99%
16	blanja	1	0,75%
23	svrdlo	1	0,75%
24	svrdlenica	3	2,24%
31	višestruko diedrično dubilo	1	0,75%
36	dubilo s udubljeno obbrađenim zarupkom	1	0,75%
48	gravetijenski šiljak	4	2,99%
49	gravetijenski polušiljak	2	1,49%
50	gravetica	12	8,96%
55	šiljak s produžetkom	1	0,75%
58	sječivo s cjelovito zatupljenim rubom	2	1,49%
59	sječivo s djelomično zatupljenim rubom	1	0,75%
60	komadić s ravno obrađenim zarupkom	1	0,75%
63	komadić s izbočeno obrađenim zarupkom	1	0,75%
65	komadić s obradbom na jednom rubu	15	11,19%
66	komadić s obradbom na dvama rubovima	5	3,73%
74	komadić s urezom	3	2,24%
75	nazubljeni komadić	1	0,75%
77	strugalo	9	6,72%
78	strugalica	4	2,99%
83	kružni segment	3	2,24%
85	pločica s hrptom	13	9,70%
86	zarubljena pločica s hrptom	2	1,49%
88	nazubljena pločica	2	1,49%
91	azilijenski šiljak	1	0,75%
92	djelomično obrađen komadić	8	5,97%
93	komadić s djelomičnom sitnom obradbom	6	4,48%
95	pločica sa sitnom obradbom	1	0,75%
96	neodredivi obradak	4	2,99%
	ukupno	134	100,00%

Tablica 2.
Brojčana i postotna zastupljenost tipova alatki u sloju C/d

	Šandalja II level C/d		
	type	**quantity**	**%**
1	simple endscraper	13	9,70%
2	atypical endscraper	2	1,49%
5	endscraper on retouched flake	5	3,73%
7	fanshaped endscraper	1	0,75%
8	endscraper on flake	1	0,75%
10	thumbnail endscraper	4	2,99%
16	rabot	1	0,75%
23	perforator	1	0,75%
24	atypical perforator (bec)	3	2,24%
31	mulitple dihedral burin	1	0,75%
36	burin on a concave truncation	1	0,75%
48	Gravette point	4	2,99%
49	atypical Gravette point	2	1,49%
50	micro gravette	12	8,96%
55	tanged point	1	0,75%
58	complete backed blade	2	1,49%
59	partly backed blade	1	0,75%
60	straight truncation	1	0,75%
63	piece with convex truncation	1	0,75%
65	continuously retouched piece - one edge	15	11,19%
66	continuously retouched piece - two edges	5	3,73%
74	nothced piece	3	2,24%
75	denticulated piece	1	0,75%
77	sidescraper	9	6,72%
78	raclette	4	2,99%
83	circular segment	3	2,24%
85	backed bladelet	13	9,70%
86	truncated backed bladelet	2	1,49%
88	denticulated bladelet	2	1,49%
91	Azilian point	1	0,75%
92	partialy retouched piece	8	5,97%
93	picece with partly marginal retouch	6	4,48%
95	bladelet with marginal retouch	1	0,75%
96	unidentifiable pieces	4	2,99%
	total	134	100,00%

Table 2.
Numerical and percentage share of tool types in layer C/d

grebala. Noktolika grebala česta su u epigravetijenu, no njihova zastupljenost u ovom sloju nije velika. Pločice s hrptom i gravetice vidno su zastupljene, što se ne može reći za gravetijenske šiljke i gravetijenske polušiljke. Strugala su značajnije zastupljena, premda nisu tipična za gornji paleolitik. Prisutan je šiljak s produžetkom i azilijenski šiljak, koji u ovom kontekstu ne upućuje na azilijen, već, s obzirom na druge alatke i zemljopisni smještaj nalazišta, na epigravetijen.

S obzirom na značajke litičke industrije (i.e. puno gravetica i pločica s hrptom, prisutnost noktolikih grebala, gravetijenskih šiljaka i polušiljaka) te rezultat datiranja sloja od 20750±400 godina prije sadašnjosti,[51] industriju možemo pripisati početku epigravetijena, tj. ranom epigravetijenu.[52]

endscrapers are present. Thumbnail endscrapers were frequent in the Epigravettian, however their presence in this layer is not high. Backed bladelets and micro-Gravettes are significantly present, which cannot be said of Gravette points and atypical Gravette points. Sidescrapers are more present, although they were not typical of the Upper Palaeolithic. A tanged point and Azilian point are present, and latter in this context does not indicate the Azilian but rather, with regard to the other tools and the geographic location of the site, the Epigravettian.

Given the features of the lithic assemblage (i.e. many micro-Gravettes and backed bladelets, the presence of thumbnail endscrapers, Gravette points and atypical Gravette points, and dating results of 20750±400 years BP),[51] the industry may be attributed to the beginning of the Epigravettian, i.e., the early Epigravettian.[52]

51 Srdoč *et al*. 1973.

52 Nedavno su P. T. Miracle i D. Brajković (Miracle, Brajković 2013) iznijeli najnovije rezultate apsolutnog datiranja slojeva Šandalje, prema kojima bi sloj C/d i cijeli kompleks C kronološki pripadali kasnom epigravetijenu.

51 Srdoč et al. 1973.

52 Recently P. T. Miracle and D. Brajković (Miracle, Brajković 2013.) presented the latest results of absolute dating of the Šandalja layers according to which layer C/d and the entire complex C would chronologically belong to the late Epigravettian.

	Šandalja II C/s	neobrađenih		obrađenih		neobrađenih	obrađenih
		količina	%	količina	%	težina (g)	težina (g)
0	gomolj/valutica		0,00%		0,00%		
1	odbojak s okorinom	10	8,33%	4	3,33%	22,6	9,2
2	sječivo s okorinom		0,00%	2	1,67%		9,3
3	pločica s okorinom	2	1,67%		0,00%	1,3	
4	odbojak	42	35,00%	3	2,50%	41,2	37,6
5	sječivo	7	5,83%	2	1,67%	23	2,8
6	pločica	19	15,83%	8	6,67%	8,7	4,6
7	jezgra za odbojke	4	3,33%		0,00%	101,7	
8	jezgra za sječiva		0,00%		0,00%		
9	jezgra za pločice	1	0,83%		0,00%	15,8	
10	mješovita jezgra	1	0,83%		0,00%	25,4	
11	ulomak jezgre		0,00%		0,00%		
12	iskrzani komad		0,00%		0,00%		
13	krijestasti komad		0,00%	2	1,67%		1,2
14	dotj. odbojak jezgre		0,00%		0,00%		
15	odbojčić	2	1,67%		0,00%	0,2	
16	iver dubila		0,00%		0,00%		
17	krhotina	11	9,17%		0,00%	203,0	
18	okrhak		0,00%		0,00%		
19	neodredivo		0,00%		0,00%		
	ukupno	99	82,50%	21	17,50%	442,9	64,7
	ukupno neobr.+obr.	120					

	Šandalja II C/s	unretouched		retouched		unret.	ret.
		No	%	No	%	weight (g)	weight (g)
0	pebble/nodule/cobble		0.00%		0.00%		
1	decortication flake	10	8.33%	4	3.33%	22.6	9.2
2	decortication blade		0.00%	2	1.67%		9.3
3	decortication bladelet	2	1.67%		0.00%	1.3	
4	flake	42	35.00%	3	2.50%	41.2	37.6
5	blade	7	5.83%	2	1.67%	23	2.8
6	bladelet	19	15.83%	8	6.67%	8.7	4.6
7	flake core	4	3.33%		0.00%	101.7	
8	blade core		0.00%		0.00%		
9	bladelet core	1	0.83%		0.00%	15.8	
10	mixed core	1	0.83%		0.00%	25.4	
11	core fragment		0.00%		0.00%		
12	splintered piece		0.00%		0.00%		
13	crest		0.00%	2	1.67%		1.2
14	core renewal flake		0.00%		0.00%		
15	small flakes	2	1.67%		0.00%	0.2	
16	burin spall		0.00%		0.00%		
17	chunk	11	9.17%		0.00%	203.0	
18	shatter		0.00%		0.00%		
19	unidentified		0.00%		0.00%		
	total	99	82.50%	21	17.50%	442.9	64.7
	total unret. + ret.	120					

Tablica 3.
Brojčana i postotna zastupljenost proizvodnih kategorija u sloju C/s

Table 3.
Numerical and percentage share of production categories in layer C/s

Sloj C/s

C/s jest oznaka za središnji dio kompleksa C. U toj je razini pronađeno 120 kom. litičke industrije (tablica 3), od čega na neobrađenu lomljevinu otpada 99 kom (82,50 %), dok je alatki dvadeset i jedna (17,50 %). Odbojaka je više od pločica, a sječiva je jako malo. Četiri su jezgre za odbojke te jedna višenamjenska i jedna za pločice.

Od alatki (tablica 4) najviše ima komadića s obradbom (tri s obradbom na jednom rubu te dva s obradbom na dvama rubovima). Na osnovi kronostratigrafske pozicije

Layer C/s

C/s is the designation of the central section of complex C. At this level, 120 lithic artifacts were found (Table 3), of which 99 pieces are unretouched débitage (82.5%), while tools account for 21 (17.5%). There are more flakes than bladelets, and very few blades. Four flake cores, one mixed core and one bladelet core were found.

Among the tools (Table 4), most are retouched pieces (three with retouch on one edge, two with retouch on two edges). Based on the chronostratigraphic position of the layer and the dating

	Šandalja II sloj C/s		
	tip	**količina**	**postotak**
1	jednostavno grebalo	1	4,76%
23	svrdlo	3	14,29%
37	dubilo s izbočeno obrađenim zarupkom	1	4,76%
48	gravetijenski šiljak	1	4,76%
62	komadić s udubljeno obrađenim zarupkom	1	4,76%
65	komadić s obradbom na jednom rubu	3	14,29%
66	komadić s obradbom na dvama rubovima	2	9,52%
74	komadić s urezom	1	4,76%
85	pločica s hrptom	1	4,76%
88	nazubljena pločica	1	4,76%
89	pločica s urezom	1	4,76%
91	azilijenski šiljak	1	4,76%
93	komadić s djelomičnom sitnom obradbom	3	14,29%
95	pločica sa sitnom obradbom	1	4,76%
	ukupno	21	100,00%

Tablica 4.
Brojčana i postotna zastupljenost tipova alatki u sloju C/s

	Šandalja II level C/s		
	type	**quantity**	**%**
1	simple endscraper	1	4,76%
23	perforator	3	14,29%
37	burin on convex truncation	1	4,76%
48	Gravette point	1	4,76%
62	piece with a concave truncation	1	4,76%
65	continuously retouched piece - one edge	3	14,29%
66	continuously retouched piece - two edges	2	9,52%
74	nothced piece	1	4,76%
85	backed bladelet	1	4,76%
88	denticulated bladelet	1	4,76%
89	notched bladelet	1	4,76%
91	Azilian point	1	4,76%
93	picece with partly marginal retouch	3	14,29%
95	bladelet with marginal retouch	1	4,76%
	total	21	100,00%

Table 4.
Numerical and percentage share of tool types in layer C/s

sloja te rezultata datiranja od 13120±230 godina prije sadašnjosti,[53] industrija se može pripisati epigravetijenu, no zbog malog broja alatki teško je dati precizniju odredbu faze. Ipak, čini se da industrija nije potpuno istovjetna s onom iz slojeva kompleksa B, koja bez dvoumljena pripada kasnom epigravetijenu. Također je moguće da tipovi lomljevine i oruđa ne predstavljaju realne međusobne odnose unutar ovog sloja, jer je dio materijala iz ovog sloja i sloja C/g mogao biti označen oznakom kompleksa C. Možda industrija ovog sloja pripada razvijenoj fazi epigravetijena, jer se kronostratigrafski nalazi između ranog (sloj C/d) i kasnog (kompleks B), no tu mogućnost zbog malog broja alatki nije moguće dokazati. Rezultati analize alatki s oznakom kompleksa C iznose se poslije.[54]

Sloj C/g

Nalazi iz gornjeg dijela kompleksa C označeni su sa C/g. Samo 17 primjeraka lomljevine nosi oznaku te razine (tablica 5). Od tog broja 14 je neobrađenih komada, a tri su obrađena. Od alatki jedna je gravetica, još su prisutni neodredivi obradak i pločica sa sitnom obradbom. Premda je gravetica česta alatka u epigravetijenu, a na tu industriju upućuje i kronostratigrafska pozicija sloja, vrlo malen broj nalaza onemogućuje precizniju determinaciju. Vrlo malen broj nalaza može se objasniti time što je dio litičkog materijala ovog sloja u početku označavan samo oznakom kompleksa (C), a ne preciznijom oznakom stratigrafske jedinice.

results of 13120±230 years BP,[53] the industry can be ascribed to the Epigravettian. However, due to the small number of tools, a precise determination of the phase is difficult. Nonetheless, it would appear that the industry is not entirely identical to that from the complex B layers, which without doubt belong to the late Epigravettian. It is also possible that the types of débitage and tools do not represent real mutual ratios within this layer, because part of the materials from this layer and layer C/g may have been marked with the designation of complex C. Perhaps the industry of this layer belongs to the evolved phase of the Epigravettian, because it was chronostratigraphically situated between the early (layer C/d) and late (complex B) phases. However this possibility could not be proven due to the small number of tools. The results of analysis of the tools bearing the designation of complex C will be presented subsequently.[54]

Layer C/g

The finds from the upper section of complex C have been designated C/g. Only 17 pieces of débitage bear the designation of this layer (Table 5). Out of this, 14 are unretouched pieces, while three are retouched. Among the tools, one is a micro-Gravette, and an unidentifiable retouched piece and a bladelet with marginal retouch are also present. Although the micro-Gravette was a frequent tool in the Epigravettian, and the chronostratigraphic position of the layer also points to this industry, the very small number of finds preclude any possibility for this determination. The very small number of finds may be explained by the fact that part of the lithics of this layer were initially only marked with the designation of the complex (C), but the not the more precise designation of the stratigraphic unit.

53 Obelić *et al.* 1994.

54 Vidi međutim bilješku 52. U tom slučaju ne bi se radilo o nekoliko kronoloških faza, već bi kompleks C, poput kompleksa B, pripadao kasnom epigravetijenu.

53 Obelić et al. 1994.

54 See, however, note 52. In this case it would not be a matter of several chronological phases, rather complex C, like complex B, would have belonged to the late Epigravettian.

	Šandalja II C/g	neobrađenih		obrađenih		neobrađenih	obrađenih
		količina	%	količina	%	težina (g)	težina (g)
0	gomolj/valutica		0,00%		0,00%		
1	odbojak s okorinom	1	5,88%		0,00%	7,9	
2	sječivo s okorinom		0,00%		0,00%		
3	pločica s okorinom	1	5,88%	1	5,88%	0,1	0,2
4	odbojak	5	29,41%		0,00%	6,4	
5	sječivo		0,00%		0,00%		
6	pločica	2	11,76%	2	11,76%	1,5	0,4
7	jezgra za odbojke		0,00%		0,00%		
8	jezgra za sječiva		0,00%		0,00%		
9	jezgra za pločice	1	5,88%		0,00%	4,6	
10	mješovita jezgra	2	11,76%		0,00%	49,1	
11	ulomak jezgre		0,00%		0,00%		
12	iskrzani komad		0,00%		0,00%		
13	krijestasti komad		0,00%		0,00%		
14	dotj. odbojak jezgre		0,00%		0,00%		
15	odbojčić		0,00%		0,00%		
16	iver dubila		0,00%		0,00%		
17	krhotina	2	11,76%		0,00%	13,0	
18	okrhak		0,00%		0,00%		
19	neodredivo		0,00%		0,00%		
	ukupno	14	82,35%	3	17,65%	82,6	0,6
	ukupno neobr.+obr.	17					

	Šandalja II C/g	unretouched		retouched		unret.	ret.
		No	%	No	%	weight (g)	weight (g)
0	pebble/nodule/cobble		0.00%		0.00%		
1	decortication flake	1	5.88%		0.00%	7.9	
2	decortication blade		0.00%		0.00%		
3	decortication bladelet	1	5.88%	1	5.88%	0.1	0.2
4	flake	5	29.41%		0.00%	6.4	
5	blade		0.00%		0.00%		
6	bladelet	2	11.76%	2	11.76%	1.5	0.4
7	flake core		0.00%		0.00%		
8	blade core		0.00%		0.00%		
9	bladelet core	1	5.88%		0.00%	4.6	
10	mixed core	2	11.76%		0.00%	49.1	
11	core fragment		0.00%		0.00%		
12	splintered piece		0.00%		0.00%		
13	crest		0.00%		0.00%		
14	core renewal flake		0.00%		0.00%		
15	small flakes		0.00%		0.00%		
16	burin spall		0.00%		0.00%		
17	chunk	2	11.76%		0.00%	13.0	
18	shatter		0.00%		0.00%		
19	unidentified		0.00%		0.00%		
	total	14	82.35%	3	17.65%	82.6	0.6
	total unret. + ret.	17					

Tablica 5.
Brojčana i postotna zastupljenost proizvodnih kategorija u sloju C/g

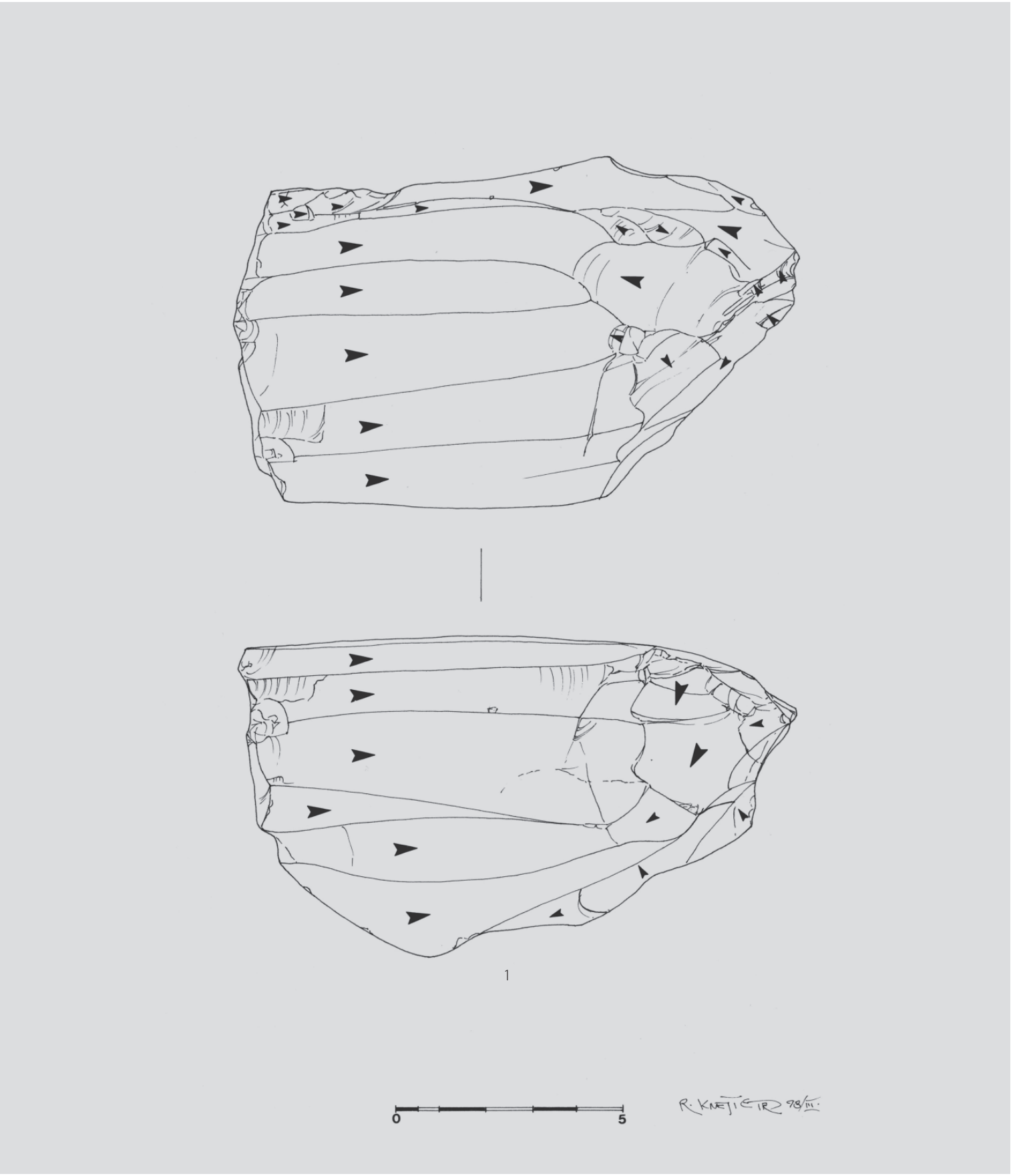
Table 5.
Numerical and percentage share of production categories in layer C/g

Kompleks C

Pod oznakom ovog kompleksa vjerojatno su ponajprije obuhvaćeni slojevi C/g i C/s, ali je također moguće da i neki nalazi sloja C/d nose oznaku C, premda je to manje vjerojatno. Naime, mnogo materijala označenog samo oznakom kompleksa C skupljeno je tijekom ranijih sezona istraživanja tog kompleksa (1966.-1967.), te vjerojatno oni potječu iz gornjeg dijela ovog kompleksa, a i nalazi sisavaca s oznakom kompleksa C više

Complex C

Layers C/g and C/s are probably encompassed by the designation of this complex first and foremost, but it is also possible that some finds from layer C/d bear the designation C, although this is less likely. Namely, much of the material designated only as complex C was gathered during earlier research seasons at this complex (1966-1967), and they probably originated from the upper section of this complex, while even the mammal finds bearing the complex C designation correspond more to the fauna from layers C/s and C/g than that from



Slika 3.
Kompleks C (epigravetijen): 1 - jezgra za sječiva. Mjerilo je u cm. Crtež: Krešimir Rončević

Figure 3.
Complex C (Epigravettian): 1 - blade core. . Scale in cm. Sketch by: Krešimir Rončević.

	Šandalja II C	neobrađenih		obrađenih		neobrađenih	obrađenih
		količina	%	količina	%	težina (g)	težina (g)
0	gomolj/valutica		0,00%		0,00%		
1	odbojak s okorinom	24	8,36%	9	3,14%	72,6	20,4
2	sječivo s okorinom	3	1,05%	8	2,79%	10,9	15,6
3	pločica s okorinom	3	1,05%	2	0,70%	2,0	1,2
4	odbojak	82	28,57%	9	3,14%	112,1	11,1
5	sječivo	28	9,76%	6	2,09%	70,1	18,2
6	pločica	39	13,59%	28	9,76%	28,7	23,5
7	jezgra za odbojke	4	1,39%		0,00%	96,6	
8	jezgra za sječiva		0,00%		0,00%		
9	jezgra za pločice	4	1,39%		0,00%	49,6	
10	mješovita jezgra	2	0,70%		0,00%	6,9	
11	ulomak jezgre		0,00%		0,00%		
12	iskrzani komad		0,00%		0,00%		
13	krijestasti komad	1	0,35%		0,00%	1,3	
14	dotj. odbojak jezgre	1	0,35%	1	0,35%	2,0	1,8
15	odbojčić	1	0,35%		0,00%	0,1	
16	iver dubila		0,00%		0,00%		
17	krhotina	28	9,76%	2	0,70%	150,7	13,2
18	okrhak		0,00%	1	0,35%		
19	neodredivo		0,00%	1	0,35%		
	ukupno	220	76,66%	67	23,34%	603,6	105
	ukupno neobr.+obr.	287					

	Šandalja II C	unretouched		retouched		unret.	ret.
		No	%	No	%	weight (g)	weight (g)
0	pebble/nodule/cobble		0.00%		0.00%		
1	decortication flake	24	8.36%	9	3.14%	72.6	20.4
2	decortication blade	3	1.05%	8	2.79%	10.9	15.6
3	decortication bladelet	3	1.05%	2	0.70%	2.0	1.2
4	flake	82	28.57%	9	3.14%	112.1	11.1
5	blade	28	9.76%	6	2.09%	70.1	18.2
6	bladelet	39	13.59%	28	9.76%	28.7	23.5
7	flake core	4	1.39%		0.00%	96.6	
8	blade core		0.00%		0.00%		
9	bladelet core	4	1.39%		0.00%	49.6	
10	mixed core	2	0.70%		0.00%	6.9	
11	core fragment		0.00%		0.00%		
12	splintered piece		0.00%		0.00%		
13	crest	1	0.35%		0.00%	1.3	
14	core renewal flake	1	0.35%	1	0.35%	2.0	1.8
15	small flakes	1	0.35%		0.00%	0.1	
16	burin spall		0.00%		0.00%		
17	chunk	28	9.76%	2	0.70%	150.7	13.2
18	shatter		0.00%	1	0.35%		
19	unidentified		0.00%	1	0.35%		
	total	220	76.66%	67	23.34%	603.6	105
	total unret. + ret.	287					

Tablica 6.
Brojčana i postotna zastupljenost proizvodnih kategorija u kompleksu C

Table 6.
Numerical and percentage share of production categories in complex C

odgovaraju fauni iz slojeva C/s i C/g nego onoj iz sloja C/d.[55] Tom mišljenju može ići u prilog i činjenica da sloj C/d sadrži dosta obradbenog otpada i alatki, dok je materijal u slojevima C/s i C/g oskudan, možda upravo zbog toga što je dio materijala iz tih razina označen samo oznakom C. Litički materijal označen sa C broji 287 komada (tablica 6). Neobrađenih nalaza ima 220 kom. (76,66 %), dok je alatki 67 (23,34 %). Među lomljevinom odbojaka ima najviše, potom slijede pločice pa sječiva (tablica 6). Jezgra za sječiva iz ovog

layer C/d.[55] This view may possibly be supported by the fact that layer C/d contains a considerable quantity of discarded artifacts and tools while the material in layers C/s and C/g is meagre, perhaps precisely because a part of the materials from these levels has been designated with C. The lithic assemblage designated with C encompass 287 pieces (Table 6). The unretouched finds encompass 220 pieces (76.66%), while there are 67 tools (23.34%). Among the débitage, flakes are the most frequent, followed by bladelets and then blades (Table 6). The blade

55 Miracle 1995.

55 Miracle 1995.

	Šandalja II sloj C		
	tip	**količina**	**postotak**
1	jednostavno grebalo	1	1,49%
2	grebalica	2	2,99%
3	dvostruko grebalo	3	4,48%
5	grebalo na obrađenom sječivu ili odbojku	2	2,99%
8	grebalo na odbojku	2	2,99%
21	svrdlo-grebalo	1	1,49%
23	svrdlo	1	1,49%
28	diedrično koso dubilo	1	1,49%
30	diedrično kutno dubilo na sječivu	1	1,49%
50	gravetica	2	2,99%
56	gravetijenski šiljak s usjekom	1	1,49%
58	sječivo s cjelovito zatupljenim rubom	1	1,49%
59	sječivo s djelomično zatupljenim rubom	1	1,49%
61	komadić s koso obrađenim zarupkom	1	1,49%
63	komadić s izbočeno obrađenim zarupkom	1	1,49%
65	komadić s obradbom na jednom rubu	8	11,94%
66	komadić s obradom na dvama rubovima	9	13,43%
74	komadić s urezom	5	7,46%
75	nazubljeni komadić	1	1,49%
76	iskrzani komadić	1	1,49%
83	kružni segment	1	1,49%
85	pločica s hrptom	1	1,49%
88	nazubljena pločica	1	1,49%
89	pločica s urezom	1	1,49%
92	djelomično obrađen komadić	7	10,45%
93	komadić s djelomičnom obradbom	2	2,99%
94	pločica s obradbom	3	4,48%
96	neodredivi obradak	4	5,97%
97	razno	2	2,99%
	ukupno	67	100,00%

Tablica 7.
Brojčana i postotna zastupljenost tipova alatki u kompleksu C

	Šandalja II level C		
	type	**quantity**	**%**
1	simple endscraper	1	1,49%
2	atypical endscraper	2	2,99%
3	double endscraper	3	4,48%
5	endscraper on retouched flake	2	2,99%
8	endscraper on flake	2	2,99%
21	perforator-endscraper	1	1,49%
23	perforator	1	1,49%
28	canted dihedral burin	1	1,49%
30	angle burin on break	1	1,49%
50	micro gravette	2	2,99%
56	Gravettian shouldered point	1	1,49%
58	complete backed blade	1	1,49%
59	partly backed blade	1	1,49%
61	piece with oblique retouched truncation	1	1,49%
63	piece with convex truncation	1	1,49%
65	continuously retouched piece - one edge	8	11,94%
66	continuously retouched piece - two edges	9	13,43%
74	notched piece	5	7,46%
75	denticulated piece	1	1,49%
76	splintered piece	1	1,49%
83	circular segment	1	1,49%
85	backed bladelet	1	1,49%
88	denticulated bladelet	1	1,49%
89	notched bladelet	1	1,49%
92	partialy retouched piece	7	10,45%
93	piece with partly marginal retouch	2	2,99%
94	retouched bladelet	3	4,48%
96	unidentifiable pieces	4	5,97%
97	diverse	2	2,99%
	total	67	100,00%

Table 7.
Numerical and percentage share of tool types in complex C

kompleksa najljepši je primjerak jezgre iz Šandalje (sl. 3). Osim iskazanog obradbenog otpada u tablici 6 pronađeno je još nekoliko primjeraka koji su pripadali kompleksu C Šandalje I. Ne zna se odgovora li taj kompleks istoimenom kompleksu Šandalje II, pa ti nalazi ovdje nisu razmatrani.

Od alatki najbrojniji su komadići s obradbom (na jednom rubu i na oba ruba). Grebala ima puno (jedno jednostavno, dvije grebalice, tri dvostruka grebala, dva na obrađenom sječivu ili odbojku, dva na odbojku, jedno u kombinaciji sa svrdlom). Prisutno je i jedno svrdlo. Pločica s hrptom samo je jedna. Prisutne su dvije gravetice i jedan lijep primjerak gravetijenskog šiljka s usjekom. Zastupljenost gravetica i pločica s hrptom neočekivano je mala. A. Montet-White i J. K. Kozlowski[56] prepoznali su četiri šiljka s usjekom u kompleksu C, a dva od njih su i nacrtana.[57] M. Malez[58] ovom kompleksu također pripisuje šiljke s usjekom, no ovom analizom pronađen je samo jedan primjerak. Moguće je da su drugi primjerci zametnuti, pa to treba uzeti u obzir. Šiljci s usjekom mogu upućivati na rani epigravetijen, dok rezultat datiranja središnjeg sloja (C/s)

core from this complex is the finest example of a core from Šandalja (Fig. 3). Besides the technological categories shown in Table 6, several more specimens were found which belonged to complex C at Šandalja I. It is not known whether this complex corresponds to the eponymous complex at Šandalja II, so these finds were not considered here.

Among the tools, the most numerous are retouched pieces (on one or both edges). There are many endscrapers (one simple endscraper, two atypical endscrapers, two double endscrapers, two on retouched blades or flakes, two on flakes, one combined with a perforator). A perforator is also present. There is only one backed bladelet. Two micro-Gravettes and one fine specimen of a Gravettian shouldered point are present. The presence of micro-Gravettes and backed bladelets was unexpectedly small. A. Montet-White and J. K. Kozlowski[56] recognized four shouldered points in complex C, while two of them are even drawn.[57] M. Malez[58] also attributed the shouldered points to this complex, although during this analysis only a single specimen was found. It is possible that the other specimens were misplaced, so this must also be considered. Shouldered points may indicate the early Epigravettian, while the results of dating the middle layer (C/s) of this complex indicate the evolved or even late

56 Montet-White, Kozlowski 1983, tablica 2.
57 Montet-White, Kozlowski 1983, sl. 2/1; Kozlowski 1992, sl. 17/1, 2
58 Malez 1987, str. 17.

56 Montet-White, Kozlowski 1983, Table 2.
57 Montet-White, Kozlowski 1983, Fig. 2/1; Kozlowski 1992, Fig. 17/1, 2.
58 Malez 1987, p. 17.

	Šandalja II B/C	neobrađenih		obrađenih		neobrađenih	obrađenih
		količina	%	količina	%	težina (g)	težina (g)
0	gomolj/valutica		0,00%		0,00%		
1	odbojak s okorinom	100	10,01%	11	1,10%	328,7	12,5
2	sječivo s okorinom	20	2,00%	15	1,50%	51,0	48,3
3	pločica s okorinom	14	1,40%	5	0,50%	10,1	3,4
4	odbojak	388	38,84%	28	2,80%	680,5	50,6
5	sječivo	92	9,21%	20	2,00%	214,7	45,6
6	pločica	92	9,21%	49	4,90%	56,2	28,3
7	jezgra za odbojke	18	1,80%		0,00%	301,0	
8	jezgra za sječiva	1	0,10%		0,00%	13,2	
9	jezgra za pločice	10	1,00%		0,00%	106,3	
10	mješovita jezgra	8	0,80%		0,00%	199,6	
11	ulomak jezgre		0,00%	1	0,10%		20,2
12	iskrzani komad		0,00%		0,00%		
13	krijestasti komad	3	0,30%	1	0,10%	9,0	3,3
14	dotj. odbojak jezgre	6	0,60%		0,00%	25,1	
15	odbojčić	6	0,60%		0,00%	0,7	
16	iver dubila		0,00%		0,00%		
17	krhotina	104	10,41%	6	0,60%	827,8	19,7
18	okrhak		0,00%		0,00%		
19	neodredivo		0,00%	1	0,10%		2,3
	ukupno	862	86,29%	137	13,71%	2823,9	234,2
	ukupno neobr.+obr.	999					

	Šandalja II B/C	unretouched		retouched		unret.	ret.
		No	%	No	%	weight (g)	weight (g)
0	pebble/nodule/cobble		0.00%		0.00%		
1	decortication flake	100	10.01%	11	1.10%	328.7	12.5
2	decortication blade	20	2.00%	15	1.50%	51.0	48.3
3	decortication bladelet	14	1.40%	5	0.50%	10.1	3.4
4	flake	388	38.84%	28	2.80%	680.5	50.6
5	blade	92	9.21%	20	2.00%	214.7	45.6
6	bladelet	92	9.21%	49	4.90%	56.2	28.3
7	flake core	18	1.80%		0.00%	301.0	
8	blade core	1	0.10%		0.00%	13.2	
9	bladelet core	10	1.00%		0.00%	106.3	
10	mixed core	8	0.80%		0.00%	199.6	
11	core fragment		0.00%	1	0.10%		20.2
12	splintered piece		0.00%		0.00%		
13	crest	3	0.30%	1	0.10%	9.0	3.3
14	core renewal flake	6	0.60%		0.00%	25.1	
15	small flakes	6	0.60%		0.00%	0.7	
16	burin spall		0.00%		0.00%		
17	chunk	104	10.41%	6	0.60%	827.8	19.7
18	shatter		0.00%		0.00%		
19	unidentified		0.00%	1	0.10%		2.3
	total	862	86.29%	137	13.71%	2823.9	234.2
	total unret. + ret.	999					

Tablica 8.
Brojčana i postotna zastupljenost proizvodnih kategorija u stratigrafskoj jedinici B/C

Table 8.
Numerical and percentage share of production categories in stratigraphic unit B/C

ovog kompleksa upućuje na razvijeni ili čak kasni epigravetijen. Problem determinacije industrije povezan je s pitanjem iz kojeg sloja (ili slojeva) potječe najveći broj alatki što nose samo oznaku kompleksa (C). Nažalost odgovor nije moguće dati, pa industriju treba odrediti samo kao epigravetijensku. Ako većina oruđa potječe iz slojeva C/s i C/g, što je moguće iz ranije navedenih razloga i zbog razlika u litičkoj industriji između ovog kompleksa i sloja C/d, moglo bi se raditi o srednjoj fazi epigravetijena Šandalje. Zbog metodoloških problema takva se mogućnost nažalost ne može potvrditi.

Epigravettian. The problem of ascertaining the industry is also linked to the question of which layer (or layers) generated the highest number of tools bearing the designation of complex (C). Unfortunately, this question cannot yet be answered, so the industry must be determined only as Epigravettian. Insofar as the majority of the tools originated in layers C/s and C/g, which is possible based on the aforementioned reasons and due to the differences in the lithic industry between this complex and layer C/d, it may be the middle phase of Šandalja's Epigravettian. This possibility cannot, unfortunately, be confirmed due to methodological problems.

Slika 4.
Stratigrafska jedinica B/C (epigravetijen): 1, 6, 9, 12 - komadići s obradbom na dvama rubovima, 2-5, 7 - komadići s obradbom na jednom rubu, 8 - komadić s udubljeno obrađenim zarupkom, 10 - grebalica, 11 - svrdlo, 13 - grebalo na obrađenom sječivu ili odbojku. Mjerilo je u cm. Crtež: Krešimir Rončević

Figure 4.
Stratigraphic unit B/C (Epigravettian): 1, 6, 9, 12 - pieces retouched on two edges, 2-5, 7 - pieces retouched on one edge, 8 - piece with concave truncation, 10 - atypical endscraper, 11 - perforator, 13 - endscraper on retouched blade or flake. Scale in cm. Sketch by: Krešimir Rončević.

	Šandalja II sloj B/C		
	tip	**količina**	**postotak**
1	jednostavno grebalo	3	2,19%
2	grebalica	4	2,92%
3	dvostruko grebalo	1	0,73%
5	grebalo na obrađenom sječivu ili odbojku	6	4,38%
8	grebalo na odbojku	1	0,73%
9	kružno grebalo	1	0,73%
10	noktoliko grebalo	2	1,46%
21	svrdlo-grebalo	1	0,73%
23	svrdlo	3	2,19%
24	svrdlenica	2	1,46%
25	višestruko svrdlo	1	0,73%
26	svrdlić	1	0,73%
31	višestruko diedrično dubilo	1	0,73%
40	višestruko dubilo s obrađenim zarupkom	1	0,73%
44	plošno dubilo	1	0,73%
48	gravetijenski šiljak	1	0,73%
49	gravetijenski polušiljak	2	1,46%
50	gravetica	11	8,03%
57	komadić s usjekom	1	0,73%
58	sječivo s cjelovito zatupljenim rubom	6	4,38%
59	sječivo s djelomično zatupljenim rubom	1	0,73%
60	komadić s ravno obrađenim zarupkom	1	0,73%
62	komadić s udubljeno obrađenim zarupkom	2	1,46%
65	komadić s obradbom na jednom rubu	21	15,33%
66	komadić s obradbom na dvama rubovima	14	10,22%
74	komadić s urezom	8	5,84%
75	nazubljeni komadić	3	2,19%
76	iskrzani komadić	1	0,73%
77	strugalo	3	2,19%
85	pločica s hrptom	7	5,11%
90	duforska pločica	1	0,73%
92	djelomično obrađen komadić	12	8,76%
93	komadić s djelomičnom sitnom obradbom	5	3,65%
94	pločica s obradbom	1	0,73%
95	pločica sa sitnom obradbom	2	1,46%
96	neodredivi obradak	3	2,19%
97	razno	2	1,46%
	ukupno	137	100,00%

Tablica 9.
Brojčana i postotna zastupljenost tipova alatki u stratigrafskoj jedinici B/C

	Šandalja II level B/C		
	type	**quantity**	**%**
1	simple endscraper	3	2,19%
2	atypical endscraper	4	2,92%
3	double endscraper	1	0,73%
5	endscraper on retouched flake	6	4,38%
8	endscraper on flake	1	0,73%
9	circular endscraper	1	0,73%
10	thumbnail endscraper	2	1,46%
21	perforator-endscraper	1	0,73%
23	perforator	3	2,19%
24	atypical perforator (bec)	2	1,46%
25	multiple perforator	1	0,73%
26	micro-perforator	1	0,73%
31	mulitple dihedral burin	1	0,73%
40	multiple burin on retouched truncation	1	0,73%
44	flat burin	1	0,73%
48	Gravette point	1	0,73%
49	atypical Gravette point	2	1,46%
50	micro gravette	11	8,03%
57	shouldered piece	1	0,73%
58	complete backed blade	6	4,38%
59	partly backed blade	1	0,73%
60	straight truncation	1	0,73%
62	piece with a concave truncation	2	1,46%
65	continuously retouched piece - one edge	21	15,33%
66	continuously retouched piece - two edges	14	10,22%
74	nothced piece	8	5,84%
75	denticulated piece	3	2,19%
76	splintered piece	1	0,73%
77	sidescraper	3	2,19%
85	backed bladelet	7	5,11%
90	Dufour bladelet	1	0,73%
92	partialy retouched piece	12	8,76%
93	picece with partly marginal retouch	5	3,65%
94	retouched bladelet	1	0,73%
95	bladelet with marginal retouch	2	1,46%
96	unidentifiable pieces	3	2,19%
97	diverse	2	1,46%
	total	137	100,00%

Table 9.
Numerical and percentage share of tool types in stratigraphic unit B/C

Prijelaz kompleksa C u kompleks B (oznaka B/C)

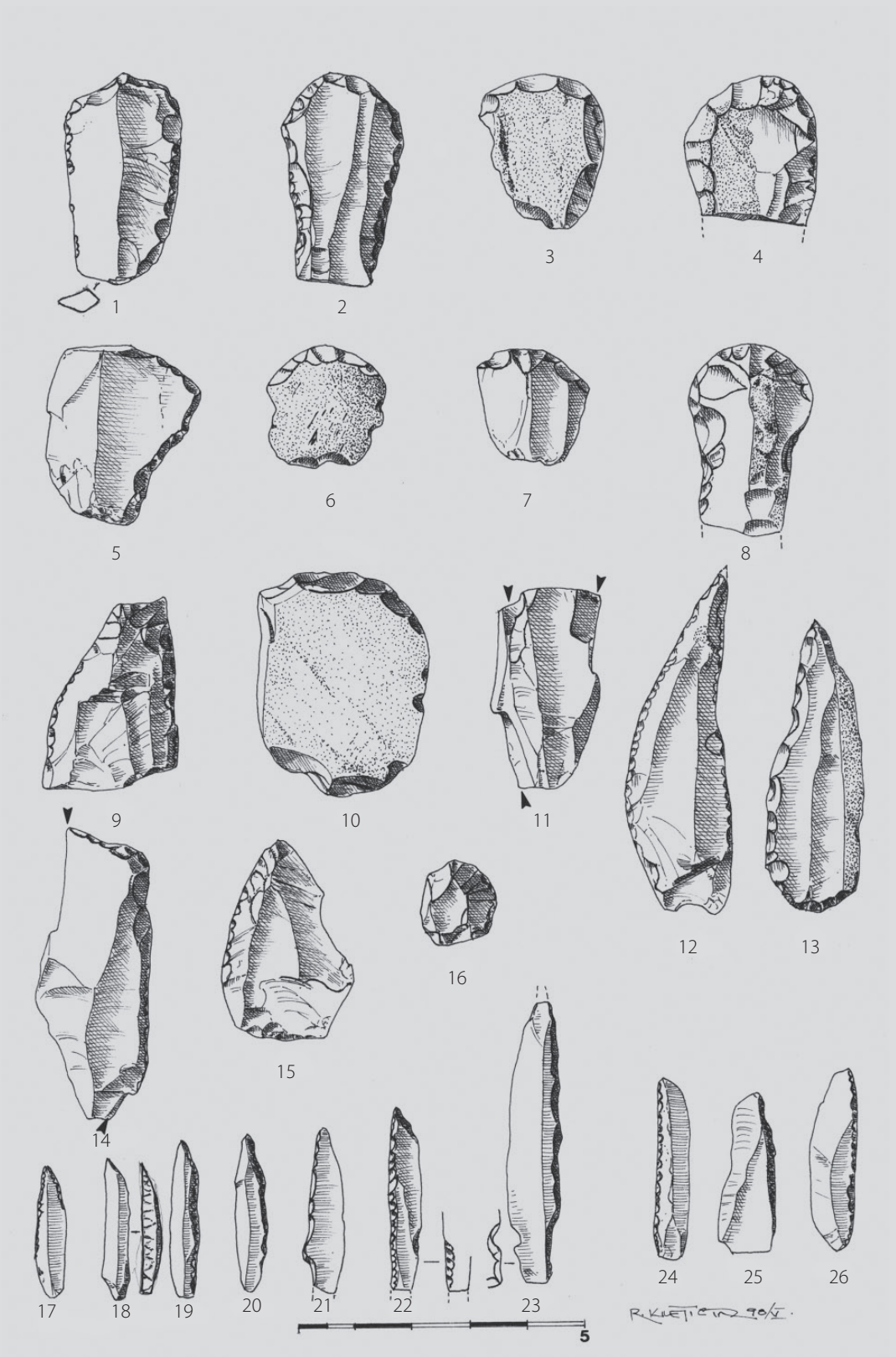
Oznaka B/C označava prijelaz kompleksa B u kompleks C, odnosno granicu između slojeva B/d i C/g. Osim nalaza koji su bili na međusobnoj granici navedenih slojeva, ponekad su oznakom B/C označavani i nalazi jednog zasebnog sloja.[59] Međutim, taj sloj je zapravo završetak kompleksa C (prema B kompleksu) koji sadrži znatno više kamenog krša nego što je uobičajeno za kompleks C.[60] Oznaku B/C nosi ukupno 994 komada litičke industrije (tablica 8). Neobrađenih nalaza je 862 (86,72 %), a alatki je 137 (13,78 %). Među lomljevinom odbojaka ima najviše, pločica je znatno manje od odbojaka, dok je sječiva i pločica podjednako (isti ih je broj bez okorine). Mnogobrojan je okorinski materijal. On zajedno s jezgrama i

Transition of complex C into complex B (designation B/C)

The designation B/C signifies the transition between complex B into C, i.e., the boundary between layers B/d and C/g. Besides the finds that were on the mutual boundary between these layers, sometimes the designation B/C also mark finds of a single separate layer.[59] However, this layer is actually the end of complex C (vis-à-vis complex B) which contains considerably more stone debris than is customary for complex C.[60] The designation B/C is carried by a total of 994 lithic artifacts (Table 8). There are 862 unretouched pieces (86.72%), and 137 tools (13.78%). Among the débitage, flakes predominate, bladelets are far fewer in number, while the presence of blades and bladelets is equal (their numbers without cortex is the same). The decortication artefacts are numerous.

59 Miracle 1995.
60 Usmeno priopćenje D. Rukavine.

59 Miracle 1995.
60 D. Rukavina personal communication.



Slika 5.
Stratigrafska jedinica B/C (epigravetijen): 1-5, 8 - grebala na obrađenom sječivu ili odbojku, 6, 7 - noktolika grebala, 9, 15 - strugala, 10 - dvostruko grebalo, 11 - višestruko diedrično dubilo, 12 - svrdlo, 13 - svrdlo-grebalo, 14 - višestruko dubilo s obrađenim zarupkom, 16 - kružno grebalo, 17-22 - gravetice, 23 - gravetijenski šiljak, 24-26 - pločice s hrptom. Mjerilo je u cm. Crtež: Krešimir Rončević

Figure 5.
Stratigraphic unit B/C (Epigravettian): 1-5, 8 - endscrapers on retouched blade or flake, 6, 7 - thumbnail endscrapers, 9, 15 - sidescrapers, 10 - double endscraper, 11 - multiple dihedral burin, 12 - perforator, 13 - perforator-endscraper, 14 - multiple burin on retouched truncation, 16 - circular endscraper, 17-22 - micro-Gravettes, 23 - Gravette point, 24-26 - backed bladelets. Scale in cm. Sketch by: Krešimir Rončević.

	Šandalja II B/d	neobrađenih		obrađenih		neobrađenih	obrađenih
		količina	%	količina	%	težina (g)	težina (g)
0	gomolj/valutica	5	0,28%		0,00%	445,8	
1	odbojak s okorinom	284	15,99%	38	2,14%	1079,1	90,1
2	sječivo s okorinom	23	1,30%	27	1,52%	55,2	62,3
3	pločica s okorinom	18	1,01%	6	0,34%	14,7	1,3
4	odbojak	543	30,57%	74	4,17%	937,1	169,2
5	sječivo	102	5,74%	65	3,66%	233,1	44,6
6	pločica	146	8,22%	106	5,97%	77,8	31,2
7	jezgra za odbojke	24	1,35%		0,00%	1066,7	
8	jezgra za sječiva	2	0,11%		0,00%	64,6	
9	jezgra za pločice	12	0,68%		0,00%	128,5	
10	mješovita jezgra	20	1,13%		0,00%	592,2	
11	ulomak jezgre	1	0,06%	1	0,06%	20,0	18,9
12	iskrzani komad		0,00%		0,00%		
13	krijestasti komad	2	0,11%	2	0,11%	3,3	2,8
14	dotj. odbojak jezgre	16	0,90%	3	0,17%	88,3	14,3
15	odbojčić	16	0,90%		0,00%	4,4	
16	iver dubila	1	0,06%	2	0,11%	0,4	0,4
17	krhotina	219	12,33%	13	0,73%	2772,6	72,3
18	okrhak	2	0,11%		0,00%	0,9	
19	neodredivo		0,00%	3	0,17%		5,6
	ukupno	1436	80,86%	340	19,14%	7584,7	513
	ukupno neobr.+obr.	1776					

	Šandalja II B/d	unretouched		retouched		unret.	ret.
		No	%	No	%	weight (g)	weight (g)
0	pebble/nodule/cobble	5	0.28%		0.00%	445.8	
1	decortication flake	284	15.99%	38	2.14%	1079.1	90.1
2	decortication blade	23	1.30%	27	1.52%	55.2	62.3
3	decortication bladelet	18	1.01%	6	0.34%	14.7	1.3
4	flake	543	30.57%	74	4.17%	937.1	169.2
5	blade	102	5.74%	65	3.66%	233.1	44.6
6	bladelet	146	8.22%	106	5.97%	77.8	31.2
7	flake core	24	1.35%		0.00%	1066.7	
8	blade core	2	0.11%		0.00%	64.6	
9	bladelet core	12	0.68%		0.00%	128.5	
10	mixed core	20	1.13%		0.00%	592.2	
11	core fragment	1	0.06%	1	0.06%	20.0	18.9
12	splintered piece		0.00%		0.00%		
13	crest	2	0.11%	2	0.11%	3.3	2.8
14	core renewal flake	16	0.90%	3	0.17%	88.3	14.3
15	small flakes	16	0.90%		0.00%	4.4	
16	burin spall	1	0.06%	2	0.11%	0.4	0.4
17	chunk	219	12.33%	13	0.73%	2772.6	72.3
18	shatter	2	0.11%		0.00%	0.9	
19	unidentified		0.00%	3	0.17%		5.6
	total	1436	80.86%	340	19.14%	7584.7	513
	total unret. + ret.	1776					

Tablica 10.
Brojčana i postotna zastupljenost proizvodnih kategorija u sloju B/d

Table 10.
Numerical and percentage share of production categories in layer B/d

ostalom lomljevinom sugerira proizvodnju artefakata *in situ*, vjerojatno uz prisutnost svih faza proizvodnog postupka, od donašanja sirovine u špilju do finalnog proizvoda. Na završnu fazu proizvodnje (dodatna obrada) upućuje prisutnost sitnih odbojaka, premda je njihova zastupljenost vrlo mala, što nije neobično s obzirom da sediment nije prosijavan, pa stoga sitni komadići nisu ni mogli biti prikupljeni.

Među alatkama (tablica 9; sl. 4 i 5) komadića s obradbom na jednom rubu ima najviše, a potom onih s obradbom na dvama rubovima. Zastupljene su gravetice i pločice s hrptom su. Među

Together with cores and the remaining débitage, it suggests production of artefacts *in situ*, probably with the presence of all production phases, from conveyance of the raw materials into the cave to the final product. The final phase of production (retouch) is indicated by the presence of tiny flakes, although they are very few in number, which is not unusual because the sediment was not sifted, so these tiny pieces could not even have been gathered.

Among the tools (Table 9; Fig. 4 and 5), pieces retouched on one edge are the most common, followed by those retouched on two edges. Micro-Gravettes and backed bladelets are present. Among

	Šandalja II sloj B/d		
	tip	**količina**	**postotak**
1	jednostavno grebalo	12	3,53%
2	grebalica	7	2,06%
3	dvostruko grebalo	10	2,94%
5	grebalo na obrađenom sječivu ili odbojku	17	5,00%
8	grebalo na odbojku	12	3,53%
9	kružno grebalo	3	0,88%
10	noktoliko grebalo	8	2,35%
15	jezgroliko grebalo	1	0,29%
23	svrdlo	8	2,35%
24	svrdlenica	6	1,76%
26	svrdlić	5	1,47%
28	diedrično koso dubilo	1	0,29%
30	diedrično kutno dubilo na sječivu	3	0,88%
31	višestruko diedrično dubilo	3	0,88%
36	dubilo s udubljeno obrađenim zarupkom	1	0,29%
37	dubilo s izbočeno obrađenim zarupkom	1	0,29%
38	poprečno dubilo s bočnim zarupkom	1	0,29%
43	jezgroliko dubilo	1	0,29%
48	gravetijenski šiljak	5	1,47%
49	gravetijenski polušiljak	1	0,29%
50	gravetica	14	4,12%
53	grbav komadić s otupljenim rubom	1	0,29%
57	komadić s usjekom	4	1,18%
58	sječivo s cjelovito zatupljenim rubom	7	2,06%
59	sječivo s djelomično zatupljenim rubom	1	0,29%
61	komadić s koso obrađenim zarupkom	4	1,18%
62	komadić s udubljeno obrađenim zarupkom	3	0,88%
63	komadić s izbočeno obrađenim zarupkom	4	1,18%
65	komadić s obradbom na jednom rubu	45	13,24%
66	komadić s obradbom na dvama rubovima	17	5,00%
74	komadić s urezom	20	5,88%
75	nazubljeni komadić	11	3,24%
76	iskrzani komadić	7	2,06%
77	strugalo	9	2,65%
78	strugalica	1	0,29%
84	zarubljena pločica	2	0,59%
85	pločica s hrptom	22	6,47%
86	zarubljena pločica s hrptom	3	0,88%
88	nazubljena pločica	1	0,29%
91	azilijenski šiljak	4	1,18%
92	djelomično obrađen komadić	23	6,76%
93	komadić s djelomičnom sitnom obradbom	13	3,82%
96	neodredivi obradak	14	4,12%
97	razno	4	1,18%
	ukupno	340	100,00%

Tablica 11.
Brojčana i postotna zastupljenost tipova alatki u sloju B/d

	Šandalja II level B/d		
	type	**quantity**	**%**
1	simple endscraper	12	3,53%
2	atypical endscraper	7	2,06%
3	double endscraper	10	2,94%
5	endscraper on retouched flake	17	5,00%
8	endscraper on flake	12	3,53%
9	circular endscraper	3	0,88%
10	thumbnail endscraper	8	2,35%
15	nucleiform endscraper	1	0,29%
23	perforator	8	2,35%
24	atypical perforator (bec)	6	1,76%
26	micro-perforator	5	1,47%
28	canted dihedral burin	1	0,29%
30	angle burin on break	3	0,88%
31	mulitple dihedral burin	3	0,88%
36	burin on a concave truncation	1	0,29%
37	burin on convex truncation	1	0,29%
38	transverse burin on lateral reotuch	1	0,29%
43	nucleiform burin	1	0,29%
48	Gravette point	5	1,47%
49	atypical Gravette point	1	0,29%
50	micro gravette	14	4,12%
53	backed gibbous piece	1	0,29%
57	shouldered piece	4	1,18%
58	complete backed blade	7	2,06%
59	partly backed blade	1	0,29%
61	piece with oblique truncation	4	1,18%
62	piece with a concave truncation	3	0,88%
63	piece with convex truncation	4	1,18%
65	continuously retouched piece - one edge	45	13,24%
66	continuously retouched piece - two edges	17	5,00%
74	nothced piece	20	5,88%
75	denticulated piece	11	3,24%
76	splintered piece	7	2,06%
77	sidescraper	9	2,65%
78	raclette	1	0,29%
84	truncated bladelet	2	0,59%
85	backed bladelet	22	6,47%
86	truncated backed bladelet	3	0,88%
88	denticulated bladelet	1	0,29%
91	Azilian point	4	1,18%
92	partialy retouched piece	23	6,76%
93	picece with partly marginal retouch	13	3,82%
96	unidentifiable pieces	14	4,12%
97	diverse	4	1,18%
	total	340	100,00%

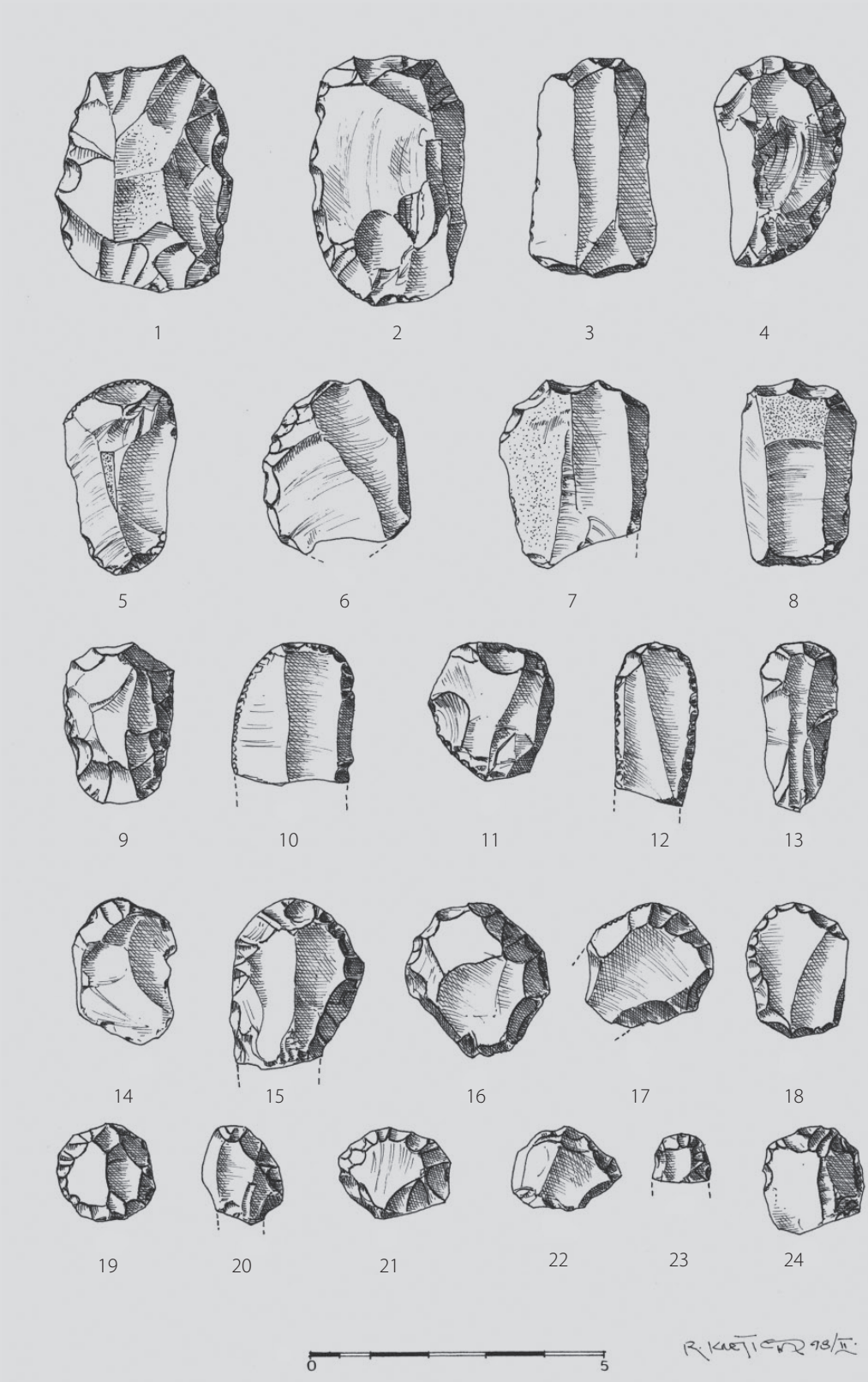
Table 11.
Numerical and percentage share of tool types in layer B/d

grebalima su dva noktolika i jedno kružno, a najviše je onih na obrađenom sječivu ili odbojku. Veća zastupljenost gravetica i pločica s hrptom nego u gornjim slojevima kompleksa C, upućuje na "prijelaznu" značajku ovog sloja ili na miješanje s oruđima kompleksa B, gdje je udio navedenih tipova značajan. Rezultat datiranja ove stratigrafske jedinice od 13050±220 godina prije sadašnjosti,[61] sličan rezultatu za sloj C/s, uz uočljive razlike u zastupljenosti pojedinih tipova alatki, potvrđuje kronostratigrafsku i tipološku pripadnost epigravetijenu.

the endscrapers, two are thumbnail and one is circular, but most are those on a retouched blade or flake. The higher presence of micro-Gravettes and backed bladelets than in the complex C layers indicates the "transitional" feature of this layer or mixing with complex B tools, in which the share of these types was significant. The dating of this stratigraphic unit to 13050±220 years BP,[61] similar to the result for layer C/s, with the notable differences in the representation of different tool types, confirms the chronostratigraphic and typological classification to the Epigravettian.

61 Obelić *et al*. 1994.

61 Obelić et al. 1994.



Slika 6.
Sloj B/d (kasni epigravetijen): 1-5, 8, 18 - dvostruka grebala, 6, 7, 13, 20 - jednostavna grebala, 11, 14, 16, 17 - grebala na odbojku, 9, 10, 12, 15 - grebala na obrađenom sječivu ili odbojku, 19 - kružno grebalo, 21, 23, 24 - noktolika grebala, 22 - grebalica. Mjerilo je u cm. Crtež: Krešimir Rončević

Figure 6.
Layer B/d (late Epigravettian): 1-5, 8, 18 - double endscrapers, 6, 7, 13, 20 - simple endscrapers, 11, 14, 16, 17, - endscrapers on flakes, 9, 10, 12, 15 - endscrapers on retouched blade or flake, 19 - circular endscraper, 21, 23, 24 - thumbnail endscrapers, 22 - atypical endscraper. Scale in cm. Sketch by: Krešimir Rončević.

Sloj B/d

Sloj B/d najdonji je dio kompleksa B. Iz njega potječe 1776 primjeraka litičke industrije (tablica 10). Neobrađenim nalazima pripada 1436 komada (80,69 %), dok alatki ima 340 (19,14 %). Odbojaka ima najviše, a pločice su brojnije od sječiva. Dio sječiva ima usnati plohak i može se s priličnom sigurnošću tvrditi da je korištena tehnika odbijanja sječiva s mekanim čekićem. Nema izrazito širokih sječiva kao u orinjasijenskim slojevima. Mnogobrojan otpadni materijal dokazuje izradbu oruđa unutar ovog sloja na samom nalazištu. Na temelju prisutnih kategorija lomljevine i jezgri, pretpostaviti je da su se sve faze proizvodnje odvijale na nalazištu (*in situ*). Krhotine su značajno zastupljene.

Od alatki (tablica 11; sl. 6) vrlo je mnogo komadića s obradbom, napose onih s obradbom na jednom rubu. Nadalje, u asortimanu alatki dosta je izražen udio djelomično obrađenih komadića i pločica s hrptom, a manje gravetica. Pet je gravetijenskih šiljaka i jedan polušiljak. Azilijenska šiljka su četiri. Od grebala najviše je onih na obrađenom sječivu ili odbojku. Zastupljenost svih tipova grebala iznosi oko 20 %. S obzirom na velik broj grebala, uz zastupljenost kružnih i noktolikih grebala, te značajnu prisutnost pločica s hrptom i gravetica, kao i rezultate datiranja ovog sloja koji iznose 10140±160[62] i 10990±60 godina prije sadašnjosti,[63] industriju treba pripisati kasnom epigravetijenu.

Sloj B/s

Sloj B/s središnji je dio kompleksa B i ujedno najbogatija stratigrafska jedinica ovog nalazišta. Pronađeno je čak 5406 primjeraka litičke (tablica 12) industrije, od čega je neobrađeno 4595 komada (85,00 %), a alatki je 811 (15,00 %). U jezgre za odbojke uvršteni su i primjerci koji nisu tipični. Ti loše izrađeni primjerci po morfologiji su između jezgara i krhotina. Katkad se ne može ustanoviti smjer lomljenja, a prilično je jasno da je od njih namjerno odbijen jedan odbojak ili više njih. Od lomljevine (tablica 28) odbojaka je daleko najviše, dok je pločica znatno više od sječiva (sl. 7), kojima pripadaju i slomljeni komadići koji su vjerojatno izvorno bili veći od 3 cm, a pokazuju značajke sječiva. Prisutna je tehnika odbijanja sječiva mekanim čekićem.[64] Krhotine čine značajan dio lomljevine. Osim prvotnih odbojaka, premda simbolički, također su prisutna prvotna sječiva i prvotne pločice. Navedene kategorije zajedno s jezgrama, odbojčićima i dotjerivim odbojcima jezgre upućuju na postojanje svih faza proizvodnje alatki unutar ove razine nalazišta. Dok odbojčići upućuju na završnu obradbu alatki, iverci dubila dokazuju proizvodnju tih tipova.

62 Obelić *et al*. 1994.

63 Miracle 1995.

64 To su uvidom u dio sječiva potvrdili F. Blaser, J. Pelegrin i J. Kozlowski.

Layer B/d

Layer B/d is the lowest part of complex B. 1,776 lithic artefacts originated in it (Table 10). There are 1,436 unretouched pieces (80.69%), and 340 tools (19.14%). Flakes are the most numerous, while bladelets are more numerous than blades. Some of the blades have a lipped butt, and it may be said with considerable certainty that the direct soft-hammer percussion technique was used. There are no markedly wide blades as in the Aurignacian layers. The numerous discards proves the production of tools inside this layer at the site itself. Based on the present categories of débitage and cores, it may be assumed that all production phases proceeded at the site (*in situ*). Chunks are present in a significant number.

Among the tools (Table 11; Fig. 6), there are very many retouched pieces, particularly those retouched on a single edge. Furthermore, the share of partially retouched pieces and backed bladelets is considerable, while that of micro-Gravettes is less so. There are five Gravette points and one atypical Gravette point. There are four Azilian points. Among the endscrapers, those on retouched blades or flakes are the most common. The presence of all endscraper types is approximately 20%. Given the high number of endscrapers, with representation of circular and thumbnail endscrapers, and the considerable presence of backed bladelets and micro-Gravettes, and the dating of this layer to 10140±160[62] and 10990±60 years BP,[63] its industry should be attributed to the Epigravettian.

Layer B/s

Layer B/s is the middle portion of complex B and also the site's richest stratigraphic unit. Here an astounding 5,406 lithic artifacts (Table 12) were found, of which 4,595 are unretouched pieces (85%), while there are 811 tools (15%). Atypical specimens were also included among the flake cores. In terms of morphology, these poorly rendered specimens are somewhere between cores and chunks. Sometimes the direction of knapping cannot be determined, but it is rather clear that one or more flakes were intentionally knapped from them. Among the débitage (Table 28), flakes are by far the most common, while bladelets considerably outnumber blades (Fig. 7), which include the broken pieces that were originally probably longer than 3 cm and exhibit the features of blades. The direct soft hammer percussion technique is also present.[64] Chunks account for a considerable portion of the débitage. Besides decortication flakes, decortication blades and decortication bladelets are also present, albeit symbolically. These categories, together with cores, small flakes and core renewal flakes indicate the existence of all phases of tool production at the site during this phase. While the small flakes indicate final retouch of tools, the burin spalls prove the production of these types.

62 Obelić et al. 1994.

63 Miracle 1995.

64 This was confirmed F. Blaser, J. Pelegrin and J. Kozlowski after inspecting a portion of the blades.

	Šandalja II B/s	neobrađenih		obrađenih		neobrađenih	obrađenih
		količina	%	količina	%	težina (g)	težina (g)
0	gomolj/valutica		0,00%		0,00%		
1	odbojak s okorinom	687	12,71%	275	5,09%	1910,1	1045,9
2	sječivo s okorinom	45	0,83%	44	0,81%	121,7	183,9
3	pločica s okorinom	102	1,89%	24	0,44%	63,5	23,3
4	odbojak	1536	28,41%	158	2,92%	2337,9	386,44
5	sječivo	224	4,14%	123	2,28%	504,9	326,4
6	pločica	428	7,92%	153	2,83%	213,0	58,2
7	jezgra za odbojke	87	1,61%	1	0,02%	1139,7	5,7
8	jezgra za sječiva	1	0,02%	1	0,02%	79,5	7,8
9	jezgra za pločice	79	1,46%	2	0,04%	578,6	8,5
10	mješovita jezgra	62	1,15%		0,00%	644,8	
11	ulomak jezgre	10	0,18%	4	0,07%	38,4	9,7
12	iskrzani komad	5	0,09%		0,00%	11,6	
13	krijestasti komad	21	0,39%		0,00%	64,9	
14	dotj. odbojak jezgre	81	1,50%	5	0,09%	244,1	9,2
15	odbojčić	201	3,72%		0,00%	36,8	
16	iver dubila	14	0,26%		0,00%	9,9	
17	krhotina	981	18,15%	14	0,26%	7405,7	76
18	okrhak	9	0,17%		0,00%	1,6	
19	neodredivo	22	0,41%	7	0,13%	10,0	4,9
	ukupno	4595	85,00%	811	15,00%	15416,7	2145,94
	ukupno neobr.+obr.	5406					

	Šandalja II B/s	unretouched		retouched		unret.	ret.
		No	%	No	%	weight (g)	weight (g)
0	pebble/nodule/cobble		0.00%		0.00%		
1	decortication flake	687	12.71%	275	5.09%	1910.1	1045.9
2	decortication blade	45	0.83%	44	0.81%	121.7	183.9
3	decortication bladelet	102	1.89%	24	0.44%	63.5	23.3
4	flake	1536	28.41%	158	2.92%	2337.9	386.44
5	blade	224	4.14%	123	2.28%	504.9	326.4
6	bladelet	428	7.92%	153	2.83%	213.0	58.2
7	flake core	87	1.61%	1	0.02%	1139.7	5.7
8	blade core	1	0.02%	1	0.02%	79.5	7.8
9	bladelet core	79	1.46%	2	0.04%	578.6	8.5
10	mixed core	62	1.15%		0.00%	644.8	
11	core fragment	10	0.18%	4	0.07%	38.4	9.7
12	splintered piece	5	0.09%		0.00%	11.6	
13	crest	21	0.39%		0.00%	64.9	
14	core renewal flake	81	1.50%	5	0.09%	244.1	9.2
15	small flakes	201	3.72%		0.00%	36.8	
16	burin spall	14	0.26%		0.00%	9.9	
17	chunk	981	18.15%	14	0.26%	7405.7	76
18	shatter	9	0.17%		0.00%	1.6	
19	unidentified	22	0.41%	7	0.13%	10.0	4.9
	total	4595	85.00%	811	15.00%	15416.7	2145.94
	total unret. + ret.	5406					

Tablica 12.
Brojčana i postotna zastupljenost proizvodnih kategorija u sloju B/s

Table 12.
Numerical and percentage share of production categories in layer B/s

Među alatkama (tablica 13; sl. 8, 9) prevladavaju komadići s obradbom, što je uobičajeno i u većini ranijih slojeva. Posebno su brojni oni s obradbom na jednom rubu, a potom slijede oni s obradbom na dvama rubovima, djelomično obrađeni, s djelomičnom sitnom obradbom. Prisutne su i pločice s obradbom, te pločice sa sitnom obradbom. Iskrzani komadići zastupljeniji su nego u ranijim slojevima. Grebala su značajno zastupljena premda je njihova postotna učestalost manja nego u prethodnom sloju dok je učestalost noktolikih grebala veća nego u prethodnom sloju, a učestalost kružnih grebala manja. U malom su postotku

Among the tools (Table 13; Fig. 8, 9), retouched pieces predominate, which was typical of most earlier layers. Those with one edge retouched are particularly numerous, followed by those retouched on two edges, partially retouched pieces, and those with partially marginal retouch. Also present are retouched bladelets and marginally retouched bladelets. Splintered pieces are far more present than in earlier layers. Endscrapers are considerably represented, although their percentage frequency is less than in the preceding layer, while the frequency of thumbnail endscrapers is higher than in the preceding layer, and

	Šandalja II sloj B/s		
	tip	**količina**	**postotak**
1	jednostavno grebalo	33	4,13%
2	grebalica	8	1,00%
3	dvostruko grebalo	4	0,50%
5	grebalo na obrađenom sječivu ili odbojku	24	3,00%
8	grebalo na odbojku	21	2,63%
9	kružno grebalo	4	0,50%
10	noktoliko grebalo	30	3,75%
15	jezgroliko grebalo	2	0,25%
17	grebalo-dubilo	1	0,13%
21	svrdlo-grebalo	1	0,13%
23	svrdlo	16	2,00%
24	svrdlenica	13	1,63%
25	višestruko svrdlo	1	0,13%
26	svrdlić	4	0,50%
28	diedrično koso dubilo	2	0,25%
29	diedrično kutno dubilo	2	0,25%
30	diedrično kutno dubilo na sječivu	6	0,50%
31	višestruko diedrično dubilo	1	0,13%
35	dubilo s koso obrađenim zarupkom	1	0,13%
36	dubilo s udubljeno obrađenim zarupkom	2	0,25%
37	dubilo s izbočeno obrađenim zarupkom	2	0,25%
38	poprečno dubilo s bočnim zarupkom	4	0,50%
41	višestruko mješovito dubilo	1	0,13%
43	jezgroliko dubilo	2	0,25%
44	plošno dubilo	1	0,13%
48	gravetijenski šiljak	9	1,13%
49	gravetijenski polušiljak	3	0,38%
50	gravetica	16	2,00%
57	komadić s usjekom	3	0,38%
58	sječivo s cjelovito zatupljenim rubom	19	2,38%
59	sječivo s djelomično zatupljenim rubom	4	0,50%
61	komadić s koso obrađenim zarupkom	5	0,63%
62	komadić s udubljeno obrađenim zarupkom	3	0,38%
63	komadić s izbočeno obrađenim zarupkom	6	0,75%
64	dvostruko zarubljeno sječivo	1	0,13%
65	komadić s obradbom na jednom rubu	93	11,64%
66	komadić s obradbom na dvama rubovima	40	4,51%
74	komadić s urezom	32	4,01%
75	nazubljeni komadić	18	2,25%
76	iskrzani komadić	42	5,26%
77	strugalo	16	2,00%
78	strugalica	10	1,25%
80	pravokutnik	5	0,63%
83	kružni segment	21	2,63%
84	zarubljena pločica	2	0,25%
85	pločica s hrptom	42	5,26%
86	zarubljena pločica s hrptom	8	1,00%
88	nazubljena pločica	7	0,88%
89	pločica s urezom	11	1,38%
91	azilijenski šiljak	18	2,25%
92	djelomično obrađen komadić	35	4,13%
93	komadić s djelomičnom sitnom obradbom	28	3,25%
94	pločica s obradbom	21	2,63%
95	pločica sa sitnom obradbom	37	4,63%
96	neodredivi obradak	42	5,26%
97	razno	28	3,25%
	ukupno	811	100,00%

Tablica 13.
Brojčana i postotna zastupljenost tipova alatki u sloju B/s

	Šandalja II level B/s		
	type	**quantity**	**%**
1	simple endscraper	33	4,13%
2	atypical endscraper	8	1,00%
3	double endscraper	4	0,50%
5	endscraper on retouched flake	24	3,00%
8	endscraper on flake	21	2,63%
9	circular endscraper	4	0,50%
10	thumbnail endscraper	30	3,75%
15	nucleiform endscraper	2	0,25%
17	endscraper-burin	1	0,13%
21	perforator-endscraper	1	0,13%
23	perforator	16	2,00%
24	atypical perforator (bec)	13	1,63%
25	mulitiple perforator	1	0,13%
26	micro-perforator	4	0,50%
28	canted dihedral burin	2	0,25%
29	angle dihedral burin	2	0,25%
30	angle burin on break	6	0,50%
31	mulitple dihedral burin	1	0,13%
35	burin on a oblique truncation	1	0,13%
36	burin on a concave truncation	2	0,25%
37	burin on convex truncation	2	0,25%
38	transverse burin on lateral truncation	4	0,50%
41	mulitple mixed burin	1	0,13%
43	nucleiform burin	2	0,25%
44	flat burin	1	0,13%
48	Gravette point	9	1,13%
49	atypical Gravette point	3	0,38%
50	micro gravette	16	2,00%
57	shouldered piece	3	0,38%
58	complete backed blade	19	2,38%
59	partly backed blade	4	0,50%
61	piece with oblique truncation	5	0,63%
62	piece with a concave truncation	3	0,38%
63	piece with convex truncation	6	0,75%
64	piece with double truncation	1	0,13%
65	continuously retouched piece - one edge	93	11,64%
66	continuously retouched piece - two edges	40	4,51%
74	nothced piece	32	4,01%
75	denticulated piece	18	2,25%
76	splintered piece	42	5,26%
77	sidescraper	16	2,00%
78	raclette	10	1,25%
80	rectangle	5	0,63%
83	circular segment	21	2,63%
84	truncated bladelet	2	0,25%
85	backed bladelet	42	5,26%
86	truncated backed bladelet	8	1,00%
88	denticulated bladelet	7	0,88%
89	notched bladelet	11	1,38%
91	Azilian point	18	2,25%
92	partialy retouched piece	35	4,13%
93	picece with partly marginal retouch	28	3,25%
94	retouched bladelet	21	2,63%
95	bladelet with marginal retouch	37	4,63%
96	unidentifiable pieces	42	5,26%
97	diverse	28	3,25%
	total	811	100,00%

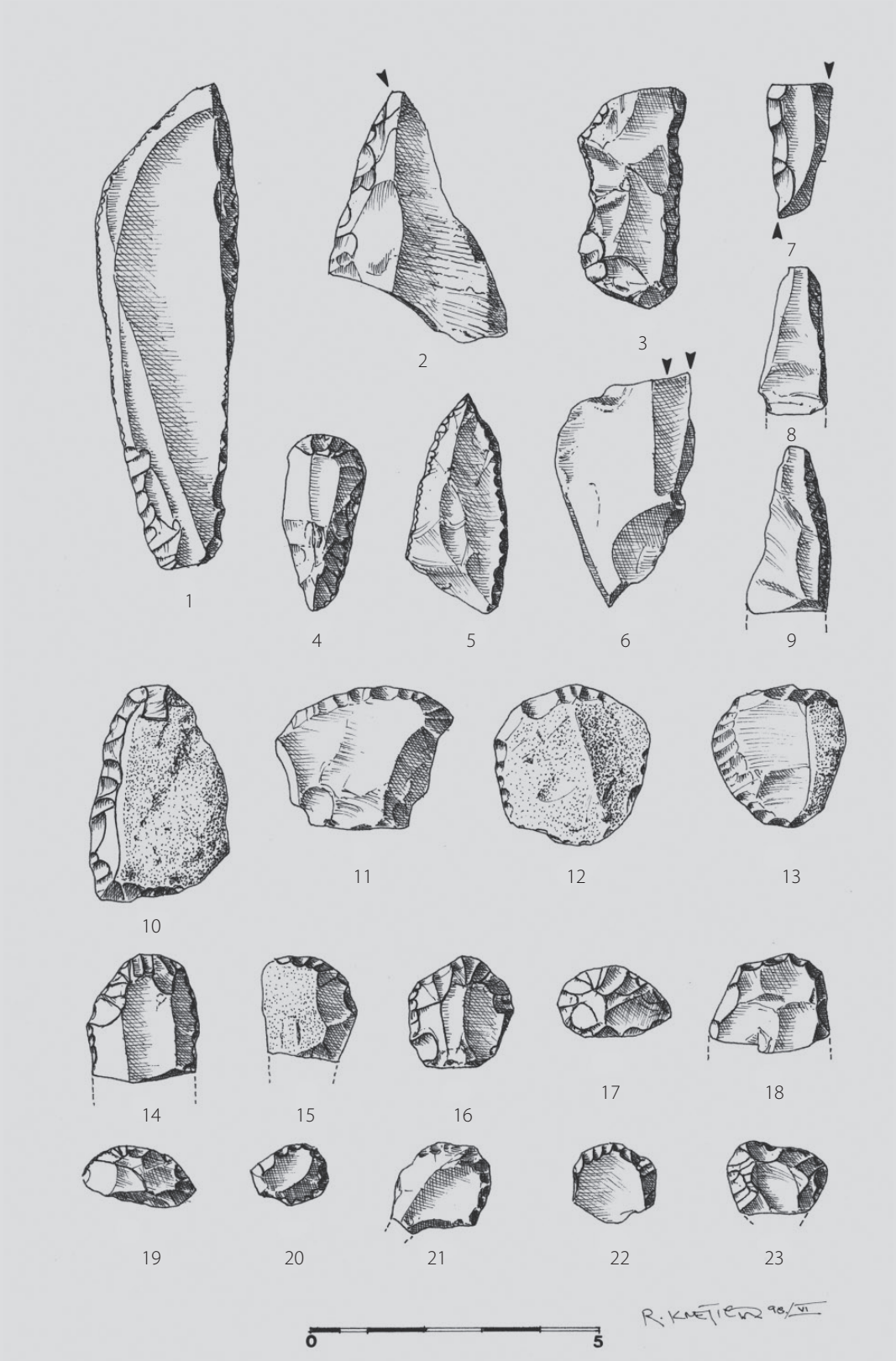
Table 13.
Numerical and percentage share of tool types in layer B/s

prisutni gravetijenski šiljci i polušiljci, a postotna zastupljenost gravetica više je nego dvostruko manja od zastupljenosti tog tipa u sloju B/d. Postotna zastupljenost pločica s hrptom nešto

the frequency of circular endscrapers is lower. Gravette points and atypical Gravette points are present in a small percentage, while the percentage of micro-Gravettes is less than half of the

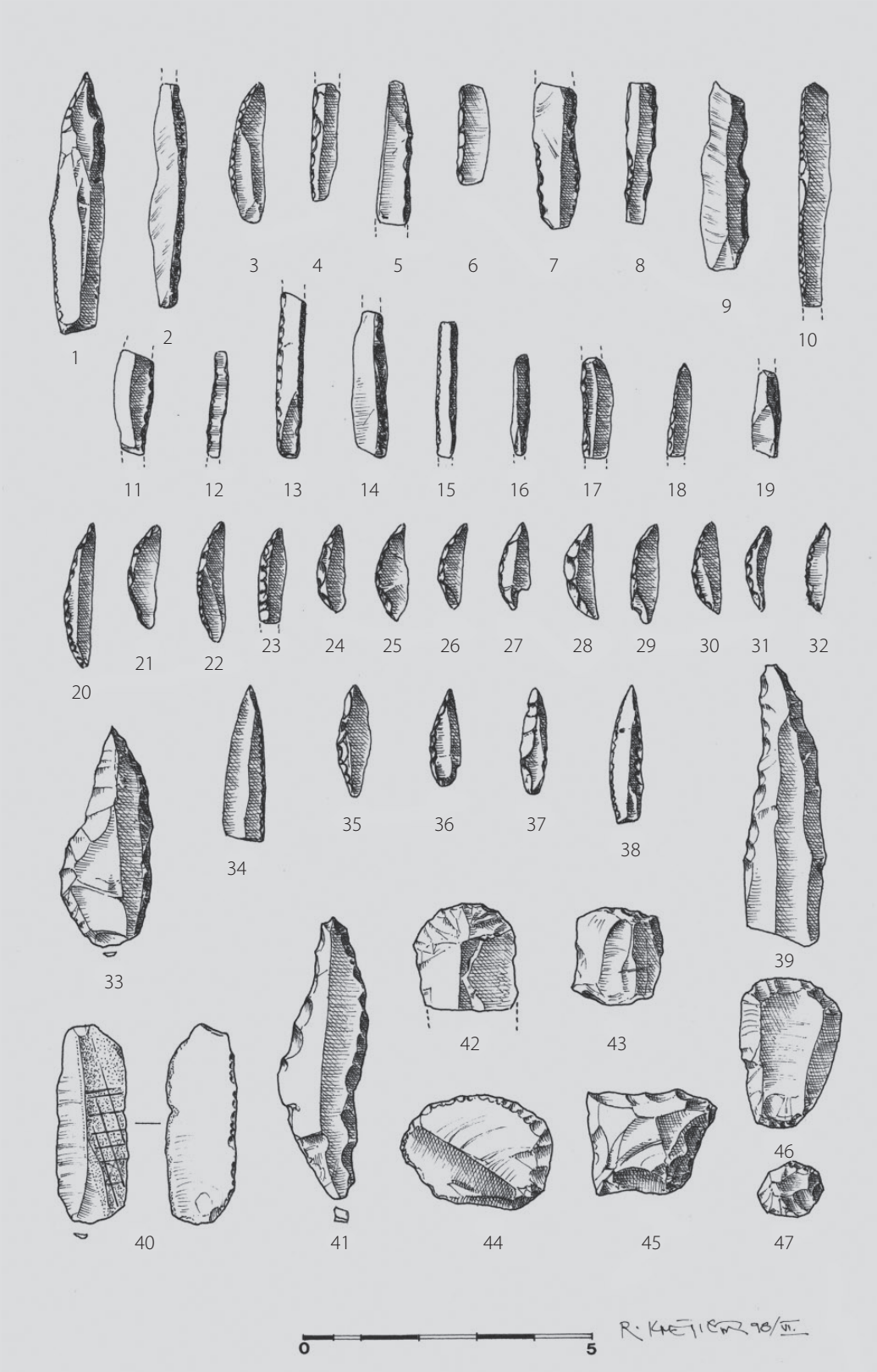
Slika 7.
Sloj B/s (kasni epigravetijen): 1-12 - sječiva. Mjerilo je u cm. Crtež: Krešimir Rončević

Figure 7.
Layer B/s (late Epigravettian): 1-12 - blades. Scale in cm. Sketch by: Krešimir Rončević.



Slika 8.
Sloj B/s (kasni epigravetijen): 1, 3 - komadići s obradbama na dvama rubovima, 2 - poprečno dubilo s bočnim zarupkom, 4, 14, 18 - grebala na obrađenom sječivu ili odbojku, 5 - svrdlo, 6 - jezgroliko dubilo, 7 - višestruko diedrično dubilo, 8, 9 - sječiva sa cjelovito zatupljenim rubom, 10 - dvostruko grebalo, 11, 15 - jednostavna grebala, 12, 13 - grebala na odbojku, 16, 17, 19-23 - noktolika grebala. Prema: Janković et al. 2011, slika 2. Mjerilo je u cm. Crtež: Krešimir Rončević

Figure 8.
Layer B/s (late Epigravettian): 1, 3 - pieces with two retouched edges, 2 - transverse burin on lateral truncation, 4, 14, 18 - endscrapers on retouched blade or flake, 5 - perforator, 6 - nucleiform endscraper, 7 - multiple dihedral burin, 8, 9 - complete backed blades, 10 - double endscraper, 11, 15 - simple endscrapers, 12, 13 - endscrapers on flakes, 16, 17, 19-23 - thumbnail endscrapers. Based on Janković et al. 2011, Fig. 2. Scale in cm. Sketch by: Krešimir Rončević.



Slika 9.
Sloj B/s (kasni epigravetijen): 1, 38 - svrdla, 2, 4-6, 10-12, 14, 16, 17, 19 - pločice s hrptom, 3, 23, 29, 34-37 - azilijenski šiljci, 7 - pločica s urezom, 8 - pravokutnik, 9 - nazubljena pločica, 13, 15 - zarubljene pločice s hrptom, 18 - gravetica, 20-22, 24-28, 30-32 - kružni segmenti, 33 - gravetijenski šiljak, 39, 41 - svrdlenice, 40 - komadić s obradbom na jednom rubu (i urezanim mrežastim motivom na okorini, 42, 43, 46 - jednostavna grebala, 44, 45 - grebala na odbojku, 47 - kružno grebalo. Prema: Janković et al. 2011, slika 3. Mjerilo je u cm. Crtež: Krešimir Rončević

Figure 9.
Layer B/s (late Epigravettian): 1, 38 - perforators, 2, 4-6, 10-12, 14, 16, 17, 19 - backed bladelets, 3, 23, 29, 34-37 - Azilian points, 7 - notched bladelet, 8 - rectangle, 9 - denticulated bladelet, 13, 15 - truncated backed bladelets, 18 - micro-Gravette, 20-22, 24-28, 30-32 - circular segments, 33 - Gravette point, 39, 41 - atypical perforators, 40 - piece retouched on one edge (and engraved lattice motif on cortex), 42, 43, 46 - simple endscrapers, 44, 45 - endscrapers on flakes, 47 - circular endscraper. Based on Janković et al. 2011, Fig. 3. Scale in cm. Sketch by: Krešimir Rončević.

je manja od one u prethodnom sloju, ali u ovoj je razini približno dvostruko veća postotna zastupljenost azilijenskog šiljka u odnosu na sloj B/d. Javljaju se i geometrijske forme (kružni segmenti i pravokutnici). Ova industrija također pripada kasnom epigravetijenu, premda se po manjoj zastupljenosti grebala, gravetica i pločica s hrptom, te po prisutnosti geometrijskih formi razlikuje od sloja B/d. To je možda odraz nešto drugačije djelatnosti šandaljskih lovaca i skupljača, koja je mogla biti sezonski uvjetovana, u usporedbi s ranijim slojem ovog kompleksa (B/d). Na okorini jedne alatke iz sloja B/s urezan je mrežasti motiv (sl. 9, 40). Pripadnost industrije kasnom epigravatijenu potvrđuje rezultat datiranja sloja B/s na 12320±100 godina prije sadašnjosti.[65]

Sloj B/g

Sloj B/g najgornji je dio kompleksa B. Od 2351 litičkih rukotvorina (tablica 14) iz ovog sloja 1914 komada (81,41 %) su neobrađeni primjerci, a alatki je 437 (18,59 %). U kategoriju jezgara za odbojke uvrštene su one loše izrađene. Morfologija im je između jezgri i krhotina. Neke od njih imaju tragove malih odbojaka koji su se odlomili pri pokušajima da se odlomi normalan odbojak, druge su samo s jednim tragom koji nije izrazit, a ima i debelih, s nejasnim smjerovima loma. Kao i u svim slojevima Šandalje, i ovdje među lomljevinskim materijalom prevladavaju odbojci. Pločica je znatno više od sječiva (koja uključuju i slomljene komadiće koji su vjerojatno izvorno bili veći od 3 cm). Krhotine su značajno zastupljene. Prisutan je okorinski materijal te odbojčići. Lomljevinski materijal, zajedno s jezgrama, i u ovoj razini upućuje na prisutnost različitih faza tijekom proizvodnje alatki. Tehnika izradbe sječiva izravnim odbijanjem i dalje je prisutna (čest je usnati plohak). Samo je jedna jezgra za sječiva pretvorena u alatku. S obzirom na zastupljenost sječiva s okorinom i bez okorine, postoji mogućnost da su neke jezgre, nakon odbijanja sječiva, dalje korištene za dobivanje pločica. Moguće je također da je dio jezgara za sječiva odnesen kako bi se na nekom drugom mjestu, možda daleko od kvalitetnih izvora sirovina, mogla dobiti sječiva i na njima izraditi alatke.

I u ovom sloju među alatkama (tablica 15; sl. 10, 11) prevladavaju komadići s obrađenim rubovima. Onih s obradbom na jednom rubu više je od onih s obradbom na dvama rubovima. Djelomično obrađenih komadića i onih s djelomičnom sitnom obradbom više je od onih s obradbom na jednom rubu. Prisutne su pločice s obradbom i pločice sa sitnom obradbom. Grebala su mnogobrojna, a među njima dolaze noktolika i kružna, tipična za epigravetijen. Udio različitih tipova svrdala veći je u usporedbi sa slojem B/s. Zastupljenost gravetica nije velika i gotovo je istovjetna kao u sloju B/s, dok su pločice s hrptom postotno nešto više zastupljene u odnosu na navedeni sloj. Od geometrijskih oblika najviše je kružnih segmenata, čija je zastupljenost vrlo slična onoj iz sloja B/s. Ostali geometrijski oblici (trokut,

65 Malez, Vogel 1969.

percentage of this type in layer B/d. The percentage of bladelets is less than in the preceding layer, but in this level the presence of Azilian points is approximately twice as high as in layer B/d. Geometric forms (circular segments and rectangles) also appear. This industry is also late Epigravettian, although it differs from layer B/d based on the lesser presence of endscrapers, micro-Gravettes and backed bladelets. This may be a reflection of the somewhat different activities of the Šandalja hunters and gatherers, which may have been contingent on the seasons, in comparison to the earlier layer of this complex (B/d). The cortex of a tool from layer B/s features an engraved lattice motif (Fig. 9, 40). This industry's classification as late Epigravettian has been confirmed by the dating of layer B/s to 12320±100 years BP.[65]

Layer B/g

Layer B/g is the uppermost part of complex B. Out of the 2,351 stone artifacts (Table 14) from this layer, 1,914 (81.41%) are unretouched pieces, while there are 437 tools (18.59%). The flake core category includes those that are poorly retouched. Their morphology lies between cores and chunks. Some of them have traces of small flakes which were knapped off in attempts to break off normal flakes, others only have a single trace which is not prominent, and there are also thicker ones with unclear knapping directions. As in all layers at Šandalja, here flakes also predominate among the débitage. There are considerably more bladelets than blades (which includes the broken pieces there were originally probably longer than 3 cm). Chunks are present to a considerable degree. Decortication material and small flakes are present. Débitage, together with cores, indicate the presence of different phases of tool production at this level as well. The direct soft hammer percussion technique to make blades is still present (the lipped butt is frequent). There is only one blade core, which was transformed into a tool. Given the presence of blades with and without cortex, there is a possibility that after knapping of blades, some cores were further used to derive bladelets. It is also possible that a portion of the blade cores were taken so that blades could be obtained and tools could be made on them at some other location, perhaps far from quality sources of raw materials.

In this layer as well, among the tools (Table 15; Fig. 10, 11) pieces with retouched edges predominate. Those with one retouched edge are the most numerous, more numerous than those with two edges retouched. Partially and partially marginally retouched pieces are more numerous than those with one completely retouched edge. Retouched and marginally retouched bladelets are present. Endscrapers are numerous, and among them there are thumbnail and circular endscrapers typical of the Epigravettian. The share of different types of perforators is higher in comparison with layer B/s. The presence of micro-Gravettes is not high and almost identical to that in layer B/s, while backed bladelets have a somewhat higher percentage share than in the aforementioned layer. Among the geometric forms, the most common are circular segments, the share of which is similar

65 Malez, Vogel 1969.

	Šandalja II B/g	neobrađenih		obrađenih		neobrađenih	obrađenih
		količina	%	količina	%	težina (g)	težina (g)
0	gomolj/valutica		0,00%		0,00%		
1	odbojak s okorinom	307	13,06%	64	2,72%	969,8	340,1
2	sječivo s okorinom	19	0,81%	28	1,19%	60,2	133,2
3	pločica s okorinom	33	1,40%	12	0,51%	21,6	7,3
4	odbojak	573	24,37%	117	4,98%	890,4	342,2
5	sječivo	99	4,21%	77	3,28%	174,9	98,2
6	pločica	191	8,12%	121	5,15%	99,2	78,9
7	jezgra za odbojke	39	1,66%	1	0,04%	571,0	7,4
8	jezgra za sječiva		0,00%	1	0,04%		3,8
9	jezgra za pločice	34	1,45%		0,00%	269,8	
10	mješovita jezgra	16	0,68%		0,00%	280,1	
11	ulomak jezgre	2	0,09%	1	0,04%	21,6	17,1
12	iskrzani komad	1	0,04%		0,00%	7,0	
13	krijestasti komad	1	0,04%	3	0,13%	1,8	3,4
14	dotj. odbojak jezgre	33	1,40%		0,00%	153,0	
15	odbojčić	113	4,81%		0,00%	27,3	
16	iver dubila	11	0,47%		0,00%	6,9	
17	krhotina	426	18,12%	7	0,30%	3207,6	43,3
18	okrhak	11	0,47%		0,00%	3,9	
19	neodredivo	5	0,21%	5	0,21%	5,1	5,3
	ukupno	1914	81,41%	437	18,59%	6771,2	1080,2
	ukupno neobr.+obr.	2351					

	Šandalja II B/g	unretouched		retouched		unret.	ret.
		No	%	No	%	weight (g)	weight (g)
0	pebble/nodule/cobble		0.00%		0.00%		
1	decortication flake	307	13.06%	64	2.72%	969.8	340.1
2	decortication blade	19	0.81%	28	1.19%	60.2	133.2
3	decortication bladelet	33	1.40%	12	0.51%	21.6	7.3
4	flake	573	24.37%	117	4.98%	890.4	342.2
5	blade	99	4.21%	77	3.28%	174.9	98.2
6	bladelet	191	8.12%	121	5.15%	99.2	78.9
7	flake core	39	1.66%	1	0.04%	571.0	7.4
8	blade core		0.00%	1	0.04%		3.8
9	bladelet core	34	1.45%		0.00%	269.8	
10	mixed core	16	0.68%		0.00%	280.1	
11	core fragment	2	0.09%	1	0.04%	21.6	17.1
12	splintered piece	1	0.04%		0.00%	7.0	
13	crest	1	0.04%	3	0.13%	1.8	3.4
14	core renewal flake	33	1.40%		0.00%	153.0	
15	small flakes	113	4.81%		0.00%	27.3	
16	burin spall	11	0.47%		0.00%	6.9	
17	chunk	426	18.12%	7	0.30%	3207.6	43.3
18	shatter	11	0.47%		0.00%	3.9	
19	unidentified	5	0.21%	5	0.21%	5.1	5.3
	total	1914	81.41%	437	18.59%	6771.2	1080.2
	total unret. + ret.	2351					

Tablica 14.
Brojčana i postotna zastupljenost proizvodnih kategorija u sloju B/g

Table 14.
Numerical and percentage share of production categories in layer B/g

pravokutnik, trapez) zastupljeni su u maloj mjeri ili ih uopće nema (romb). Postotna zastupljenost azilijenskih šiljaka veća je od one u prethodnom sloju.

Nekoliko ulomaka keramike nosi oznaku ovog sloja, no oni su u ovaj sloj bili potisnuti iz sloja A, koji je dao više ulomaka keramičkih posuda. Isti je slučaj primijećen i kod nekih faunskih nalaza.[66] Miješanje je vjerojatno izazvano stratigrafskim hijatom i/

to that in layer B/s. The remaining geometric forms (triangle, rectangle, trapezium) are minimally present or they are absent (rhombs). The percentage share of Azilian points is higher than in the preceding layer.

Several potsherds bear this layer's designation, however they were pushed into this layer from layer A, which yielded more potsherds. The same case was noted for certain fauna finds.[66] The mixing was probably caused by a stratigraphic hiatus and/or

66 Brajković, Miracle 1997.

66 Brajković, Miracle 1997.

	Šandalja II sloj B/g		
	tip	**količina**	**postotak**
1	jednostavno grebalo	23	5,26%
2	grebalica	5	1,14%
3	dvostruko grebalo	4	0,92%
5	grebalo na obrađenom sječivu ili odbojku	11	2,52%
8	grebalo na odbojku	9	2,06%
9	kružno grebalo	3	0,69%
10	noktoliko grebalo	15	3,43%
15	jezgroliko grebalo	2	0,46%
19	dubilo-zarubljeno sječivo	1	0,23%
20	svrdlo-zarubljeno sječivo	1	0,23%
23	svrdlo	12	2,75%
24	svrdlenica	10	2,29%
25	višestruko svrdlo	2	0,46%
26	svrdlić	3	0,69%
27	diedrično srednje udbilo	1	0,23%
30	diedrično kutno dubilo na sječivu	3	0,69%
31	višestruko diedrično dubilo	2	0,46%
36	dubilo s udubljeno obrađenim zarupkom	1	0,23%
37	dubilo s izbočeno obrađenim zarupkom	1	0,23%
44	plošno dubilo	1	0,23%
50	gravetica	9	2,06%
53	grbav komadić s otupljenim rubom	2	0,46%
54	strelica	1	0,23%
55	šiljak s produžetkom	1	0,23%
58	sječivo s cjelovito zatupljenim rubom	5	1,14%
59	sječivo s djelomično zatupljenim rubom	7	1,60%
60	komadić s ravno obrađenim zarupkom	1	0,23%
61	komadić s koso obrađenim zarupkom	3	0,69%
63	komadić s izbočeno obrađenim zarupkom	3	0,69%
65	komadić s obradbom na jednom rubu	42	9,61%
66	komadić s obradbom na dvama rubovima	21	4,81%
74	komadić s urezom	17	3,89%
75	nazubljeni komadić	8	1,83%
76	iskrzani komadić	15	3,43%
77	strugalo	7	1,60%
78	strugalica	4	0,92%
79	trokut	1	0,23%
80	pravokutnik	1	0,23%
81	trapez	1	0,23%
83	kružni segment	13	2,97%
84	zarubljena pločica	2	0,46%
85	pločica s hrptom	26	5,95%
86	zarubljena pločica s hrptom	6	1,37%
89	pločica s urezom	5	1,14%
91	azilijenski šiljak	14	3,20%
92	djelomično obrađen komadić	37	8,47%
93	komadić s djelomičnom sitnom obradbom	30	6,86%
94	pločica s obradbom	13	2,97%
95	pločica sa sitnom obradbom	5	1,14%
96	neodredivi obradak	22	5,03%
97	razno	5	1,14%
	ukupno	437	100,00%

Tablica 15.
Brojčana i postotna zastupljenost tipova alatki u sloju B/g

	Šandalja II level B/g		
	type	**quantity**	**%**
1	simple endscraper	23	5,26%
2	atypical endscraper	5	1,14%
3	double endscraper	4	0,92%
5	endscraper on retouched flake	11	2,52%
8	endscraper on flake	9	2,06%
9	circular endscraper	3	0,69%
10	thumbnail endscraper	15	3,43%
15	nucleiform endscraper	2	0,46%
19	burin - truncated blade	1	0,23%
20	perforator - truncated blade	1	0,23%
23	perforator	12	2,75%
24	atypical perforator (bec)	10	2,29%
25	mulitiple perforator	2	0,46%
26	micro-perforator	3	0,69%
27	straight dihedral burin	1	0,23%
30	angle burin on break	3	0,69%
31	mulitple dihedral burin	2	0,46%
36	burin on a concave truncation	1	0,23%
37	burin on convex truncation	1	0,23%
44	flat burin	1	0,23%
50	micro gravette	9	2,06%
53	backed gibbous piece	2	0,46%
54	arrowhead	1	0,23%
55	tanged point	1	0,23%
58	complete backed blade	5	1,14%
59	partly backed blade	7	1,60%
60	straight truncation	1	0,23%
61	piece with oblique retouched truncation	3	0,69%
63	piece with convex truncation	3	0,69%
65	continuously retouched piece - one edge	42	9,61%
66	continuously retouched piece - two edges	21	4,81%
74	nothced piece	17	3,89%
75	denticulated piece	8	1,83%
76	splintered piece	15	3,43%
77	sidescraper	7	1,60%
78	raclette	4	0,92%
79	triangle	1	0,23%
80	rectangle	1	0,23%
81	trapeze	1	0,23%
83	circular segment	13	2,97%
84	truncated bladelet	2	0,46%
85	backed bladelet	26	5,95%
86	truncated backed bladelet	6	1,37%
89	notched bladelet	5	1,14%
91	Azilian point	14	3,20%
92	partialy retouched piece	37	8,47%
93	picece with partly marginal retouch	30	6,86%
94	retouched bladelet	13	2,97%
95	bladelet with marginal retouch	5	1,14%
96	unidentifiable pieces	22	5,03%
97	diverse	5	1,14%
	total	437	100,00%

Table 15.
Numerical and percentage share of tool types in layer B/g

ili intenzivnim hodanjem po razini A.[67]

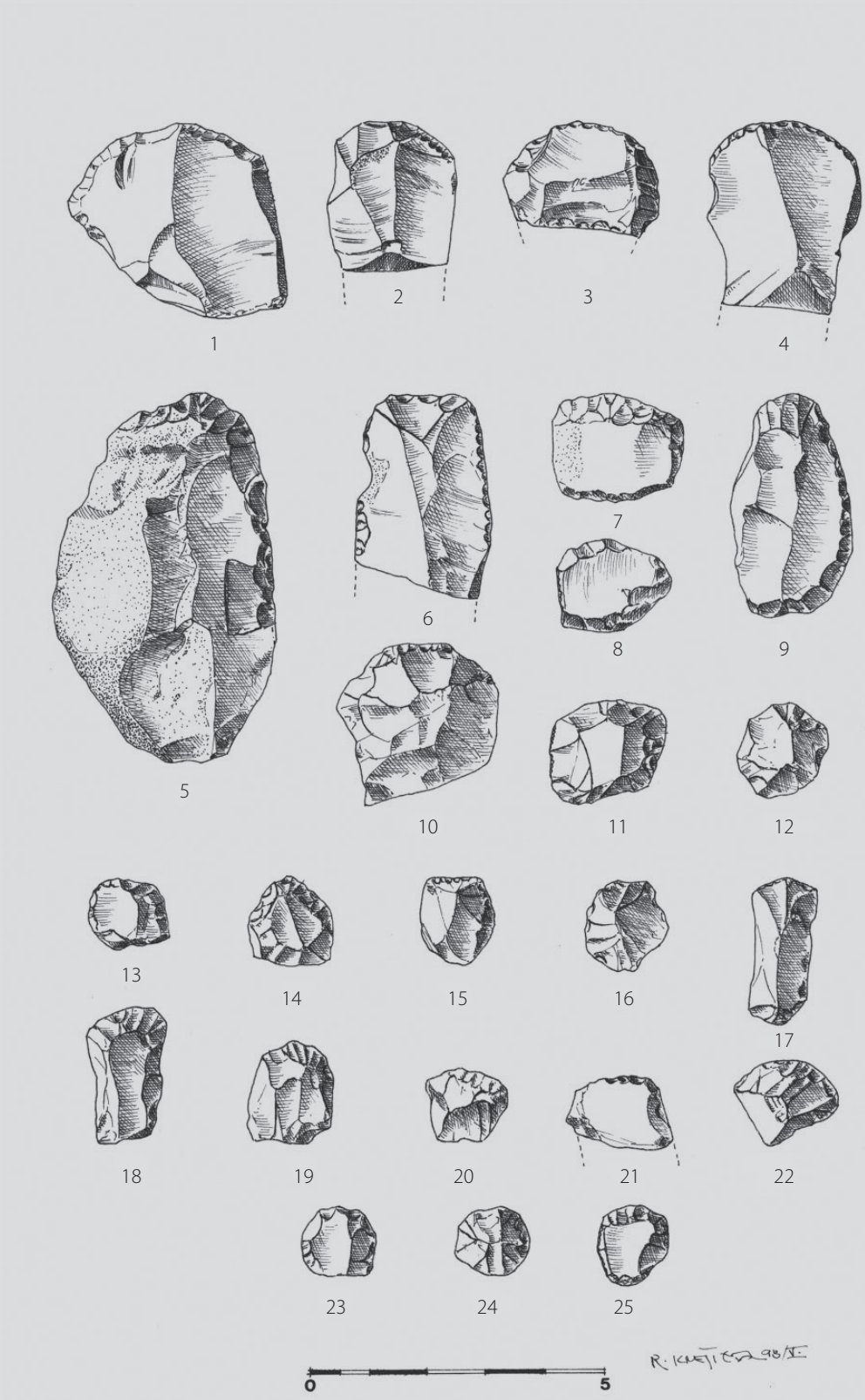
Zastupljenost pojedinih tipova alatki gotovo je istovjetna onoj iz sloja B/s te možemo reći da se radi o istoj kulturnoj manifestaciji, a možda i istoj djelatnosti lovaca iz ovih dviju razina.

intense walking upon level A.[67]

The share of individual tool types is almost identical to that from layer B/s, and it may be said that this is the same cultural phenomenon, and possibly the same hunting activities from these

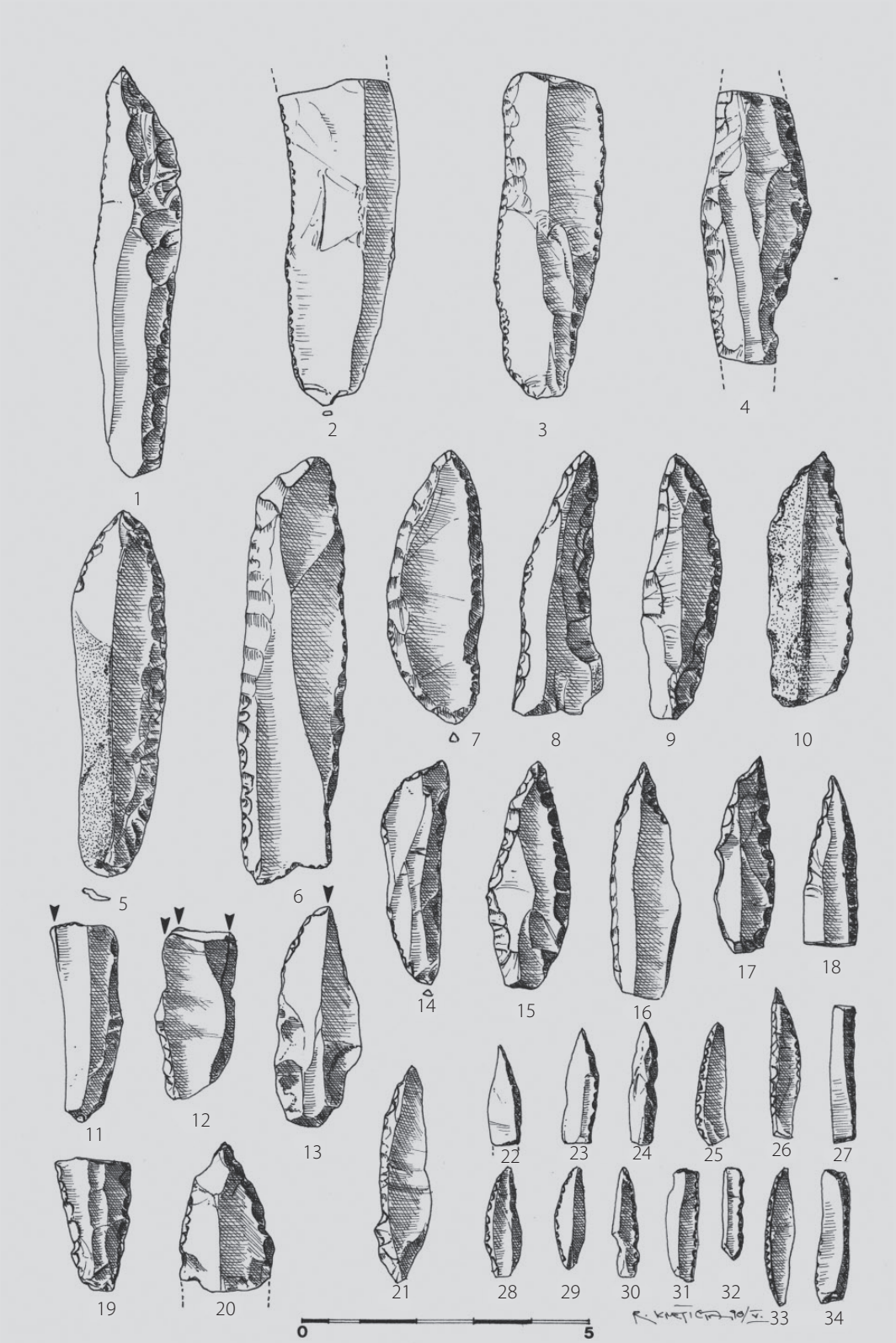
67 Za taj fenomen vidi Villa, Courtin 1983.

67 For this phenomenon, see Villa, Courtin 1983.



Slika 10.
Sloj B/g (kasni epigravetijen): 1, 3, 8, 10 - grebala na odbojcima, 2, 4, 7, 18 - jednostavna grebala, 5, 6 - grebala na obrađenom sječivu ili odbojku, 9, 17 - dvostruka grebala, 11, 24, 25 - kružna grebala, 12-16, 19-23 - noktolika grebala. Mjerilo je u cm. Crtež: Krešimir Rončević

Figure 10.
Layer B/g (late Epigravettian): 1, 3, 8, 10 - endscrapers on flakes, 2, 4, 7, 18 - simple endscrapers, 5, 6 - endscrapers on retouched blade or flake, 9, 17 - double endscrapers, 11, 24, 25 - circular endscrapers, 12-16, 19-23 - thumbnail endscrapers. Scale in cm. Sketch by: Krešimir Rončević.



Slika 11.
Sloj B/g (kasni epigravetijen): 1, 10, 15, 16, 18, 20 - svrdla, 2 - komadić s obradbom na jednom rubu, 3-5, 19 - komadići s obradbom na dvama rubovima, 6, 14 - komadići s izbočeno obrađenim zarupkom, 7 - grebalo na obrađenom sječivu ili odbojku, 8, 9 - svrdlenice, 11 - dubilo-zarubljeno sječivo, 12 - višestruko diedrično dubilo, 13 - dubilo s izbočeno obrađenim zarupkom, 17 - grebalo-dubilo, 21-25, 28 - azilijenski šiljci, 26, 30 - gravetice, 27, 31 - zarubljene pločice s hrptom, 29, 33 - kružni segmenti, 32 - pločica s hrptom, 34 - pravokutnik. Mjerilo je u cm. Crtež: Krešimir Rončević

Figure 11.
Layer B/g (late Epigravettian): 1, 10, 15, 16, 18, 20 - perforators, 2 - piece with one edge retouched, 3-5, 19 - pieces with two edges retouched, 6, 14 - pieces with convex truncation, 7 - endscraper on retouched blade or flake, 8, 9 - atypical perforators, 11 - burin-truncated blade, 12 - multiple dihedral burin, 13 - burin with convex truncation, 17 - endscraper-burin, 21-25, 28 - Azilian points, 26, 30 - micro-Gravettes, 27, 31 - truncated backed bladelets, 29, 33 - circular segments, 32 - backed bladelet, 34 - rectangle. Scale in cm. Sketch by Krešimir Rončević.

Sloj B/g datiran je 10830±50 godina prije sadašnjosti[68] i potvrđuje da se radi o kasnom epigravetijenu.

Kompleks B

Nekoliko je primjeraka lomljevine označeno samo oznakom kompleksa B. To su: jezgra za odbojke, jezgra za pločice, osam krhotina, dva odbojka s okorinom, osam odbojaka i jedna pločica. Ne zna se iz koje razine kompleksa B ovi nalazi potječu.

Sloj A/d i humus

Iz sloja A, ponekad je posebno naznačen donji dio tog sloja (A/d), potječe više ulomaka litičke lomljevine i keramike. Na keramici se javlja i oznaka humus, a već je navedeno da se nekoliko ulomaka našlo u razini B/g kamo su mogli biti potisnuti iz sloja A. Uglavnom se radi o ulomcima keramičkih posuda izrađenima od gline s dosta primjesa kalcita. Boja ulomaka je crvenosmeđa, a površina je grubo obrađena, uglavnom neuglačana. Prema obliku ručke jedan bi ulomak pripadao razdoblju srednjega brončanog doba.[69]

4.2. Sirovine litičkih rukotvorina

4.2.1. Kategorije sirovina

J. Zupanič[70] je rožnjake Šandalje podijelila prema strukturi i sastavu u četiri skupine. Ovdje ponajprije donosimo 11 kategorija (i kategoriju razno) uspostavljenih makroskopski, isključivo prema boji i prozirnosti, a potom je od svake kategorije odabran najmanje jedan tipični predstavnik (ukupno 16) za daljnju makroskopsku i mikroskopsku analizu.

Kategorija 1: U ovu skupinu spadaju svijetlosivi i tamnosivi varijeteti rožnjaka koji su svjetlonepropusni i mat površine.

Kategorija 2: Svjetlonepropusna siva sirovina izražene laminarne strukture, mat površine.

Kategorija 3: Prema boji u ovoj skupini možemo razlikovati 4 varijeteta: bjelkasti, svijetlosivi, sivoplavi i sivocrni. Svi varijeteti su djelomično svjetlopropusni i neprozirni s izraženim sjajem. Kod svijetlosivih i sivoplavih varijeteta vidljive su bjelkaste točkice u strukturi materijala.

Kategorija 4: Sirovina medenožute boje, svjetlopropusna, neprozirna, izraženog sjaja.

two levels. The dating of layer B/g is 10830±50 years BP[68] and confirms that this was a case of the late Epigravettian.

Complex B

Several specimens of débitage are marked only with the designation of complex B. These are: flake core, bladelet core, eight chunks, two flakes with cortex, eight flakes and one bladelet. The levels in complex B in which these finds originated is not known.

Layer A/d and humus

Several fragments of lithic débitage and pottery originated in layer A, sometimes the specially designated lower part of this layer (A/d). The designation humus also appears on the pottery, and it has already been stated that several fragments were found in level B/g whence they may have been pushed from layer A. Generally these are potsherds made of clay with considerable calcite temper. The colour of the potsherds is red-brown, and the surface is coarsely worked and generally unpolished. Based on the shape of a handle, one potsherd belong to the Middle Bronze Age.[69]

4.2. Lithic raw material

4.2.1. Raw material categories

J. Zupanič[70] classified the cherts of Šandalja into four groups according to structure and composition. Here we are first and foremost presenting 11 categories (and the miscellaneous category) ascertained macroscopically, based exclusively on colour and translucence, and then at least one representative from each category (16 in total) have been chosen for further macroscopic and/or microscopic analysis.

Category 1: Light gray and dark gray chert varieties with opaque and matte surfaces belong to this group

Category 2: Opaque gray raw material with notable laminary structure, matte surface

Category 3: Based on colour, 4 varieties can be distinguished in this group: whitish, light gray, gray-blue and gray-black. All varieties are partially translucent and opaque with notable lustre. In the light-gray and gray-blue varieties, whitish dots in the structure of the material are visible

Category 4: Raw material is honey-yellow, translucent, opaque, with notable lustre

68 Malez, Vogel 1969.
69 Usmeno priopćenje S. Karavanić.
70 Zupanič 1975.

68 Malez, Vogel 1969.
69 S. Karavanić personal communication.
70 Zupanič 1975.

Kategorija 5: Sirovina crvene do crvenosmeđe boje, djelomično svjetolopropusna, neprozirna, sjajne površine.

Kategorija 6: Sirovina tamnozelene boje, djelomično svjetolopropusna, neprozirna

Kategorija 7: Ovoj skupini pripadaju dva varijeteta prema boji, zelenosivi i smeđesivi. Oba su varijeteta djelomično svjetlopropusna, neprozirna i sjajna.

Kategorija 8: Sirovina sivocrne boje, djelomično svjetlopropusna, neprozirna i sjajna.

Kategorija 9: Sirovina smeđe boje, djelomično svjetolopropusna, neprozirna i sjajna.

Kategorija 10: Sirovina sive, sivozelenkaste boje, djelomično svjetlopropusna, neprozirna, mat i glatke površine.

Kategorija 11: Sirovina sivozelenkaste boje, svjetlonepropusna, mat površine.

Razno: Skupina različite petrografije, u kojoj su artefakti koji na temelju makroskopskih odlika ne pripadaju nijednoj od definiranih skupina.

Prvi put se u sloju D javlja značajnija varijacija unutar sirovina (rožnjaci različitih boja) u usporedbi s ranijim orinjasijenskim slojevima, gdje izrazito dominira sivi, često patiniran rožnjak (kategorija 1).[71] Zbog miješanja orinjasijenskih i epigravetijenskih elemenata u ovom sloju detaljniji statistički pokazatelji ne bi nam dali realnu sliku te promjene. Stoga su podaci dani za mlađe slojeve (vidi tablice 16 i 17).

Sirovina 3 najučestalija je u slojevima C/d, C/s, C, B/C i B/d, a u istim je slojevima prema učestalosti na drugome mjestu sirovima 1 (Tablice 16 i 17). U sloju C/d nakon toga (na trećemu mjestu) slijedi sirovina 2, a potom 5, dok je u slojevima C/s, C, B/C i Bd na trećemu mjestu sirovina 5. Ta je sirovina na istome mjestu i u slojevima B/s i B/g, no za razliku od ranijih slojeva u njih je na prvome mjestu sirovina 1, a na drugome sirovima 3. U slojevima C/d, C/s, B/C, B/d i B/g vrlo su slični (ponegdje gotovo istovjetni) trendovi u učestalosti sirovine između odbojaka, sječiva i pločica, dok je u kompleksu C među odbojcima vidljiv isti trend učestalosti sirovine, a sječiva i pločice izrađuju se nešto češće od sirovine 5, iako je njezina učestalost u ovom kompleksu nešto niža od učestalosti sirovine 1. U sloju B/s među odbojcima učestalost sirovine odgovara cjelokupnoj učestalosti, dok su pločice i sječiva najviše proizvođeni od sirovine 3.

71 Karavanić 2003; Karavanić, Janković 2010.

Category 5: Raw material is red to red-brown, partially translucent, opaque, with shiny surface

Category 6: Raw material is dark green, partially translucent, opaque

Category 7: Two varieties based on colour, green-gray and brown-gray, belong to this group. Both varieties are partially translucent, opaque and shiny

Category 8: Raw material is gray-black, partially translucent, opaque and shiny

Category 9: Raw material is brown, partially translucent, opaque and shiny

Category 10: Raw material is gray, gray-green, partially translucent, opaque, matte and smooth surface

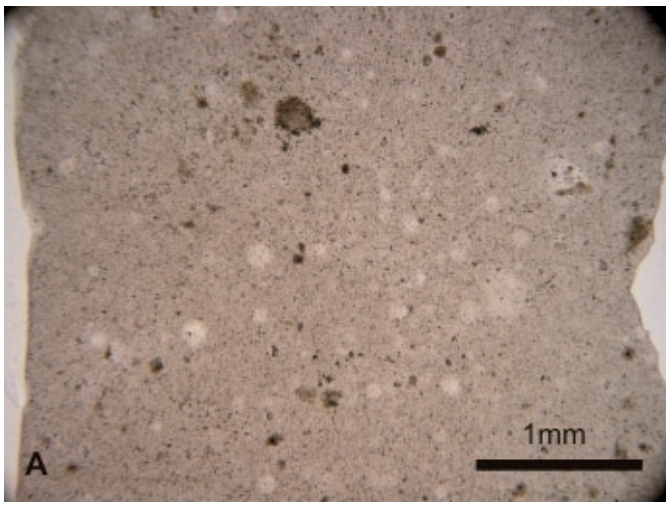
Category 11: Raw material is gray-green, non-translucent, matte surface

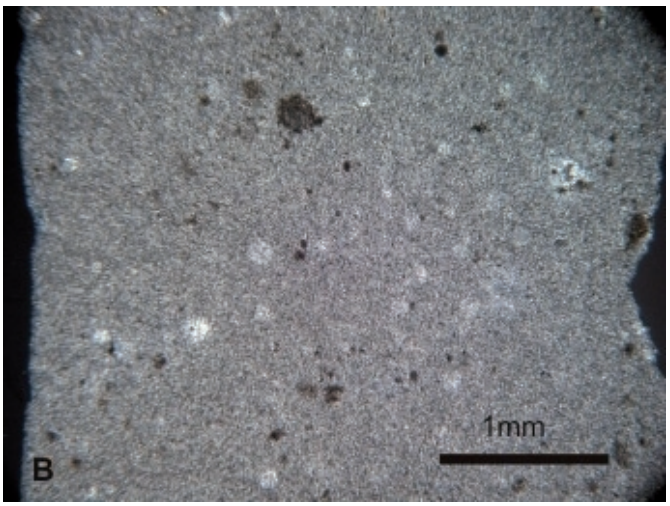
Miscellaneous: group with diverse petrography, in which the artefacts based on macroscopic traits do not belong to any of the defined groups

Considerable variation within a raw material (differently coloured cherts) appears for the first time in layer D in comparison to earlier Aurignacian layers, where gray, often patinated chert (category 1) is largely dominant.[71] Due to the mixture of Aurignacian and Epigravettian elements in this layer, more detailed statistical indicators would not yield a real picture of these changes. Thus, data are provided for younger layers (see Tables 16 and 17).

Raw material 3 is the most common in layers C/d, C/s, C, B/C and B/d, while in the same layers, based on frequency, the second most common raw material is 1 (Tables 16 and 17). In layer C/d, raw material 2 is next (in third place) and then 5, while in layers C/s, C, B/C and Bd raw material 5 is in third place. This raw material has the same rank in layers B/s and B/g, however, as opposed to earlier layers, as in them raw material 1 is in first place, while raw material 3 ranks second. In layers C/d, C/s, B/C, B/d and B/g there are very similar (sometimes virtually identical) trends in the frequency of raw materials between flakes, blades and bladelets, while in complex C the same trend in raw material frequency is visible, and blades and bladelets were mostly made of raw material 5, even though its frequency in this complex is somewhat lower than the frequency of raw material 1. In layer B/s, among the flakes the frequency of raw materials corresponds to the overall frequency, while bladelets and blades were mostly made of raw material 3.

71 Karavanić 2003; Karavanić, Janković 2010.





Slika 12a. / Slika 12b.
Mikroskopski izbrusak radiolarijskog rožnjaka matriksne potpore. Radiolarije su izmijenjene u mikrokvarc ili kalcedon i raspršene u matriksu od mikrokristaliničnog kvarca. A. Bez analizatora. B. S uključenim analizatorom.

Figure 12a. / Figure 12b.
Photomicrographs of radiolarian chert with matrix supported fabric. The radiolarians were preserved as microquartz or chalcedony or as individual quartz crystals and are scattered in the matrix of microcrystalline quartz. A) Plane-polarized light. B) Crossed polars

4.2.2. Petrografija sirovine litičkih rukotvorina

Šesnaest uzoraka kamenih artefakata pregledano je prvo pomoću binokularnog povećala s povećanjem 4x, 6,3x, 10x, 16x, 25x, a deset od njih, koji su se međusobno bitno razlikovali, odabrano je za izradu mikroskopskih izbrusaka. Izbrusci su pregledani pomoću polarizacijskog mikroskopa.

Kombinirano makroskopskom i mikrosopskom analizom utvrđeno je da su svi uzorci kamenih artefakata rožnjaci. To su uglavnom radiolarijski rožnjaci koji se razlikuju u nekim strukturnim i teksturnim značajkama, kao što su pakiranje, stratifikacija i sadržaj karbonatne komponente. Samo je jedan uzorak tzv. zamjenski rožnjak. On je u potpunosti nastao silicifikacijom vapnenca. Izdvojeni su sljedeći tipovi rožnjaka:

Rožnjaci mikrokristalinične osnove u kojoj se nalaze rasute i rijetko raspoređene radiolarije (matriksna potpora). Radiolarije su izmijenjene u mikrokvarc ili kalcedon (sl. 12) ili su sačuvane kao pojedinačni kristali kvarca. U nekim je uzorcima unutar matriksa uočena dispergirana organska materija i najvjerojatnije hematit. Ovaj tip rožnjaka predstavlja skupine uzoraka kategorija 3, 4, 7, 9 i vjerojatno 11 spomenutih gore.

Rožnjaci s izraženom stratifikacijom (sl. 13 A i B). Stratifikacija se očituje po izmjeni lamina različitog pakiranja, uglavnom sastavljenim od radiolarija, i po prisutnosti sitnije zrnatih, kriptokristaliničnih proslojaka (sl. 13A). Karbonatna komponenta rezultat je naknadne kalcitizacije već formiranih rožnjaka (sl. 13B). Uz radiolarije, koje prevladavaju, pojavljuju se i silicificirane globigerinidne foraminifere te sitni fragmenti školjkaša. Pojedine pukotine ispunjene su kalcedonom. Ova skupina rožnjaka predstavljala bi uzorke kategorija 1, 2 i 8.

Rožnjaci s gusto pakiranim radiolarijama zrnate potpore (sl. 14A i B) i mikrokristaliničnim i kriptokristaliničnim kvarcnim matriksom. Radiolarije su sačuvane kao mikrokvarc ili kalcedon. Ova bi skupina predstavljala uzorke kategorije 10.

4.2.2. Petrography of raw materials

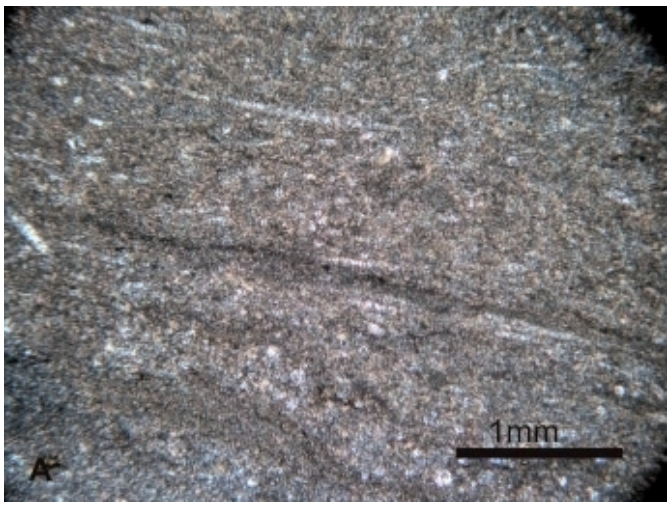
Sixteen samples of stone artefacts were first examined macroscopically and with the help of a stereo magnifier at magnifications of 4x, 6.3x, 10x, 16x, and 25x, which led to the reduction from 16 to 10 samples apparently differing one from another.

These ten samples were subsequenty studied using thin-sections and the polarising microscope. The combined macroscopic and microscopic examination ascertained that all samples of stone artefacts are cherts. These are mostly radiolarian cherts that differ in certain structural and textural traits, such as, the package, stratification and content of carbonate components. Only one of them shows that the silicification occurred by the replacement of an original limestone.

The following chert types have been distinguished:
cherts consisting of a microcrystalline matrix in which there are sparsely distributed radiolarians (matrix-supported). The radiolarians were preserved as microquartz or chalcedony (Fig. 12) or as individual quartz crystals. In some samples, dispersed organic matter and probable hematite have been observed. This chert type represents sample categories 3, 4, 7, 9 and probably 11 mentioned above.

Cherts with prominent stratification shown by alternating laminae containing radiolarians and those consisting of cryptocrystalline laminae (Fig. 13A). Besides radiolarians, which predominate, silicified globigerinid foraminifers, and tiny fragments of bivalves are also present. Individual fissures are filled with chalcedony. Some representatives of this chert type contain carbonate component which resulted from a secondary, calcitisation process (Fig. 13 B) This chert type represents samples categories 1, 2 and 8.

Cherts of grain-supported fabric with densely packed radiolarians (Fig. 14A and B), and a micro- and cryptocrystalline quartz matrix. The radiolarians may be preserved as micro-quartz or chalcedony. This chert type is regarded to represent the sample category 10.



Slika 13a. / Slika 13b.
Mikroskopski izbrusak rožnjaka karakteriziranog sa: A. Stratifikacijom - vidljive su lamine i leće vrlo fine zrnate ili kriptokristalinične strukture. Bez analizatora. B. Karbonatnom komponentom - kalcitni kristali (smećkasto) potiskuju mikrokvarcni matriks i/ili čestice (uglavnom radiolarije). S uključenim analizatorom.

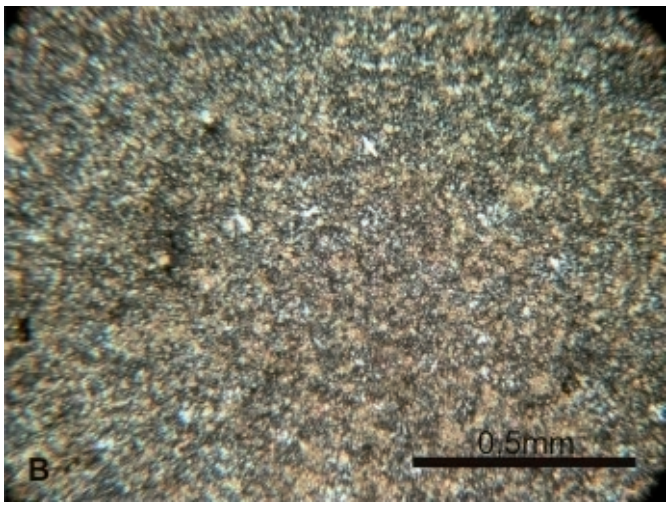
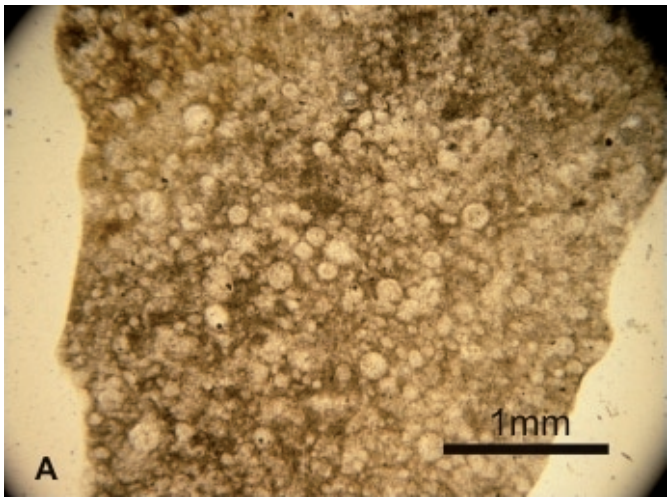


Figure 13a. / Figure 13b.
Photomicrographs of chert characterized by: A) stratification - laminae and lenses of very fine grained and cryptocrystalline structure. Plane-polarized light; B) carbonate component - micro-quartz matrix and/or particles (general radiolarian) are replaced by calcite crystals (brownish). Crossed polars.



Slika 14a. / Slika 14b.
Mikroskopski izbrusak rožnjaka karakteriziranog gustim pakiranjem radiolarija i jasno izraženom zrnatom potporom. A. Bez analizatora. B. S uključenim analizatorom.

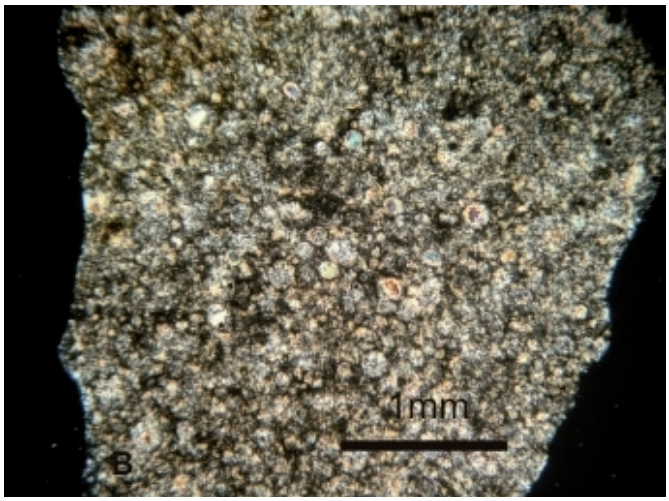


Figure 14a. / Figure 14b.
Photomicrographs of chert characterized by dense package of radiolarians and clearly expressed grain-supported fabric. A) Plane-polarized light. B) Crossed polars.

Rožnjaci koji uz radiolarije sadrže i spikule spužvi. Čestice su rasute u mikrokvarcnoj osnovi (matriksna potpora) (sl. 15). Ova bi skupina predstavljala uzorke kategorije 6.

Dijagenetski rožnjak. U osnovi izgrađenoj od mikrokristaliničnog kvarca nalaze se silicificirane planktonske foraminifere (sl. 16A i B), te vrlo rijetke radiolarije. Rožnjak je u potpunosti nastao silicifikacijom vapnenačkog sedimenta. Primarno je to bio vapnenac tipa vekston. Ovaj tip rožnjaka predstavlja skupinu uzoraka kategorije 5.

Petrografske analize pokazuju da su ljudi koji su nastanjivali špilju Šandalju izrađivali svoje alatke od rožnjaka.[72] Uspoređujući

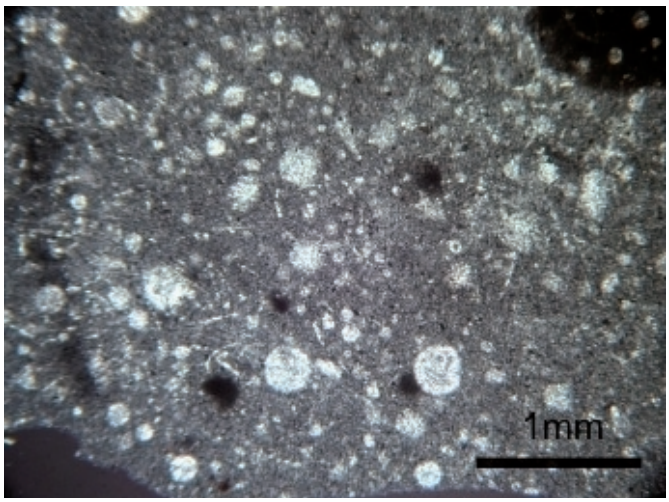
Cherts containing radiolarians and sponge spicules scattered in a micro-quartz matrix (matrix-supported fabric) (Fig. 15). This chert type corresponds to the sample category 6.

Diagenetic chert. Matrix built of microcrystalline quartz contains partly preserved silicified planktonic foraminifers (Fig. 16A and B), and a very few radiolarians. Hence, this chert originated by silicification of original lime wackestone. This chert type corresponds to the sample category 5.

Petrographic analyses have shown that the people who resided in Šandalja cave made their tools from chert.[72] Comparing the

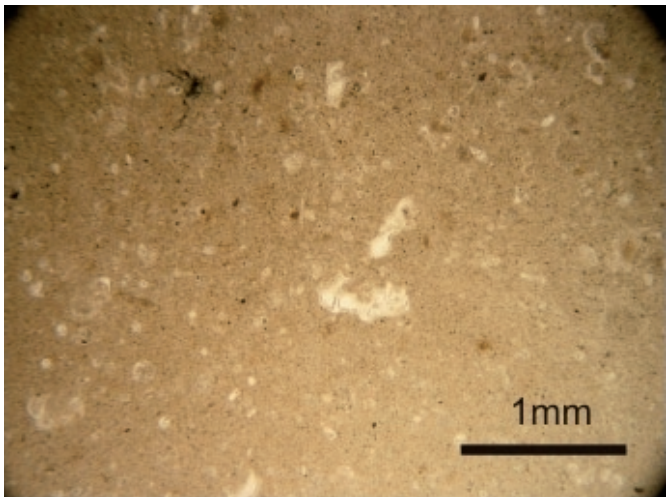
72 U ranijoj analizi sirovina J. Zupanič je ustanovila i prisutnost tufova, vidi Zupanič 1975.

72 In an earlier analysis of the raw materials, J. Zupanič also ascertained the presence of tuffs, see Zupanič 1975.



Slika 15.
Mikroskopski izbrusak rožnjaka koji uz radiolarije sadrži i spikule spužvi. Radiolarije su sačuvane kao mikrokristalinični kvarc. S uključenim analizatorom.

Figure 15.
Photomicrograph of chert which besides radiolarians also contains sponge spicules. The radiolarians are preserved as microcrystalline quartz. Crossed polars.



Slika 16a. / Slika 16b.
Mikroskopski izbrusak zamjenskog rožnjaka, nastalog silicifikacijom vapnenačkog sedimenta. U osnovi od mikrokristaliničnog kvarca vidljive su silicificirane planktonske foraminifere, te rijetke radiolarije. A. bez analizatora; B. s uključenim analizatorom.

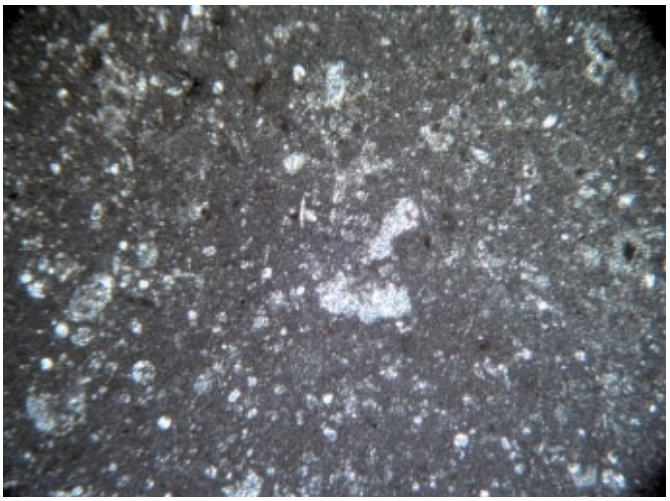


Figure 16a. / Figure 16b.
Photomicrographs of diagenetic chert, formed by silicification of limestone sediments. Silicified planktonic foraminifers and a very few radiolarians are visible in the microcrystalline quartz matrix. A) Plane-polarized light. B) Crossed polars.

petrografske značajke rožnjačkih artefakata iz špilje s rožnjacima iz okolnih izdanaka vapnenaca, može se zaključiti da su barem neke od sirovina bile dostupne u blizini same špilje. Proslojci, leće i nodule rožnjaka sličnog sastava nalaze se unutar turonskih vapnenaca, odnosno prema novijoj odredbi starosti u srednje cenomanskim do gornjocenomanskim dobro uslojenim vapnencima južne Istre (npr: lokalitet Premantura u blizini Pule), te u najgornjim dijelovima jedinice Kirmenjak iz gornje jure (npr: lokalitet Zlatni rt, kod Rovinja).[73] U većini takvih slučajeva rožnjačke nodule ili konkrecije, zbog svoje veće otpornosti na kemijsko i

petrographic characteristics of the chert artefacts from the cave with cherts contained in nearby exposed limestones, it may be concluded that at least some raw materials could have derived from relevant rock outcrops. Namely, chert intercalations, nodules and lenses showing similar composition can be found within the Turonian well-layered limestones of southern Istria (for example: the Premantura place near Pula). According to more recent dating these limestones correspond to the Middle and Upper Cenomanian. Another possible source are cherts occurring in the uppermost part of the Upper Jurrasic Kirmenjak unit (for example: the Zlatni rt, Rovinj environments).[73]

73 Polšak 1965b; Tišljar 1978; Vlahović *et al.* 2003.

73 Polšak 1965b; Tišljar 1978; Vlahović et al. 2003.

mehaničko trošenje u odnosu na karbonatnu stijenu unutar koje se nalaze, strše iz podloge i time olakšavaju uzimanje fragmenata odlomom. Zbog trošenja karbonatne stijene, rožnjaci također mogu ispasti iz stijene, pa se tada mogu naći u dnu nekih strmijih izdanaka te koncentrirani u jarcima i na plažama. Osim spomenutih mogućih izvora rožnjaka, dio kamene sirovine mogao je biti prikupljen i od mjestimice litificiranih "kvarcnih pijesaka" gornjeg alba, koji se od Pule preko Loborike, Pinezića protežu dalje prema sjeveru.[74]

4.3. Analiza koštanih rukotvorina

U gornjopaleolitičkim naslagama Šandalje pronađeno je više koštanih rukotvorina te probušenih životinjskih zubi koji su do sada bili samo djelomično obrađeni i objavljeni.[75] Koštane rukotvorine klasificirane su korištenjem ustaljenih kategorija.[76] Determinacije životinjskih vrsta na osnovi kostiju korištenih za izradu koštanih rukotvorina, gdje je to bilo moguće izvršio je P. T. Miracle.[77] Koštane rukotvorine orinjasijenskih slojeva objavljene su u više radova,[78] a iz sloja D, gdje dolazi do miješanja orinjasijenskih i gravetijenskih elemenata, prisutna su tri fragmentirana koštana nalaza, od kojih jedan možda i nije alatka.[79]

Sloj C/d dao je više koštanih nalaza i dva zuba (sl. 17, 1-4). Vrlo je zanimljiva pločica s urezanim linijama i kratkim crticama na jednoj liniji, što je možda dio nekog motiva (sl.17, 2). Prvobitno se moglo raditi o širem predmetu koji je pukao te je na njemu ostao samo dio motiva. Rubovi pločice mogli su poslije biti uglačani i zaobljeni. Motiv je možda bila riba (sada je vidljiv samo dio), a urezi na gornjoj liniji mogli bi prikazivati shematiziranu peraju. Dakako, ovo je samo jedna mogućnost koja ne mora odgovarati onomu što je čovjek želio prikazati. U istom sloju pronađen je jedan zub s načinjenim kanalićem ispod krune (sl. 17, 3), te jedan probušeni zub (sl. 17, 4). Od alatki prisutan je jedan mali probojac trokutastog presjeka (sl. 17, 1), dva mala ulomka probojca od kojih je jedan izbočeno ravnog, a drugi okruglog presjeka, te jedan potpuno plosnati ulomak koji je možda distalni dio probojca slomljenog vrha. Osim ova četiri primjerka u istom sloju pronađena su i dva paroška običnog jelena koja su možda glačana ljudskom rukom i služila su kao alatke.

Proksimalni ulomak probojca izbočeno-ravnog presjeka, načinjen od kosti nekog velikog cervida, potječe iz sloja C/s. Središnji ulomak šiljka elipsoidnog presjeka i jedan probušeni zub (sl. 17, 5), te koštana pločica bez nekog urezanog motiva, ali s probušenom rupom (sl. 17, 6), nose oznaku kompleksa C. Iz istog kompleksa potječu distalni ulomak probojca izbočeno-udubljenog presjeka (sl. 17, 7), te probojac elipsodnog presjeka i slomljenog vrha (sl. 17, 8) ukrašen crticama (urezima).

Thanks to comparatively higher resistance to chemical and mechanical weathering in comparison to the carbonate rock, chert layers, nodules and lenses protrude from host limestones, can be extracted from the limestone and their debris may be found at the bottom of some outcrops and concentrate in gullies and on beaches. Besides these possible sources, some of the raw materials could have derived from locally lithified Upper Albian "quartz sands", which from Pula, over Loborika and Pinezići stretch farther north.[74]

4.3) Analysis of bone artifacts

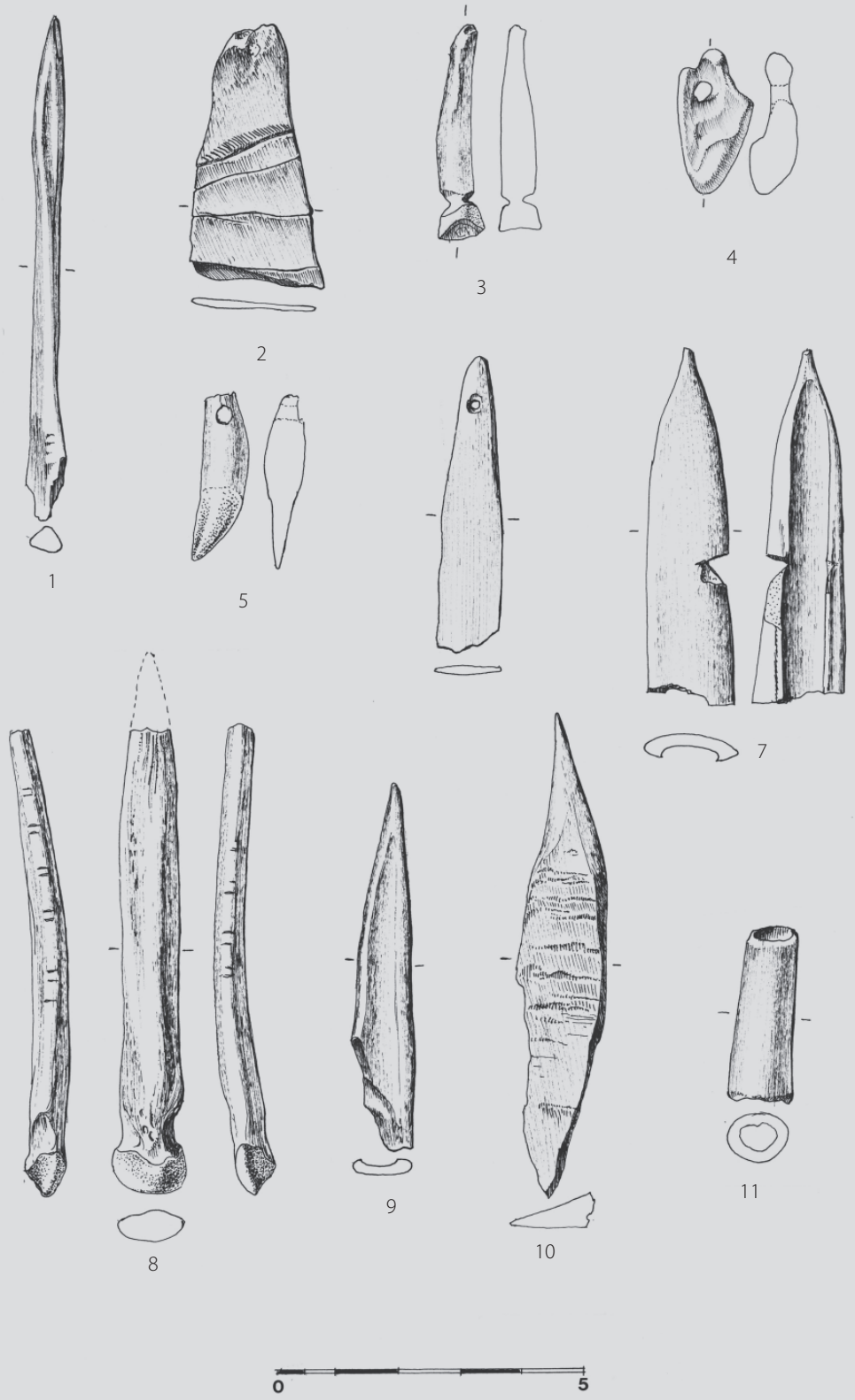
A number of bone artifacts and pierced animal teeth, only partially analyzed and published at this point, were found in the Upper Palaeolithic layers of Šandalja.[75] The bone artifacts were classified using standard categories.[76] The determination of animal species based on the bones used to make the artifacts was done, where possible, by P. T. Miracle.[77] The bone artifacts from the Aurignacian layers have been published in several works,[78] while three fragmented bone finds, of which one may not even be a tool, are from layer D, where Aurignacian and Gravettian elements mixed.[79]

Layer C/d yielded several bone finds and two teeth (Fig. 17, 1-4). A plaquette with engraved lines and short dashes on one of the lines is intriguing, in that this may constitute some sort of motif (Fig. 17, 2). Originally this may have been a wider object which broke, with only part of the motif remaining on it. The edges of the plaquette may have been polished and rounded later. The motif may be a fish (with only a part now visible), while the incisions on the upper line may depict a schematized fin. To be sure, this is only one possibility which need not correspond to what the person intended to portray. A tooth with a small canal made below the crown (Fig. 17, 3), and a pierced tooth (Fig. 17, 4) were found in the same layer. Among the tools, a small awl with triangular cross-section (Fig. 17, 1), two small awl fragments, one with plano-convex and the other with round cross-section, and one entirely flat fragment which may be the distal part of an awl with broken tip were also present. Besides these four specimens, two antler tines from a red deer that may have been polished by human hand and used as tools were also found in the same layer.

The proximal awl fragment with plano-convex cross-section, made from the bone of some large cervid, originated in layer C/s. The middle fragment of a point with ellipsoid cross-section and a pierced tooth (Fig. 17, 5), and a bone plaquette without any motifs engraved on it but with a pierced hole (Fig. 17, 6) bear the designation of complex C. A distal awl fragment with convex-concave cross-section (Fig. 17, 7), and an awl with ellipsoid cross-section and broken tip (Fig. 17, 8) decorated with small lines (incisions) are from the same complex.

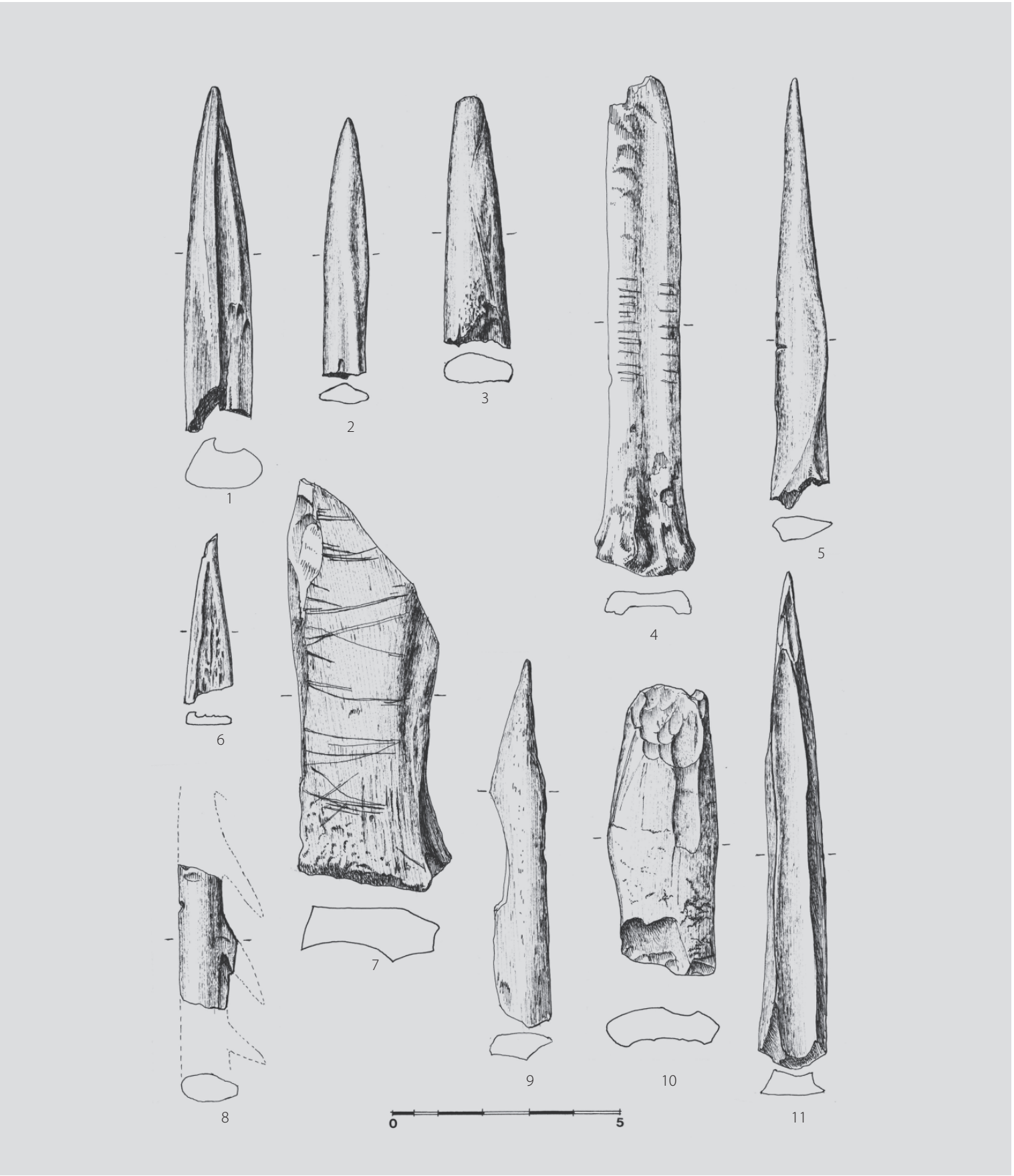
74 Durn *et al*. 2003.
75 Malez 1979b, 1987; Karavanić 1999; 2003; Karavanić, Janković 2010.
76 Camps-Fabrer 1974, 1988; Piel-Desruisseaux 1986.
77 Usmeno priopćenje P. T. Miraclea.
78 Malez 1987; Karavanić 2003; Karavanić, Janković 2010.
79 Karavanić 1999.

74 Durn et al. 2003.
75 Malez 1979b, 1987; Karavanić 1999; 2003; Karavanić, Janković 2010.
76 Camps-Fabrer 1974, 1988; Piel-Desruisseaux 1986.
77 P. T. Miracle personal communication.
78 Malez 1987; Karavanić 2003; Karavanić, Janković 2010.
79 Karavanić 1999.



Slika 17.
Sloj C/d (rani epigravetijen): 1 - koštani probojac trokutnog presjeka, 2 - koštana pločica s urezanim linijama i kratkom crticama na jednoj liniji (možda dio nekog motiva), 3 - zub s kanalićem ispod krune, 4 - probušeni zub; kompleks C (epigravetijen): 5 - probušeni životinjski zub, 6 - koštana pločica s rupom, 7 - distalni ulomak koštanog probojca, 8 - koštani probojac ukrašen crticama, slomljena vrha; B/C (epigravetijen): 9 - distalni ulomak koštanog probojca, 10 - koštani probojac s urezanim sporednim linijama, 11. valjkasta koštana cjevčica. Mjerilo je u cm. Crtež: Arhiv ZPGK HAZU

Figure 17.
Layer C/d (early Epigravettian): 1 - bone awl with triangular cross-section, 2 - bone plaquette with engraved lines and dashes on one line (possibly a motif), 3 - tooth with small canal below crown, 4 - pierced tooth; complex C (Epigravettian): 5 - pierced animal tooth, 6 - bone plaquette with hole, 7 - distal fragment of bone awl, 8 - bone awl decorated with dashes, broken tip; B/C (Epigravettian): 9 - distal fragment of bone awl, 10 - bone awl with engraved parallel lines, 11. cylindrical bone tube. Scale in cm. Sketch: Archives of the Institute for Quaternary Palaeontology and Geology of Croatian Academy of Sciences and Arts.



Slika 18.

Sloj B/d (kasni epigravetijen): 1 - distalni ulomak koštanog šiljka, 2 - distalni ulomak koštanog šiljka ili probojca, 3 - proksimalni ulomak koštane alatke; sloj B/s (kasni epigravetijen): 4 - koštani probojac slomljena vrha, ukrašen dvama redovima usporednih urezanih crtica, 5 - koštani probojac odlomljenog proksimalnog dijela, 6 - vrh koštanog probojca, 7 - koštani ulomak s urezanim linijama; sloj B/g (kasni epigravetijen): 8 - središnji koštani ulomak harpuna, 9 - distalni dio koštanog probojca, 10 - koštana spatula, 11 - koštani probojac. Modificirano prema Janković et al. 2011, slika 4. Mjerilo je u cm. Crtež: Arhiv ZPGK HAZU

Figure 18.

Layer B/d (late Epigravettian): 1 - distal fragment of bone point, 2 - distal fragment of bone point or awl, 3 - proximal fragment of bone tool; layer B/s (late Epigravettian): 4 - bone awl with broken tip, decorated by two rows of parallel engraved dashes, 5 - bone awl broken at proximal section, 6 - tip of bone awl, 7 - bone fragment with engraved lines; layer B/g (late Epigravettian): 8 - middle fragment of bone harpoon, 9 - distal part of bone awl, 10 - bone spatula, 11 - bone awl. Modified according to Janković et al. 2011, Fig. 4. Scale in cm. Sketch: Archives of the Institute for Quaternary Palaeontology and Geology of Croatian Academy of Sciences and Arts.

Distalni ulomak probojca izbočeno-udubljenog presjeka (sl. 17, 9) potječe s granice kompleksa B i C (B/C), a istom su signaturom još označeni: jedan probojac, s urezanim usporednim linijama trokutastog presjeka (sl. 17, 10), probojac izbočeno-ravnog presjeka kojemu nedostaje distalni dio, distalni dio šiljka elipsoidnog presjeka te jedna valjkasta koštana cjevčica (sl. 17, 11).

U sloju B/d pronađeno je šest koštanih ulomaka te jedan ulomak roga. To su distalni ulomak debelog šiljka nepravilnog presjeka (sl. 18, 1), distalni ulomak šiljka ili probojca trokutastog presjeka (sl. 18, 2), jedan vjerojatno proksimalni ulomak izbočeno-ravnog presjeka (sl. 18, 3), dugačak ulomak slomljene baze i vrha izrađen od kosti divlje svinje, kratak i vrlo tanak središnji komadić neke rukotvorine, središnji ulomak elipsoidnog presjeka te jedan komadić roga.

Sloj B/s dao je dvanaest koštanih ulomaka, od kojih je jedanaest ulomaka oruđa. Jedan široki probojac slomljena vrha ukrašen s dva reda usporedno urezanih crtica načinjen na srnećoj kosti (sl. 18, 4) gotovo je cjelovit, kao i probojac trokutastog presjeka kod kojeg nedostaje jedino proksimalni dio (sl.18, 5). Osim navedenih cjelovitih primjeraka u istom su sloju pronađeni sljedeći ulomci alatki: vrh probojca izbočeno-udubljenog presjeka (sl. 18, 6), proksimalni ulomak probojca izbočeno-ravnog presjeka, proksimalni ulomak probojca izbočeno-udubljenog presjeka načinjenog na srnećoj kosti, proksimalni ulomak probojca nepravilnoga kružnog presjeka, tanki središnji ulomak malog šiljka trokutastog presjeka, distalni ulomak šiljka slomljena vrha ili probojca, središnji ulomak izbočeno-udubljenog presjeka, tanki središnji ulomak izbočeno-ravnog presjeka, te proksimalni ulomak koji je vjerojatno pripadao probojcu. Posebno je zanimljiv koštani ulomak s urezanim linijama (sl. 18, 7).

Iz sloja B/g potječe sedam ulomaka koštane industrije, u što je uključen i jedan vrh paroška. To su: središnji ulomak harpuna elipsoidnog presjeka (sl. 18, 8), distalni dio probojca izbočeno-udubljenog presjeka (sl. 18, 9), probojac izbočeno-udubljenog presjeka (sl. 18, 11), spatula izbočeno-udubljenog presjeka (sl. 18, 10), središnji ulomak šiljka nepravilnog okruglog presjeka, tanki vrh malog šiljka ili probojca s puno urezanih crtica, te već spomenut vrh paroška koji je vjerojatno bio poliran.

Oznaku kompleksa B, bez detaljnijeg navođenja sloja, nosi pet koštanih alatki od kojih ni jedna nije cjelovita, četiri probušena zuba te koštana pločica s urezanim mrežastim motivom. Alatkama pripadaju: distalni dio šiljka izbočeno-udubljenog presjeka (sl. 19, 1), proksimalni dio šiljka izbočeno-ravnog presjeka (sl. 19, 2), distalni dio probojca izbočeno-udubljenog presjeka (sl. 19, 3), šiljak odlomljena vrha i baze okruglog presjeka (sl. 19, 4) te šiljak slomljene baze čiji je proksimalni dio ukrašen urezanim crticama (sl. 19, 5). Taj je šiljak gotovo cjelovit, a njegov je presjek na distalnom dijelu okrugao, a na proksimalnom trokutast. Već su spomenuta četiri probušena životinjska zuba koji su bili nakit s oznakom ovog kompleksa (sl. 19, 6, 7, 9) i koštana pločica s mrežastim motivom na obje strane (sl. 19, 8). Na jednoj strani koštane pločice mrežasti motiv znatno je širi nego na drugoj.

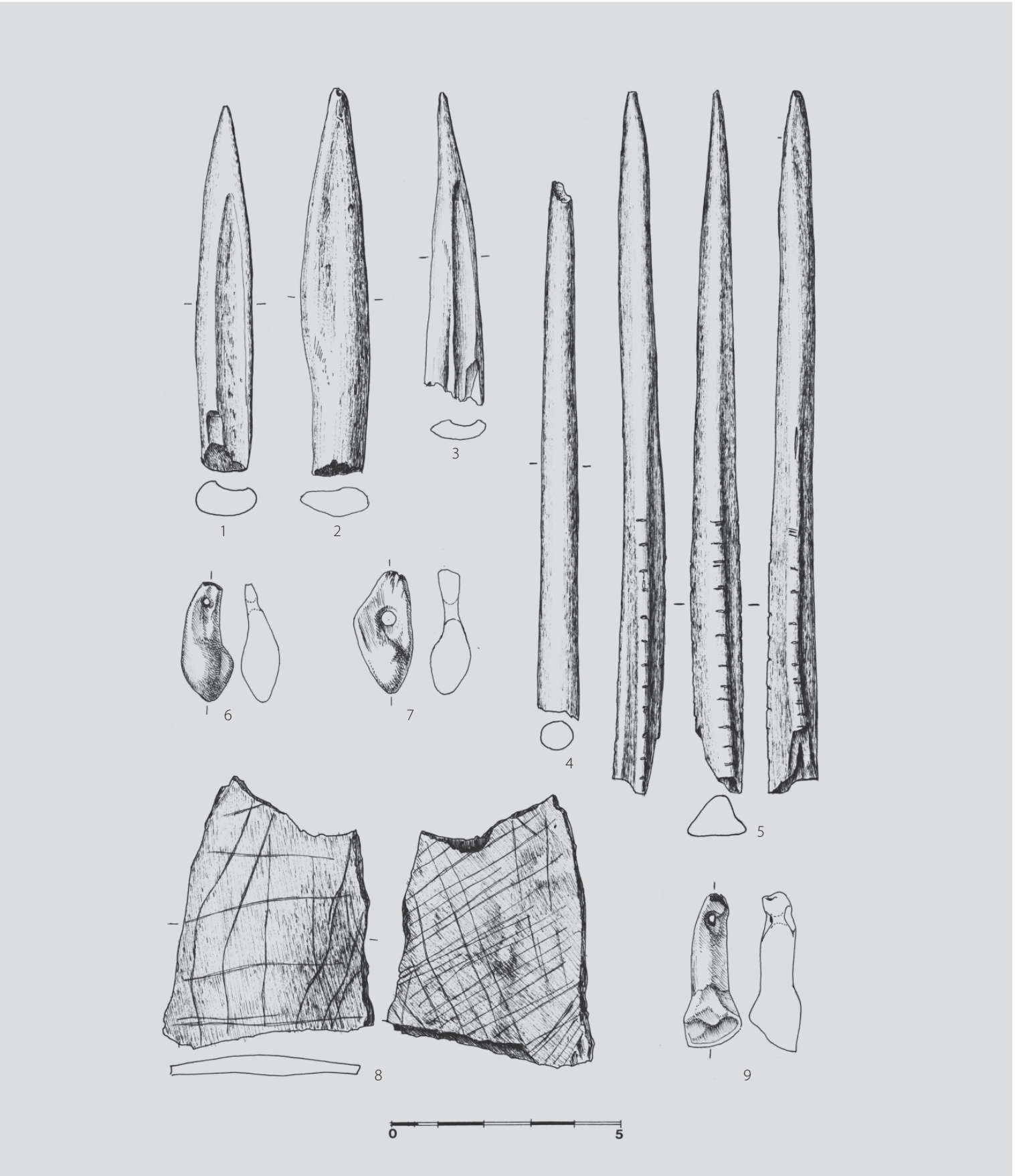
A distal awl fragment with convex-concave cross-section (Fig. 17, 9) originated in the boundary between complex B and C (B/C), and the same signature was also used to designate: an awl with engraved parallel lines and triangular cross-section (Fig. 17, 10), an awl with plano-convex cross-section on which the distal portion is missing, the distal portion of a point with ellipsoid cross-section and a small, cylindrical bone tube (Fig. 17, 11).

Six bone fragments and one antler fragment were found in layer B/d. These are a distal fragment of a thick point with irregular cross-section (Fig. 18, 1), a distal fragment of a point or awl with triangular cross-section (Fig. 18, 2), which is likely a proximal fragment with plano-convex cross-section (Fig. 18, 3), the long fragment of a broken base and tip made from a wild boar bone, a short and very thin middle piece of some artifact, a middle fragment with ellipsoid cross-section and one small piece of an antler.

Layer B/s yielded twelve bone fragments, of which eleven are tool fragments. One wide awl with a broken tip adorned with three rows of parallel engraved dashes made on a deer bone (Fig. 18, 4) is almost whole, like the awl with triangular cross-section which is missing its proximal part (Fig. 18, 5). Besides these whole specimens, the following tool fragments were found in the same layer: the tip of an awl with plano-concave cross-section (Fig. 18, 6), a proximal awl fragment with plano-convex cross-section, a proximal awl fragment with plano-concave cross-section made on a roe deer bone, a proximal awl fragment with irregular circular cross-section, a thin middle fragment of a small awl with triangular cross-section, a distal fragment of a point with broken tip or an awl, a middle fragment with plano-concave cross-section, a thin middle fragment with plano-convex cross-section, and a proximal fragment which probably belonged to an awl. A bone fragment with engraved lines (Fig. 18, 7) is particularly interesting.

Seven bone industry fragments originated in layer B/g, which includes one antler point. These are: a middle fragment of a harpoon with ellipsoid cross-section (Fig. 18, 8), a distal portion of an awl with plano-concave cross-section (Fig. 18, 9), an awl with plano-concave cross-section (Fig. 18, 11), a spatula with plano-concave cross-section (Fig. 18, 10), a middle fragment of a point with irregular round cross-section, the thin tip of a small point or awl with many engraved small lines, and the already mentioned antler point which was probably polished.

Five bone tools, of which none are whole, four pierced teeth and a bone plaquette with an engraved lattice motif bear the designation of complex B, without detailed indication of the layer. The tools include: the distal portion of a point with plano-concave cross-section (Fig. 19, 1), the proximal portion of a point with plano-convex cross-section (Fig. 19, 2), the distal portion of an awl with plano-concave cross-section (Fig. 19, 3), a point with broken tip and base with circular cross-section (Fig. 19, 4), and a point with broken base with proximal portion adorned by engraved small lines (Fig. 19, 5). This point is almost whole, and its cross-section is circular at the distal portion, but triangular at the proximal part. Four pierced animal teeth that were ornaments bearing the designation of this complex (Fig. 19, 6, 7, 9) and the bone plaquette with lattice motif on both sides (Fig. 19, 8) have already been mentioned. On one side of the bone plaquette, the lattice motif is considerably wider than on the other side.



Slika 19.
Kompleks B (kasni epigravetijen): 1 - distalni dio koštanog šiljka, 2 - proksimalni dio koštanog šiljka, 3 - distalni dio koštanog probojca, 4 - koštani šiljak odlomljenog vrha i baze, 5 - koštani šiljak slomljene baze ukrašen urezanim crticama, 6, 7, 9 - probušeni životinjski zubi, 8 - koštana pločica s urezanim mrežastim motivom na obje strane. Mjerilo je u cm. Crtež: Arhiv ZPGK HAZU

Figure 19.
Complex B (late Epigravettian): 1 - distal part of bone point, 2 - proximal part of bone point, 3 - distal part of bone awl, 4 - bone point broken off at tip and base, 5 - bone point with broken base decorated by engraved dashes, 6, 7, 9 - pierced animal teeth, 8 - bone plaquette engraved lattice motif on both sides. Scale in cm. Sketch: Archives of the Institute for Quaternary Palaeontology and Geology of Croatian Academy of Sciences and Arts.

4.4. Sažetak analiza kulturnog inventara i interpretacija rezultata

Premda za litiku sloja D ovdje nisu izneseni cjeloviti podaci,[80] treba napomenuti da on sadrži obilježja orinjasijena i epigravetijena. U tom je sloju prisutno po jedno kobilično i njuškasto grebalo, koja su tipična za orinjasijen, zajedno s alatkama čestim u epigravetijenu, tj. noktolikim grebalom, pločicom s hrptom te dvjema graveticama. Miješanje tih dviju industrija odražava se i u sirovinama gdje uz svijetlosivo patinirani rožnjak dolaze rožnjaci različitih boja, česti u kasnijim slojevima. M. Malez[81] odredio je značajke ovog sloja kao "prijelazni stupanj iz mlađeg orinjasijena prema ranom gravetijenu (sl. 12)", dok je Đ. Basler[82] uočio dominaciju "elemenata koji bi se mogli nazvati gravetto-aurignacien". Ipak, čini se vjerojatnijim da je miješanje orinjasijenskih i (epi)gravetijenskih elemenata prouzročeno djelovanjem životinja ili paleolitičkog čovjeka[83] ili korištenjem nedovoljno precizne metode iskopavanja. Štoviše, na temelju granulometrijskih analiza, kao što je već navedeno, moguće je pretpostaviti stratigrafski hijat između slojeva D i C/d.[84] Stoga litičku industriju sloja D valja okvirno odrediti kao mješavinu orinjasijenskih i epigravetijenskih elemenata nastalu djelovanjem postdepozicijskih procesa ili korištenjam nedovoljno precizne metode iskopavanja.

Sloj C/d može pripadati ranom epigravetijenu, i prema rezultatu datiranja koji iznosi 20750±400 godina prije sadašnjosti[85] trebalo bi ga smjestiti pred sam početak zadnjega glacijalnog maksimuma.[86] Među otpadnim materijalom najbrojniji su odbojci, a bitna tehnološka značajka litičke industrije je dominacija sječiva nad pločicama. Sječiva nisu široka, kao neki primjerci u orinjasijenskim slojevima, premda je i dalje prisutna tehnika izravnog odbijanja mekanim čekićem. Grebala su učestala, a dubila rijetka. Noktolika grebala skromno su zastupljena. Postotni udio gravetica u alatkama nešto je manji od 10 %, dok je pločicâ s hrptom (zajedno sa zarubljenima) više od 11 %. Prisutni su gravetijenski šiljci i polušiljci. Među koštanim inventarom dominiraju ulomci probojaca. Ne znamo što prikazuju urezane linije na jednoj koštanoj pločici, dok je na drugoj probušena rupa te je ona vjerojatno bila privjesak. I tri su zuba služila kao nakit. Najmarkantnije značajke industrije ovog sloja su veća proizvodnja sječiva u odnosu na pločice i visok udio komadića sa zatupljenim rubom (gravetice + tipovi pločica s hrptom) unutar alatki (oko 20 %). S obzirom na malen udio tipičnih gravetijenskih šiljaka u sloju C/d, vrlo značajan udio gravetica i pločica s hrptom te na rezultat radiokarbonskog datiranja tog sloja, znatno je realnije njegovu

4.4. Summary of artefact analysis and interpretation of results

Even though comprehensive data were not released for the lithic assemblage of layer D,[80] it is noteworthy that it contains Aurignacian and Epigravettian features. This layer contained one keeled and one atypical nosed endscraper, which are typical of the Aurignacian, together with tools frequent in the Epigravettian, i.e., a thumbnail endscraper, a backed bladelet and two micro-Gravettes. The mixing between these two industries is reflected in the raw materials, where besides light-gray patinated chert there are cherts of varying colours, frequent in later layers. Malez[81] determined the features of this layer as "a transition phase from the younger Aurignacian toward the early Gravettian (Fig. 12)", while Đ. Basler[82] observed the domination "of elements which could be called Gravettian-Aurignacian." Nonetheless, it appears likely that the mixing between Aurignacian and (Epi)Gravettian elements was caused by the activity of animals or Palaeolithic humans,[83] or the use of insufficiently precise excavation methods. Moreover, based on granulometric analysis, as already stated, it is possible to assume a stratigraphic hiatus between layers D and C/d.[84] Thus, the stone industry of layer D should be generally specified as a mixture of Aurignacian and Epigravettian elements caused by the postdepositional processes or the use of insufficiently precise excavation methods.

Layer C/d may belong to the early Epigravettian and based on the dating result of 20750±400 years BP[85] it should be placed just before the onset of the last glacial maximum.[86] Among the debitage, the most numerous are flakes, while an important technological feature of the lithic industry is the dominance of blades over bladelets. The blades are not wide as in certain specimens in the Aurignacian layers, although the direct soft hammer percussion technique was still present. Endscrapers are frequent, while burins are rare. Thumbnail endscrapers are moderately represented. The percentage share of micro-Gravettes in tools is slightly less than 10%, while backed bladelets (together with truncated ones) is over 11%. Gravette points and atypical Gravette points are present. Awl fragments dominate among the bone inventory. We do not know what the engraved lines on one bone plaquette depict, while a hole was pierced on another and it was probably a pendant. The three teeth also served as ornaments. The most striking feature of this layer's industry is the larger blade production in comparison to bladelets and the high share of backed pieces (micro-Gravettes + backed bladelet types) among the tools (approximately 20%). Given the small share of typical Gravette points in layer C/d, a considerable share of micro-Gravettes and bladelets and the results of radiocarbon dating of this layer, it is

80 Za njih vidi Karavanić 1999.
81 Malez 1987, str. 17
82 Basler 1983, str. 53
83 Za fenomen miješanja nalaza zbog intenzivnog hodanja vidi Villa, Courtin 1983.
84 Miracle 1995.
85 Srdoč *et al*. 1973.
86 Vidi međutim bilješku 52.

80 For them, see Karavanić 1999.
81 Malez 1987, p. 17
82 Basler 1983, p. 53
83 For the phenomenon of mixed finds due to intense walking, see Villa, Courtin 1983.
84 Miracle 1995.
85 Srdoč et al. 1973.
86 See, however, note 52.

industriju pripisati epigravetijenu,[87] a ne tipičnom gravetijenu, kao što je to učinio M. Malez.[88]

Datacija sloja C/s od 13120±230 godina prije sadašnjosti[89] upućuje na stratigrafsku prazninu (oko 7000 godina) između tog sloja i sloja C/d.[90] Slična vrijednost kao za sloj C/s dobivena je i prilikom datiranja prijelaza kompleksa C u kompleks B. Ona iznosi 13050±220 godina prije sadašnjosti.[91] Nažalost, nedovoljan broj alatki u sloju C/s i C/g te nemogućnost određivanja točne stratigrafske pripadnosti za materijal označen sa B/C, što vrijedi i za onaj označen samo kompleksom C, onemogućuju preciznu interpretaciju litičkog materijala tih slojeva, premda je jasno da se u kronološkom smislu radi o epigravetijenu. Prisutna je vidna razlika u zastupljenosti pojedinih alatki između sloja C/g i onih označenih samo kompleksom C.

Jednostavna grebala (tip 1), gravetice (tip 50) i pločice s hrptom (tip 85) višestruko su učestaliji u sloju C/g, dok od noktolikih grebala (tip 10), gravetijenskih šiljaka (tip 48) te gravetijenskih polušiljaka (tip 49) nema ni jednog primjerka koji je označen sa C, a ti tipovi dolaze u sloju C/d. Moguće je da materijal iz slojeva C/s i C/g, kojima je izvorno pripadao i dio rukotvorina označenih sa C i B/C, odražava jednu (srednju) fazu, koju iz prije navedenih razloga nije moguće pouzdano utvrditi i definirati. Jedna od značajki te faze mogla bi biti prisutnost šiljaka s usjekom, koji se kasnije gube.[92] Međutim, ukoliko su oznakom C označene i neke rukotvorine iz sloja C/d, što može biti slučaj,[93] postoji vjerojatnost da se šiljci s usjekom pojavljuju u Šandalji već ranije, kao što je to slučaj na talijanskim nalazištima, premda ova analiza to nije pokazala. Ovom analizom ustanovljen je samo jedan gravetijenski šiljak s usjekom označen kompleksom C i jedan komadić s usjekom označen sa B/C, dok su J. Kozlowski i A. Montet-White[94] identificirali četiri šiljka s usjekom s oznakom C. To treba uzeti u obzir jer je moguće da su ti komadići nažalost negdje zametnuti. Osim navedenih primjeraka, četiri komadića s usjekom (ne radi se o šiljcima) potječu iz sloja B/d, a nema ih u kasnijim slojevima.

Za kompleks B postoje čak četiri rezultata datiranja radiokarbonskom metodom. Sloj B/d datiran je na 10140±160 godina prije sadašnjosti[95] prvi put, te drugi put na 10990±60 godina prije sadašnjosti.[96] S obzirom da je rezultat mlađeg sloja B/s koji iznosi 12320±100 godina prije sadašnjosti[97] potvrđen izravnim datiranjem uzorka čovjeka iz tog sloja,[98] čini se da

much more realistic to attribute its industry to the Epigravettian,[87] and not the typical Gravettian, as Malez did.[88]

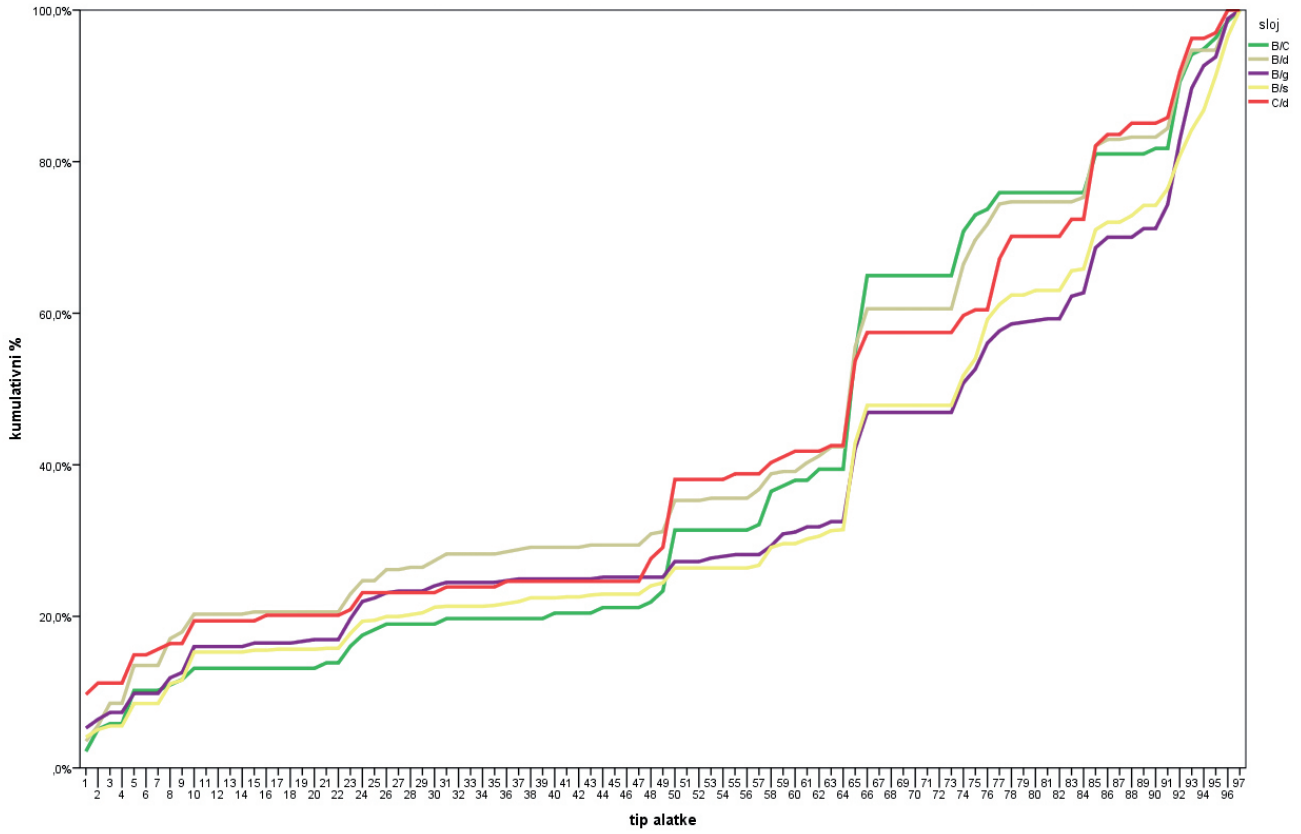
The dating of layer C/s to 13120±230 years BP[89] indicates a stratigraphic gap (ca 7,000 radiocarbon years) between this layer and layer C/d.[90] A similar value as for layer C/s was obtained in the dating of the transition of the complex C into B. It is 13050±220 years BP.[91] Unfortunately, the insufficient number of tools in layers C/s and C/g, and the impossibility of determining the precise stratigraphic classification of the materials designated with B/C, which also applies to those only designated with complex C, precludes the precise interpretation of the lithics of these layers, although it is clear that in the chronological sense this is the Epigravettian. A visible difference is present in the presence of individual tools between layer C/g and those designated only with complex C.

Simple endscrapers (type 1), micro-Gravettes (type 50) and backed bladelets (type 85) are much more frequent in layer C/g, while among the thumbnail endscrapers (type 10), Gravette points (type 48) and atypical Gravette points (type 49) there is not a single specimen designated as C, and these types belong to layer C/d. It is possible that the material from layers C/s and C/g, which originally encompassed a part of the artifacts designated with C and B/C, reflect a (middle) phase, which cannot be reliably ascertained and defined due to the aforementioned reasons. One of the features of this phase may have been the presence of shouldered points which was later lost.[92] However, insofar as the C designation was also used to mark certain artifacts from layer C/d, which may have been the case,[93] there is a likelihood that the shouldered points appeared in Šandalja even earlier, as is the case at Italian sites, although this analysis has not shown that. This analysis ascertained only a single Gravettian shouldered point designated with complex C and one shouldered piece designated with B/C, while J. Kozlowski and A. Montet-White[94] identified four shouldered points bearing the designation C. This should be taken into account, because it is possible that these pieces were misplaced somewhere. Besides the aforementioned examples, four small shouldered pieces (not points) are from layer B/d, and they are absent in subsequent layers.

There are as many as four radiocarbon dates for complex B. Layer B/d was dated to 10140±160 years BP[95] the first time, and to 10990±60 years BP the second time.[96] Since the result for the younger layer B/s, which is 12320±100 years BP,[97] was confirmed by direct dating of the human remains from that layer,[98] it would appear that the result for B/d is too recent. This may also be

87 Montet-White 1996; Karavanić 1999.
88 Malez 1979a; 1979b; 1987.
89 Obelić et al. 1994.
90 Vidi međutim bilješku 52.
91 Obelić *et al*. 1994.
92 Usporedi Kozlowski 1979, 1992; Montet-White, Kozlowski 1983.
93 Usmeno priopćenje D. Rukavine.
94 Kozlowski, Montet-White 1983, str. 382.
95 Obelić *et al*. 1994.
96 Miracle 1995.
97 Malez, Vogel 1969.
98 Janković *et al*. 2012; usmeno priopćenje M. Richardsa.

87 Montet-White 1996; Karavanić 1999.
88 Malez 1979a; 1979b; 1987.
89 Obelić et al. 1994.
90 See, however, note 52.
91 Obelić et al. 1994.
92 Cf. Kozlowski 1979, 1992; Montet-White, Kozlowski 1983.
93 D. Rukavina personal communication.
94 Kozlowski, Montet-White 1983, p. 382.
95 Obelić et al. 1994.
96 Miracle 1995.
97 Malez, Vogel 1969.
98 Janković et al. 2012; M. Richards personal communication.



Slika 20.
Kumulativne krivulje postotne zastupljenosti tipova alatki u naznačenim slojevima. Na apscisi su brojevi prema modificiranoj listi tipova D. De Sonneville-Bordes i J. Perrot (1953).

Figure 20.
Cumulative percentage graphs of tool types with layers indicated. The apsides show numbers based on the modified list of types, D. De Sonneville-Bordes and J. Perrot (1953).

je rezultat za B/d premlad. Na to može upućivati i datiranje najmlađeg sloja kompleksa B (sloj B/g) koje je dalo vrijednost od 10830±50 godina prije sadašnjosti.[99] Premda se može zaključiti da je cijeli kompleks taložen između približno 12500 i 10000 godina, u vrijeme kasnoga glacijala, osim izrazitih sličnosti vidljive su i značajne razlike u litičkoj industriji između nekih razina spomenutog kompleksa. U svim su slojevima odbojci najbrojniji. Pločicâ je nešto više od sječiva u sloju B/d, a taj je omjer u korist pločicâ znatno izrazitiji u kasnijim slojevima. I dalje se rabi postupak izravnog odbijanja sječiva mekanim čekićem, a vjerojatna je uporaba još jednog postupka,[100] što može vrijediti i za slojeve kompleksa C. Dok je postotna zastupljenost pojedinih tipova alatki izrazito slična između slojeva B/s i B/g, na što jasno pokazuje kumulativna krivulja, sloj B/d po istim kriterijima odstupa od navedenih slojeva, premda i on pripada istom kompleksu (sl. 20).

Usporedimo li potanje učestalost pojedinog tipa alatki u slojevima C/d i B/d, pokazat će se zamjetne razlike između jednoga i drugog sloja (sl. 20). U sloju C/d postotna zastupljenost grebala znatno je veća, posebno jednostavnog grebala (tip 1), koje je gotovo tri puta češće

indicated by the dating of the youngest layer of complex B (layer B/g) which yielded a value of 10830±50 years BP.[99] Although it may be concluded that the entire complex accumulated between ca. 12,500 and 10,000 years, during the Late Glacial, besides some remarkable similarities there are also considerable differences in the lithic industry between certain levels of this complex. In all layers the flakes are the most numerous. Bladelets are somewhat more numerous than blades in layer B/d, and this ratio to the benefit of bladelets is more notable in later layers. The direct soft hammer percussion technique continued to be used, and use of another technique is also likely,[100] which may also apply to the layers of complex C. While the percentage share of individual types of tools is markedly different between layers B/s and B/g, which is clearly shown by the cumulative curve, by the same criteria layer B/d deviates from these layers, although it also belongs to the same complex (Fig. 20).

Insofar as the frequency of individual tool types in layers C/d and B/d is compared in greater detail, a notable difference between one and the other layer (Fig. 20) becomes apparent. In layer C/d, the percentage share of endscrapers is considerably higher, particularly that of simple endscrapers (type 1) which are almost three times

99 Malez, Vogel 1969.
100 Usmeno priopćenje J. Pelegrina, F. Blasera i J. Kozlowskog.

99 Malez, Vogel 1969.
100 J. Pelegrin, F. Blaser and J. Kozlowski personal communications.

nego u kasnoepigravetijenskom sloju B/d. Postotna učestalost gravetica (tip 50) više je nego dvostruko veća u sloju C/d, a u istom su sloju zastupljenije i pločice s hrptom (tip 85). Kružni segmenti dolaze u sloju C/d, dok ih u sloju B/d nema. Usporedimo li, pak, postotnu zastupljenost pojedinih tipova alatki u sloju B/d, s jedne strane, te u slojevima B/s i B/g, s druge strane, dolazimo do zaključka da unutar kompleksa B također postoje razlike u litičkoj industriji. Grebala se pojavljuju u većem postotku u sloju B/d, premda to ne vrijedi za noktoliko grebalo (tip 10) koje je učestalije u slojevima B/s i B/g. Postotak gravetica približno je dvostruko veći u sloju B/d u odnosu na dva kasnija sloja kompleksa B (ako ih tretiramo kao cjelinu), a već je bilo navedeno da četiri komadića s usjekom (ne radi se o šiljcima) potječu iz sloja B/d, a nema ih u kasnijim slojevima. Također valja spomenuti da kružni segment i geometrijske forme nedostaju u sloju B/d, a dolaze u kasnijim slojevima.

Kulturu iz najgornjeg dijela ovog kompleksa (sloj B/g) M. Malez[101] svrstava u epipaleolitik, a središnji i donji dio (slojevi B/s i B/d) u završnu fazu gravetijena. Prema rezultatima ovdje provedene analize industriju svih slojeva kompleksa B treba pripisati kasnom epigravetijenu, uz naznaku razlika između sloja B/d i kasnijih slojeva (B/s, B/g). Prema učestalosti pojedinih tipova alatki slojevi B/s i B/g gotovo su istovjetni.

Paleolitički lovci Šandalje izrađivali su alatke uglavnom od raznobojnih rožnjaka,[102] što je potvrdila i detaljna novija analiza, dok tufovi koji su ranije bili determinirani u ovoj analizi nisu pronađeni.[103] Primijećeno je da sirovina orinjasijenskih razina F, E/F i F pokazuje uniformnost koja se odražava u izuzetno visokoj zastupljenosti svijetlosmeđe patiniranog rožnjaka.[104] Za razliku od toga u sloju C/d dolazi do znatno češćeg korištenja raznobojnih rožnjaka i taj trend traje do kraja epigravetijena (sloj B/d). Prema M. Malezu[105] i J. Zupanič[106] sirovina je mogla biti sabrana u nanosima Soče ili drugih alpskih rijeka, koje su, zbog niže razine mora, utjecale u Jadran jugoistočnije, pa su tadašnji riječni nanosi bili znatno bliže Šandalji od današnje doline Soče. Svi rožnjaci, međutim, možda ne potječu s navedenog područja (dolina Soče), već su neki od njih mogli biti sabrani u srednjoj, istočnoj Istri[107] ili južnoj Istri ili s nekih drugih područja alpskog predgorja.[108] Hipoteza o sabiranju rožnjaka u dolini Soče ili drugih alpskih rijeka, za izradbu paleolitičkih alatki Šandalje, bila bi dodatno podržana kada bi u današnjem nanosu rijeke bilo moguće pronaći valutice istih rožnjaka koji su pronađeni u špilji. To je

101 Malez 1987, str. 17.
102 Malez 1972; Zupanič 1975.
103 Zupanič 1975.
104 Karavanić 2003; Karavanić, Janković 2010.
105 Malez 1972a
106 Zupanič 1975.
107 Zupanič 1975.
108 Malez 1972a.

more common than in late Epigravettian layer B/d. The percentage frequency of micro-Gravettes (type 50) is more than twice that of layer C/d, while in the same layer backed bladelets (type 85) are also more highly represented. Circular segments are present in layer C/d, while they are absent in layer B/d. If the percentage share of individual tool types in layer B/d on the one hand is compared to layers B/s and B/g on the other, then we arrive at the conclusion that inside complex B there are also differences in the lithic industry. Endscrapers appeared in a higher percentage in layer B/d, although this does not apply to the thumbnail endscraper (type 10) which is more frequent in layers B/s and B/g. The percentage of micro-Gravettes is approximately double in layer B/d in comparison to the two subsequent complex B layers (if they are treated as a whole), and it has already been noted that the four shouldered pieces (not points) originated in layer B/d, and they are absent in later layers. It is also worthwhile mentioning that the circular segment and geometric forms are absent in layer B/d, but they did appear in later layers.

Malez classified the culture of the uppermost part of this complex (layer B/g)[101] as Epipalaeolithic, and the middle and lower parts (layers B/s and B/d) as Gravettian. Based on the results of the analysis herein conducted, the industry of all complex B layers should be attributed to the late Epigravettian, with an indication of differences between layer B/d and later layers (B/s, B/g). Layers B/s and B/g are virtually identical in terms of individual tool types.

The Palaeolithic hunters of Šandalja generally made tools on various colour cherts, [102] which has been confirmed by more recent detailed analysis, while the tuffs ascertained earlier were not found in this analysis.[103] It has been noticed that the raw materials of Aurignacian levels F, E/F and F exhibit a uniformity which is reflected in the exceptionally high presence of light-brown patinated cherts.[104] By contrast, layer C/d indicates the considerably more frequent use of differently coloured cherts, and this trend lasted until the end of the Epigravettian (layer B/d). According to Malez[105] and Zupanič,[106] the raw materials may have been gathered in the alluvium of the Soča (Isonzo) or other Alpine rivers which, due to lower sea levels, flowed into the Adriatic somewhere farther south-east, so the riverine alluvium at the time was much closer to Šandalja than today's Soča Valley. However, all cherts did not necessarily have to have come from the same area (the Soča Valley), rather some may have been gathered in central or eastern Istria[107] or in southern Istria, or from some other Prealpine foothills.[108] The hypothesis on gathering the chert used to make the Palaeolithic tools of Šandalja in the valley of the Soča or other Alpine rivers would be further supported if it were possible to find pebbles of the same cherts found in the cave in today's river

101 Malez 1987, p. 17.
102 Malez 1972; Zupanič 1975.
103 Zupanič 1975.
104 Karavanić 2003; Karavanić, Janković 2010.
105 Malez 1972a
106 Zupanič 1975.
107 Zupanič 1975.
108 Malez 1972a.

	C/d	C/s	C/g	C	B/C	B/d	B/s	B/g
1	11,09	12,12	14,29	6,36	11,25	24,09	31,99	35,74
2	10,08	1,01	0,00	3,18	4,41	4,60	2,35	3,19
3	42,54	47,47	35,71	59,09	45,59	32,87	20,22	16,25
4	3,02	3,03	14,29	2,73	1,74	1,74	1,89	2,30
5	8,27	11,11	21,43	5,00	6,73	9,96	10,58	12,59
6	1,61	5,05	0,00	1,36	2,78	2,58	2,35	4,08
7	5,44	4,04	0,00	1,82	1,16	4,04	1,87	2,35
8	5,24	2,02	0,00	2,27	4,29	3,06	1,81	1,93
9	1,61	0,00	0,00	0,45	0,58	1,04	0,04	0,84
10	0,40	1,01	0,00	1,36	0,93	0,91	0,81	1,78
11	0,00	1,01	0,00	0,45	0,46	0,56	0,41	0,94
razno	10,69	12,12	14,29	15,91	20,07	14,55	25,68	18,03
broj artefakata	**496**	**99**	**14**	**220**	**862**	**1436**	**4595**	**1914**

	C/d	C/s	C/g	C	B/C	B/d	B/s	B/g
1	11.09	12.12	14.29	6.36	11.25	24.09	31.99	35.74
2	10.08	1.01	0.00	3.18	4.41	4.60	2.35	3.19
3	42.54	47.47	35.71	59.09	45.59	32.87	20.22	16.25
4	3.02	3.03	14.29	2.73	1.74	1.74	1.89	2.30
5	8.27	11.11	21.43	5.00	6.73	9.96	10.58	12.59
6	1.61	5.05	0.00	1.36	2.78	2.58	2.35	4.08
7	5.44	4.04	0.00	1.82	1.16	4.04	1.87	2.35
8	5.24	2.02	0.00	2.27	4.29	3.06	1.81	1.93
9	1.61	0.00	0.00	0.45	0.58	1.04	0.04	0.84
10	0.40	1.01	0.00	1.36	0.93	0.91	0.81	1.78
11	0.00	1.01	0.00	0.45	0.46	0.56	0.41	0.94
diverse	10.69	12.12	14.29	15.91	20.07	14.55	25.68	18.03
N	**496**	**99**	**14**	**220**	**862**	**1436**	**4595**	**1914**

Tablica 16.
Postotna brojčana zastupljenost sirovinskih kategorija u slojevima: 1. svijetlosivi i tamnosivi varijeteti sirovine, 2. svjetlonepropusna siva sirovina izražene laminarne strukture, 3. četiri varijeteta sirovine: bjelkasti, svijetlosivi, sivoplavi i sivocrni, 4. sirovina medenožute boje, 5. sirovina crvene do crvenosmeđe boje 6. sirovina tamnozelene boje, 7. dva varijeteta sirovine, zelenosivi i smeđesivi, 8. sirovina sivocrne boje, 9. sirovina smeđe boje, 10. sirovina sive, sivozelenkaste boje, 11. sirovina sivozelenkaste boje, razno, skupina različite petrografije, u kojoj su artefakti koji na temelju makroskopskih odlika ne pripadaju nijednoj prije navedenoj skupini.

Table 16.
Percentage numerical share of raw material categories in layers: 1. light-gray and dark-gray raw material varieties, 2. non-translucent gray raw materials with notable laminary structure, 3. four raw material varieties: whitish, light-gray, gray-blue and gray-black, 4. honey-yellow raw material, 5. red to red-brown raw material, 6. dark-green raw material, 7. two raw material varieties, green-gray and brown-gray, 8. gray-black raw material, 9. brown raw material, 10. gray, gray-green raw material, 11. gray-green raw material, miscellaneous, group with varying petrography, in which the artefacts do not belong to any of the previously specified groups based on macroscopic features.

pokušao I. Turk,[109] ali nažalost nije bilo pozitivnih rezultata, tj. nije se naišlo na materijal koji bi bio istovjetan onome iz Šandalje. Pojedine kategorije sirovine (svijetli varijetet unutar kategorije 3 i kategorije 5) makroskopski pokazuju veliku sličnost s materijalom sjeverne Italije[110] te se navedene sirovine mogu povezati i s tim područjem, a bile su korištene tijekom epigravetijena Italije. Radi se o sirovini *biancone* i *scaglia rossa*. Dok se potonja nalazi u sjevernoj i srednjoj Italiji, prva se javlja samo u sjevernoj Italiji, a budući da su obje prisutne u Šandalji, vjerojatnije je da su došle iz područja sjeverne Italije.[111]

Još uvijek nije potpuno jasan odgovor na pitanje kojim su se smjerovima šandaljski lovci kretali sabirući vrlo kvalitetne sirovine

alluvium. I. Turk[109] attempted this, but unfortunately he did not arrive at a positive result, i.e., he did not come upon materials identical to that from Šandalja. In macroscopic observation, individual categories of raw materials (the lighter varieties within category 3 and category 5) show a great similarity to the materials of northern Italy,[110] and these raw materials may be linked to this region - they were used during the Epigravettian in Italy. These are "*biancone*" and "*scaglia rossa*". While the latter can be found in northern and central Italy, the former can only be found in northern Italy, and since both were present in Šandalja, it is likely that they came from northern Italy.[111]

The routes along which the Šandalja hunters moved when collecting high-quality raw materials to make stone tools is still

109 Usmeno priopćenje
110 Usmeno priopćenje M. Peresanija i G. Boschiana.
111 Boschian 1995; Boschian, Zamagni 2005; Peresani 1998; Bietti et al. 2004; Cancellieri 2011; usmeno priopćenje M. Peresani i G. Boschian.

109 Personal communication.
110 M. Peresani and G. Boschian personal communications.
111 Boschian 1995; Boschian, Zamagni 2005; Peresani 1998; Bietti et al. 2004; Cancellieri 2011; M. Peresani and G. Boschian personal communications.

	C/d	C/s	C/g	C	B/C	B/d	B/s	B/g
1	18,95	32,22	15,74	18,44	27,78	36,86	56,90	59,57
2	23,40	15,04	0,00	7,49	8,20	11,73	2,19	3,12
3	35,45	17,34	16,83	33,63	31,95	19,39	12,94	8,59
4	1,06	7,41	57,75	1,46	1,30	0,42	0,47	0,64
5	4,52	8,96	2,66	2,09	5,33	3,36	4,71	5,38
6	1,34	1,45	0,00	0,81	2,07	1,32	1,50	2,38
7	4,09	1,65	0,00	0,70	1,06	3,40	1,43	1,43
8	2,66	2,60	0,00	1,95	4,53	7,18	1,17	1,37
9	1,90	0,00	0,00	0,31	0,51	0,56	0,21	0,21
10	0,28	0,14	0,00	4,79	1,06	1,22	0,43	1,28
11	0,00	0,25	0,00	0,45	0,53	0,27	0,27	0,35
razno	6,35	12,96	7,02	27,88	15,68	14,29	17,78	15,68
težina (g)	**2192,00**	**442,90**	**82,60**	**603,60**	**2823,90**	**7584,70**	**15416,70**	**6771,20**

	C/d	C/s	C/g	C	B/C	B/d	B/s	B/g
1	18.95	32.22	15.74	18.44	27.78	36.86	56.90	59.57
2	23.40	15.04	0.00	7.49	8.20	11.73	2.19	3.12
3	35.45	17.34	16.83	33.63	31.95	19.39	12.94	8.59
4	1.06	7.41	57.75	1.46	1.30	0.42	0.47	0.64
5	4.52	8.96	2.66	2.09	5.33	3.36	4.71	5.38
6	1.34	1.45	0.00	0.81	2.07	1.32	1.50	2.38
7	4.09	1.65	0.00	0.70	1.06	3.40	1.43	1.43
8	2.66	2.60	0.00	1.95	4.53	7.18	1.17	1.37
9	1.90	0.00	0.00	0.31	0.51	0.56	0.21	0.21
10	0.28	0.14	0.00	4.79	1.06	1.22	0.43	1.28
11	0.00	0.25	0.00	0.45	0.53	0.27	0.27	0.35
diverse	6.35	12.96	7.02	27.88	15.68	14.29	17.78	15.68
weight (g)	**2192.00**	**442.90**	**82.60**	**603.60**	**2823.90**	**7584.70**	**15416.70**	**6771.20**

Tablica 17.
Postotna težinska zastupljenost sirovinskih kategorija u slojevima: 1. svijetlosivi i tamnosivi varijeteti sirovine, 2. svjetlonepropusna siva sirovina izražene laminarne strukture, 3. četiri varijeteta sirovine: bjelkasti, svijetlosivi, sivoplavi i sivocrni, 4. sirovina medenožute boje, 5. sirovina crvene do crvenosmeđe boje, 6. sirovina tamnozelene boje, 7. dva varijeteta sirovine, zelenosivi i smeđesivi, 8. sirovina sivocrne boje, 9. sirovina smeđe boje, 10. sirovina sive, sivozelenkaste boje, 11. sirovina sivozelenkaste boje, razno, skupina različite petrografije, u kojoj su artefakti koji na temelju makroskopskih odlika ne pripadaju nijednoj prije navedenoj skupini.

Table 17.
Percentage weight share of raw material categories in layers: light-gray and dark-gray raw material varieties, 2. non-translucent gray raw materials with notable laminary structure, 3. four raw material varieties: whitish, light-gray, gray-blue and gray-black, 4. honey-yellow raw material, 5. red to red-brown raw material, 6. dark-green raw material, 7. two raw material varieties, green-gray and brown-gray, 8. gray-black raw material, 9. brown raw material, 10. gray, gray-green raw material, 11. gray-green raw material, miscellaneous, group with varying petrography, in which the artefacts do not belong to any of the previously specified groups based on macroscopic features.

za izradbu kamenih alatki.[112] Jedan je smjer vjerojatno išao sjeverno, preko jadranske nizine i prostora današnje Slovenije, dok je drugi mogao ići južno, duž jadranske obale.[113]

U većini epigravetijenskih slojeva (kompleksi C i B) osim alatki prisutni su i predmeti korišteni kao pojedinačni privjesci ili dijelovi nakita. Iz sloja C/d potječe i koštana pločica s urezanim linijama i crticama za koje nije jasno što točno predstavljaju. Koštani ulomak s urezanim linijama pronađen je u kasnoepigravetijenskom sloju B/s, a koštana pločica koja na obje strane ima mrežasti motiv, nosi oznaku kompleksa B. Gotovo sve koštane alatke su slomljene, i najčešći su samo njihovi ulomci. Neki se primjerci ne mogu pouzdano tipološki odrediti (šiljci ili probojci) jer nisu cjeloviti. Najviše ima probojaca, odnosno njihovih ulomaka, premda je dosta i šiljaka. Alatke često imaju paralelne ureze koji mogu imati vizualnu, a neki i simboličku, možda numeričku, funkciju. Jedini ulomak

not known.[112] One route probably ran northward, over the Adriatic lowlands and the territory of today's Slovenia, while another may have ran south, along the Adriatic coast.[113]

Besides tools, objects used as individual pendants or components of ornaments are present in most Epigravettian layers (complexes C and B). A bone plaquette with engraved lines, the significance of which is unclear, also came from layer C/d. A bone fragment with engraved lines was found in late Epigravettian layer B/s, while a bone plaquette with a lattice motif on both sides bears the designation of complex B. Almost all bone tools are broken, and most often only their fragments are present. Some examples cannot be reliably typologically specified (points or awls) because they are not whole. Tools often have parallel incisions which may have a visual, and some even a symbolic, perhaps numeric, function. The only harpoon fragment was found in late Epigravettian layer B/g.

112 Montet-White 1996.
113 Montet-White 1996.

112 Montet-White 1996.
113 Montet-White 1996.

harpuna pronađen je u kasnoepigravetijenskom sloju B/g. Iz istog sloja potječe i spatula. Za nakit su obično korišteni zubi običnog jelena, velikih cervida, srne i divlje svinje. Najčešće su probušeni na korijenu kako bi se mogli nositi kao privjesci, odnosno u obliku ogrlice. Često su glačanjem zaobljeni. Oko korijena jednog zuba iz sloja C/d načinjen je žljebasti kanal, vjerojatno da bi se zub lakše mogao privezati. Iz kompleksa B potječe i jedna školjka s rupom.

Koštanu industriju Šandalje, pod čime se podrazumijevaju predmeti od kosti, roga i zubâ, možemo razvrstati u tri skupine. Prva bi obuhvaćala alatke, druga ukrasne predmete (zubi, probušena koštana pločica), a treća "umjetničke predmete", tj. ulomke s urezanim linijama koje možda imaju neko apstraktno značenje. U orinjasijenu Šandalje prisutne su prve dvije skupine, dok treća nije ustanovljena. Sve tri skupine rukotvorina dolaze u epigravetijenu Šandalje. Probušena koštana pločica mogla je imati apotropejsko ili neko drugo simboličko značenje, a zubi su zasigurno bili dio nakita koji u gornjem paleolitiku ponajprije ima simboličko značenje dok je estetska komponenta bila sekundarna. Prikaz na jednom koštanom komadiću je zagonetan, a koštani komad s urezanim linijama i pločica s mrežastim motivom na obje strane možda predstavljaju apstraktno simboličko izražavanje. Urezi na alatkama mogu biti produkt brojanja, nekog drugog simboličkog značenja ili samo estetike.

Osim litičkoga i koštanog materijala u epigravetijenskim slojevima Šandalje naišlo se na više vatrišta i komadiće okera. Ostaci crvenog okera pronađeni su u slojevima C/d, C/g, B/d, B/s te na prijelazu kompleksa B u kompleks C (B/C), odakle potječu i ostaci smeđeg okera. Prema Malezovim izvješćima može se zaključiti da su u slojevima B/g i B/s otkopana četiri vatrišta, dok se u sloju B/d našlo na jedno.[114] Neka od njih bila su omeđena krupnim kamenjem.[115]

Uočene su razlike u postotnoj zastupljenosti pojedinih tipova alatki između sloja C/d i slojeva kompleksa B. Promjena se očituje i u proizvodnom postupku. Proizvodnja pločica u usporedbi sa sječivima izrazitija je u kasnijim slojevima, dok u sloju C/d sječiva ima više od pločica. Drukčija zastupljenost pojedinih tipova alatki korespondira s promjenom u učestalosti pojedinih faunističkih vrsta. Primjerice, u sloju C/d ostaci konja brojniji su od ostataka goveda, što se odnosi i na ostale slojeve kompleksa C te prijelaz ka kompleksu B (B/C), dok su goveda najzastupljenija vrsta u kompleksu B.[116] Nadalje, učestalost običnog jelena u slojevima kompleksa B veća je od one u ranijim slojevima. Veća prisutnost gravetica i pločica s hrptom u sloju C/d, u usporedbi sa slojevima kompleksa B možda je u svezi s promjenom glavne lovne životinje (C/d - konj, B - govedo).

Uočene su razlike u zastupljenosti pojedinih tipova alatki u slojevima kompleksa B. Slojevi B/s i B/g u tom pogledu pokazuju minimalne razlike i mogu se tretirati kao cjelina. Veće su razlike u odnosu na stariji sloj B/d. Već je navedeno da u fauni svih slojeva

A spatula originated in that same layer. The teeth of red deer, large cervids, roe deer and wild boars were normally used for ornaments. Most often they were pierced at the root so that they could be worn as pendants, i.e. on necklaces. They were often rounded by polishing. A groove-like canal was made around the root of a tooth from layer C/d, probably so that it could be more easily tied. A shell with a hole also originated in complex B.

The bone industry of Šandalja, which implies objects made of bone, antler and teeth, can be divided into three groups. The first encompasses tools, the second decorative objects (teeth, pierced bone plaquette) and the third "artistic objects", i.e., fragments with engraved lines which may have some abstract meaning. The first two groups were present in Šandalja's Aurignacian, while the third has not been ascertained. All three artifact groups were present in Šandalja's Epigravettian. A pierced bone plaquette may have had apotropaic or some other symbolic significance, while teeth were certainly parts of ornaments which in the Upper Palaeolithic primarily had symbolic significance while the aesthetic component was secondary. The portrayal on one bone piece is inscrutable, and the bone piece with engraved lines and the plaquette with lattice motifs on both sides constitute abstract symbolic expressions. The incisions on tools may be the product of counting, or some other symbolic meaning, or simple aesthetics.

Besides the lithics and bone materials, several firing places and pieces of ochre were also found in the Epigravettian layers of Šandalja. The remains of red ochre were found in layers C/d, C/g, B/d, B/s and at the transition of complex B into C (B/C) whence the remains of brown ochre also originated. According to the reports by Malez, it may be concluded that four firing places were excavated in layers B/g and B/s, while one was found in layer B/d.[114] Some of them were bordered by large stones.[115]

Differences in the percentage share of individual tool types have been observed between layer C/d and the complex B layers. The change manifested itself in the technology. The production of bladelets in comparison with blades is more notable in later layers, while in layer C/d there are more blades than bladelets. The different shares of individual tool types correspond to the change in frequency of individual animal species. For example, in layer C/d, the equine remains are more numerous than bovine remains, which also applies to the remaining layers of complex C and the transition toward complex B (B/C), while bovines were the most frequent species in complex B.[116] Furthermore, the frequency of red deer in the complex B layers is higher than in earlier layers. The higher presence of micro-Gravettes and backed bladelets in layer C/d in comparison to complex B layers may be linked to the change in the main hunted animals (C/d - horses, B - bovines).

Differences were observed in the representation of individual tool types in the complex B layers. Layers B/s and B/g in this sense exhibit minimal differences and may be treated as a whole. The differences in relation to the older layer B/d are greater. It has

114 Miracle 1995, tablica 3.4.
115 Malez 1965a, T. 2/1.
116 Miracle 1995, 1996.

114 Miracle 1995, Table 3.4.
115 Malez 1965a, P. 2/1.
116 Miracle 1995, 1996.

kompleksa B dominira govedo, no od najstarijeg sloja (B/d) prema najmlađem sloju (B/g) njegova je relativna zastupljenost sve veća.[117]

5. USPOREDBA S ISTOVREMENIM JADRANSKIM NALAZIŠTIMA

Značajke epigravetijena istočne jadranske regije donekle su prikazane u mnogobrojnim radovima.[118] Epigravetijen Šandalje valja ponajprije usporediti s istarskim nalazištima. Dvije špilje podno Učke sadrže industriju epigravetijena. To su Pupićina peć i Vešanska peć. Obje su smještene u kanjonu podno Vranjske drage.

Dubila, grebala, a potom i komadići s hrptom najčešće su alatke koje potječu iz naslaga kasnogglacijalnog interstadijala Pupićine, a vrlo je slična situacija u stanišnim razinama koje pripadaju mlađem drijasu.[119] Slično situaciji u Pupićini, grebala su česta u Šandalji, ali su dubila rijetka u epigravetijenskim slojevima potonjeg nalazišta.[120] Određene sličnosti u litičkoj industriji vidljive su s nalazištem Vešanska peć, gdje su u slojevima kasnog epigravetijena česta dubila, kratka grebala, gravetice i posebno pločice s hrptom,[121] premda u Vešanskoj nema geometrijskih mikrolita koji su prisutni u Šandalji.[122]

U Nugljanskoj peći dio stratigrafskog slijeda zasigurno pripada kasnom epigravetijenu, što potvrđuje i jedan radiokarbonski rezultat[123] koji ukazuje na barem djelomičnu vremensku podudarnost Šandalje i Nugljanske peći. U horizontu koji pripada interstadijalu među alatkama su zabilježena noktolika grebala i pločice s hrptom čija je asocijacija karakteristična za kasni epigravetijen. U ovom horizontu dubila su malobrojna. U nešto kasnijem epigravetijenskom horizontu iz Nugljanske peći koji pripada vremenu drijasa III raste udio pločica s hrptom i dubila u odnosu na prethodni horizont, a noktolika grebala nestaju. U oba horizonta prisutan je visok udio komada s obradbom. Geometrijski mikroliti su rijetki i zabilježen je samo jedan primjerak trokuta u mlađem horizontu.[124]

Kremene rukotvorine iz Romualdove špilje, koja se nalazi na završetku Limskog kanala kod Rovinja, M. Malez[125] pripisuje mlađem orinjasijenu i ranoj fazi gravetijena. Nalaza je premalo za pouzdanu odredbu. Jedan šiljak s usjekom i pločica s hrptom upućuju na epigravetijen, a takvi su šiljci s usjekom prisutni u šandaljskom kompleksu C.[126] U Romualdovoj špilji pronađen je i jedan probušeni jelenji zub, kakvi su nađeni

already been stated bovines dominated in all complex B layers, however from the oldest (B/d) to youngest (B/g) layers, their relative share increased.[117]

5. COMPARISON WITH CONTEMPORANEOUS ADRIATIC SITES

The characteristics of the Epigravettian in the eastern Adriatic have been presented to some extent in numerous works.[118] The Epigravettian at Šandalja should first be compared to Istrian sites. Two caves below the mountain Učka contain Epigravettian industry. These are Pupićina peć and Vešanska peć. Both are located in a canyon at the foot of Vranjska Draga.

Burins, endscrapers and then backed pieces are most often tools which originated from Late Glacial interstadial layers at Pupićina, and it is very similar situation in habitat levels which belong to the Younger Dryas.[119] Like the situation in Pupićina, endscrapers are frequent in Šandalja, but burins are rare in the Epigravettian layers of the latter site.[120] Certain similarities in the lithic industry are visible with regard to Vešanska, where burins, short endscrapers, micro-Gravettes and especially backed bladelets are frequent in the late Epigravettian layers,[121] although in Vešanska there are no geometric microliths, which are present in Šandalja.[122]

In the cave known as Nugljanska peć, a part of the stratigraphic sequence certainly belongs to the late Epigravettian, which is confirmed by a radiocarbon date[123] which indicates at least a partial chronological correspondence between Šandalja and Nugljanska. Thumbnail endscrapers and backed bladelets, an association typical of the late Epigravettian, were registered among the tools in the horizon which belongs to the interstadial. Burins are few in number in this horizon. The share of backed bladelets and burins grew in the somewhat later Epigravettian horizon from Nugljanska which belongs to the Dryas III in comparison to the preceding horizon, while thumbnail endscrapers disappeared. A high share of retouched pieces are present in both horizons. Geometric microliths are rare and they were registered in only one example of a triangle in a younger horizon.[124]

Flint artifacts from Romualdova Cave, which is situated at the end of the bay known as the Lim Channel near Rovinj, were attributed by Malez[125] to the younger Aurignacian and the earlier phase of the Gravettian. There are too few finds for a reliable determination. One shouldered point and backed bladelet indicate the Epigravettian, and such shouldered points are present in the Šandalja's complex C.[126] A pierced red deer tooth, as registered in

117 Miracle 1995, 1996.
118 Malez 1970; 1971;1975b; 1976; 1979b ; Basler 1983.
119 Miracle 1997; Komšo, Pellegatti 2007.
120 Janković et al. 2012.
121 Komšo, Pellegatti 2007.
122 Janković et al. 2012.
123 Miracle, Forenbaher 2000; Komšo, Pellegatti 2007; Pellegatti 2009.
124 Komšo i Pellegatti 2007.
125 Malez 1987, str.18.
126 Kozlowski 1979; 1992; Montet-White, Kozlowski 1983.

117 Miracle 1995, 1996.
118 Malez 1970; 1971; 1975b; 1976; 1979b; Basler 1983.
119 Miracle 1997; Komšo, Pellegatti 2007.
120 Janković et al. 2012.
121 Komšo, Pellegatti 2007.
122 Janković et al. 2012.
123 Miracle, Forenbaher 2000; Komšo, Pellegatti 2007; Pellegatti 2009.
124 Komšo and Pellegatti 2007.
125 Malez 1987, p. 18.
126 Kozlowski 1979; 1992; Montet-White, Kozlowski 1983.

u Šandalji.[127] Dok barem dio epigravetijenskih slojeva (C/d, slojevi kompleksa B) Šandalje može upućivati na postojanje radionice i duži boravak jedne lovačko-skupljačke zajednice, u Romualdovoj se špilji vjerojatno radi o kratkom zadržavanju unutar jedne lovne epizode ili više njih.

U Ljubićenoj pećini kraj Marčane definirana su dva kasnogornjopaleolitička horizonta koja se na temelju radiokarbonskih rezultata mogu smatrati epigravetijenskima.[128]

Za još nekoliko istarskih nalazišta može se pretpostaviti njihovo naseljavanje tijekom kasnog epigravetijena, a to su Vergotinova peć,[129] Abri Kontija 002[130] i Pećina kod Rovinjskog sela 1.[131] Nažalost, za ova nalazišta nedostaju nam radiokarbonski rezultati koji bi mogli potvrditi ovakve pretpostavke.

Epigravetijen je ustanovljen i na Loparu na otoku Rabu, za koji M. Malez[132] rabi naziv tardigravetijen. Odlikuje se grebalima, sječivima i pločicama s hrptom te azilijenskim šiljcima.[133] Revizija artefakata s Lopara koju je proveo jedan od autora ovog rada (IK) s D. Perkićem pokazala je prisutnost gravetica, pločica s hrptom, kružnih segmenata te azilijenskih šiljaka, što potvrđuje epigravetijen, možda njegovu kasnu fazu. Nažalost, taj je materijal sabran na površini gdje je bio pomiješan s materijalom iz kasnijih razdoblja, pa je neke pouzdanije zaključke iz takve mješavine teško dobiti.

Vela jama kod Osorčice na otoku Lošinju također sadrži nalaze koji mogu pripadati epigravetijenu, a ista se konstatacija možda može odnositi i na nalazište Jami na Sredi na otoku Cresu.[134] Međutim, alatke s prvog nalazišta malobrojne su, a sa drugoga nisu objavljene, te se bez znanstveno relevantnog uzorka s navedenih nalazišta ne čini uputnim o njima detaljnije raspravljati.

U epigravetijenskim slojevima Vele spile na otoku Korčuli[135] najzastupljenija su kratka grebala, a pločice s hrptom i geometrijski mikroliti također su prisutni.

Špilja Kopačina, koja se nalazi na sjeverozapadnoj strani otoka Brača, između Supetra i Donjeg Humca, također je dala nalaze epigravetijena.[136] Među alatkama vrlo su česta kratka grebala, odnosno noktolika grebala, a pločice s hrptom i geometrijske forme, iako malobrojne, također su prisutne.[137] Prema značajkama industrije i rezultatima apsolutnog datiranja[138] navedenu manifestaciju treba pripisati kasnom epigravetijenu. Vukosavljević *et al*.[139] smatraju da

Šandalja, was also found in Romualdova.[127] While at least part of the Epigravettian layers (C/d, complex B layers) of Šandalja may indicate the existence of a workshop and the extended residence of a hunter/gatherer community, in Romualdova it was probably a case of a brief stay during one or more hunting expeditions.

Two late Upper Palaeolithic horizons were defined in the cave Ljubićeva pećina near Marčana, which may be deemed Epigravettian based on radiocarbon dates.[128]

It may be assumed that several other Istrian sites were inhabited during the late Epigravettian, and these are Vergotinova peć,[129] Abri Kontija 002[130] and Pećina near Rovinjsko Selo 1.[131] Unfortunately, there are no radiocarbon dates for these sites which could confirm this hypothesis.

The Epigravettian was also ascertained at Lopar on the island of Rab, for which Malez[132] used the term Tardigravettian. It is characterized by endscrapers, blades and backed bladelets and Azilian points.[133] An audit of the artefacts from Lopari conducted by one of the authors of this work (I.K.) together with D. Perkić demonstrated the presence of micro-Gravettes, backed bladelets, circular segments and Azilian points, which confirms the Epigravettian, perhaps its late phase. Unfortunately, this material was collected at the surface, where it was mixed with materials from later periods, so it is difficult to draw any more unambiguous conclusions on the basis of this assortment.

The Vela jama cave near Osorčica on the island of Lošinj also contains finds which may be Epigravettian, and this same assertion can also apply to the Jami na Sredi site on the island of Cres.[134] However, the tools from the former are few in number, while those from the latter have not been published, and without a scientifically relevant sampling from these sites it does not appear prudent to discuss them in any detail.

In the Epigravettian layers of Vela spila cave on the island of Korčula,[135] short endscrapers are the most common, while backed bladelets and geometric microliths are also present.

Kopačina cave, which is situated on the north-western side of the island of Brač, between Supetar and Donji Humac, also yielded Epigravettian finds.[136] Short and thumbnail endscrapers are very common, while backed bladelets and geometric forms, although few in number, are also present.[137] Based on the industry characteristics and the results of absolute dating,[138] the latter should be attributed to the late Epigravettian. Vukosavljević et al.[139]

127 Malez 1987, sl. 17/4.
128 Percan *et al*. 2009; Percan 2010.
129 Malez 1987, Komšo 2004.
130 Komšo 2009.
131 Komšo 2008a.
132 Malez 1974b.
133 Montet-White, Kozlowski 1983.
134 Dimitrijević, *et al*. 1998; Malez 1979a; Mirosavljević 1968.
135 Čečuk, Radić 2005.
136 Čečuk 1993; 1996; Vukosavljević *et al*. 2011.
137 Vukosavljević *et al*. 2011
138 Čečuk 1996; Vukosavljević *et al*. 2011.
139 Vukosavljević *et al*. 2011.

127 Malez 1987, Fig. 17/4.
128 Percan et al. 2009; Percan 2010.
129 Malez 1987, Komšo 2004.
130 Komšo 2009.
131 Komšo 2008a.
132 Malez 1974b.
133 Montet-White, Kozlowski 1983.
134 Dimitrijević, et al. 1998; Malez 1979a; Mirosavljević 1968.
135 Čečuk, Radić 2005.
136 Čečuk 1993; 1996; Vukosavljević et al. 2011.
137 Vukosavljević et al. 2011
138 Čečuk 1996; Vukosavljević et al. 2011.
139 Vukosavljević et al. 2011.

cjelokupni stratigrafski slijed iz Kopačine, osim brončanodobne faze, treba pripisati kasnom epigravetijenu, nasuprot ranijem mišljenju, prema kojemu su u Kopačini zabilježeni kasnoepigravetijenski i mezolitički slojevi.[140] Iz Kopačine potječu i koštane alatke,[141] slomljeni šiljci te eventualno probojci kakvih ima i u Šandalji.

Prisutnost epigravetijena utvrđena je i u pećini Zemunici na sjevernoj strani Malog Mosora, pokraj sela Biska. U skupu nalaza nisu pronađeni karakteristični tipovi alatki prema kojima se može utvrditi kulturna pripadnost epigravetijenu, već je ta pripadnost utvrđena kronološki, prema rezultatima datiranja metodom ^{14}C.[142]

U pećini Vlakno na Dugom otoku također su zabilježeni epigravetijenski slojevi, koji se mogu okvirno smjestiti između 12350[143] i 10160 godina prije sadašnjosti.[144] Epigravetijenska industrija s ovog nalazišta pokazuje značajnu tipološku homogenost kroz vrijeme koju karakterizira visok udio noktolikih grebala i pločica s hrptom, kao i komadića s djelomičnom obradbom. Zakrivljeni šiljci s hrptom, koji bi se tipološki mogli definirati i kao azilijenski šiljci, također su zabilježeni u repertoaru alatki. Dubila su rijetka.[145] Nalazište na području istočne jadranske regije s obilnim materijalom iz razdoblja epigravetijena je Badanj kod Stolca u Bosni i Hercegovini.[146] Prilikom istraživanja Đ. Baslera[147] skupljeno je 250000 kamenih artefakata. Čak 48 % alatki prikupljenih Baslerovim iskopavanjima čine grebala (Basler ih naziva strgala), i to kružna, noktolika, grebala na vrhu sječiva i na odbojcima, dok zastupljenost gravetica, pločica s hrptom i ostalih alatki s hrptom iznosi 26 %, što je iznimno mnogo.[148] Zastupljenost gravetica i pločica s hrptom prikupljenih iskopavanjima R. Whallona[149] varira od sloja do sloja, ali je ona gotovo uvijek (osim u dva sloja) ispod 20 %. Također možemo pratiti trend smanjivanja zastupljenosti navedenih kategorija, uz blaga odstupanja, od starijih slojeva prema mlađima. Promatramo li zastupljenost gravetica i pločica s hrptom u šandaljskim slojevima C/d, B/d, te slojeve B/s i B/g tretiramo kao cjelinu, uočavamo isti trend (smanjivanje zastupljenosti pločica s hrptom i gravetica), koji se kontinuirano nastavlja iz sloja u sloj, od starijih prema mlađima. To kontinuirano smanjivanje zastupljenosti navedenih alatki u Šandalji remete međutim podaci dobiveni za kompleks C i sloj B/C. Budući da se za tako označene alatke ne zna pouzdano iz kojeg sloja potječu, statističke podatke za C kompleks i razinu B/C valja uzeti s ogradom. To se odnosi i na slojeve C/s i G/g, gdje je broj zastupljenih alatki premalen za statističku analizu. Na pitanje uzroka gotovo kontinuiranog smanjivanja zastupljenosti

assume that the entire stratigraphic sequence from Kopačina, with the exception of the Bronze Age phase, should be attributed to the late Epigravettian, as opposed to the earlier view whereby late Epigravettian and Mesolithic layers were registered in Kopačina.[140] Bone tools,[141] broken points and possibly the type of awls at Šandalja were also found in Kopačina.

The presence of the Epigravettian was also confirmed in the Zemunica cave on the northern side of Mali Mosor, next to the village of Bisko. None of the typical tool types were found in the lithic assemblage which could be used to ascertain an Epigravettian culture, rather this was confirmed by C14 dating.[142]

Epigravettian layers were also registered in the cave called Vlakno on the island of Dugi otok, which may be generally placed between 12,350[143] and 10,160 years BP.[144] The Epigravettian industry of this site exhibits considerable typological homogeneity over time characterized by a high share of thumbnail endscrapers and backed bladelets, as well as partially retouched pieces. Curved backed points, which may be typologically defined as Azilian points, were also recorded among the repertoire of tools. Burins are rare.[145] Badanj, near Stolac in Bosnia-Herzegovina, is another site in the eastern Adriatic region with abundant materials from the Epigravettian.[146] During research conducted by Đ. Basler,[147] 250,000 stone artefacts were collected. As many as 48% of the tools gathered during Basler's excavations are endscrapers, i.e., circular, thumbnail, endscrapers on blade tips and on flakes, while the share of micro-Gravettes, bladelets and other backed tools is 26%, which is a considerable amount.[148] The presence of micro-Gravettes and backed bladelets gathered in R. Whallon's excavations[149] varies from layer to layer, but it is almost always (except in two layers) below 20%. It is also possible to follow the decreasing trend in these categories, with minor deviations, from the older to younger layers. If the share of micro-Gravettes and backed bladelets in Šandalja layers C/d, B/d are observed, and layers B/s and B/g are treated as a whole, the same trend (reduction of the share of backed bladelets and micro-Gravettes) can be seen, and it continues from layer to layer, from oldest to youngest. However, this continuous reduction in the share of these tools in Šandalja is disrupted by the data obtained for complex C and layer B/C. Since the layers from which the tools so designated cannot be determined with any certainty, the statistics for complex C and level B/C should be taken with some caution. This also pertains to the layers C/s and G/g, where the number of tools is too small for a statistical analysis. It is rather difficult to answer the question on the causes of the continuous

140 Čečuk 1996.
141 Čečuk 1996, sl. 8
142 Šošić Klindžić *et al*., u pripremi.
143 Vujević, Parica 2011.
144 Brusić 2005; Komšo 2008b.
145 Vukosavljević 2012.
146 Basler 1976; 1979a; 1979b; Kujundžić 1987; Whallon 1989; 1999.
147 Basler 1979a, str. 349.
148 Basler 1979a, str.349-350.
149 Whallon 1989, sl. 3.

140 Čečuk 1996.
141 Čečuk 1996, sl. 8
142 Šošić Klindžić et al., in preparation.
143 Vujević, Parica 2011.
144 Brusić 2005; Komšo 2008b.
145 Vukosavljević 2012.
146 Basler 1976; 1979a; 1979b; Kujundžić 1987; Whallon 1989; 1999.
147 Basler 1979a, p. 349.
148 Basler 1979a, pp. 349-350.
149 Whallon 1989, Fig. 3.

gravetica i pločica s hrptom od starijih prema mlađim slojevima, vrlo je teško odgovoriti. Promjene u industriji možda su barem djelomičan odraz različite učestalosti pojedinih faunističkih vrsta. U sloju C/d Šandalje prevladava konj, dok su u kompleksu B najzastupljenija goveda, a u istom kompleksu zastupljeniji je obični jelen, nego što je to slučaj u kompleksu C.[150] Premda je uočen isti trend opadanja zastupljenosti gravetica tijekom vremena u Badnju i Šandalji, zastupljenost pojedinih životinjskih vrsta u Badnju vidno je različita od one u Šandalji.[151] Stoga uzrok promjenama litičke industrije ne treba isključivo vezati za promjene u zastupljenosti određenih životinjskih vrsta.

Zadirući u unutrašnjost, paleolitički su lovci jadranske regije mogli doći u prostor središnje Bosne.[152] Rudina glavica kod Trnova značajno je nalazište iz te regije pripisano kasnom gravetijenu.[153] Prema ovdje korištenoj terminologiji kulturu ovog nalazišta pripisali bismo okvirno epigravetijenu, bez pretenzije podrobnijeg određivanja neke faze navedene kulture i pokušaja precizne usporedbe s drugim nalazištima.

Kasni epigravetijen ustanovljen je u slojevima IX i VIII u Crvenoj stijeni kod Nikšića u Crnoj Gori.[154] Grebala su vrlo česta i zastupljenija od alatki s hrptom u svim slojevima osim u sloju VIII.[155]

Valja spomenuti i dva nalazišta u unutrašnjosti Crne Gore. To su Mališina stijena i Medena stijena u kanjonu Ćehotine na sjeveru Crne Gore.[156] Dio stanišnih razina Mališine stijene pripisan je finalnom gravetijenu i tardigravetijenu.[157] Prema ovdje korištenoj terminologiji tardigravetijen odgovarao bi epigravetijenu, a od karakterističnih alatki tu su ponajprije pločice i šiljci s hrptom. Kamena industrija Medene stijene pripisana je epigravetijenu (slojevi X-V) i lokalnom mezolitiku (sloj IV) koji sadrži trapeze.[158] Rana faza epigravetijena Medene stijene (X i IX) ne sadrži zarubljene pločice, niti šiljke s usjekom, kojih nema na prostoru istočnog Balkana.[159] No šiljci s usjekom nađeni su u Šandalji i na Apeninskom poluotoku. Kasna faza epigravetijena Medene stijene (slojevi VIII-V) predstavlja zapravo završni epigravetijen, sa značajnim udjelom kratkih, noktolikih i kružnih grebala te geometrijskih formi.[160] Te značajke slične su kasnom epigravetijenu Šandalje i drugim nalazištima jadranske regije, premda su geometrijski oblici (osim segmenata kruga) u Šandalji znatno rjeđe zastupljeni.

150 Miracle 1995.
151 Miracle 1995; Miracle, Sturdy 1991.
152 Kujundžić 1989, bilj. 24; Mulaomerović 1985.
153 Mulaomerović 1984.
154 Basler 1975; 1979a; Montet-White 1996; Mihailović 2009.
155 Mihailović 2009, T. 18.
156 Mihailović 1996; Radovanović 1986.
157 Radovanović 1986.
158 Mihailović 1996; 1999.
159 Mihailović 1996.
160 Mihailović 1996.

reduction in the share of micro-Gravettes and backed bladelets from the older to younger layers. Changes in industry were perhaps a partial reflection of the different frequencies of individual animal species. Horses dominate in layer C/d at Šandalja, while in complex B bovines are the most common, while in the same complex the red deer is better represented than in complex C.[150] Although the same declining trend in the share of micro-Gravettes over time in Badanj and Šandalja was observed, the share of individual animal species in Badanj is visibly different than that in Šandalja.[151] Thus, the cause of the changes in the lithic industry should not be linked to changes in the presence of certain animal species.

The Palaeolithic hunters of the Adriatic zone may have reached central Bosnia as they made inroads into the interior.[152] Rudina Glavica at Trnovo is a major site from that region, ascribed to the late Gravettian.[153] Based on the terminology used herein, this site's culture can generally be attributed to the Epigravettian, without pretensions to more specifically determine any phase of this culture or attempts to make precise comparisons with other sites.

The late Epigravettian was ascertained in layers IX and VIII in Crvena Stijena near Nikšić in Montenegro.[154] Endscrapers are very frequent and more highly represented than backed tools in all layers, except layer VIII.[155]

Two sites in the Montenegrin interior also merit attention. These are Mališina Stijena and Medena Stijena in the Ćehotina Canyon in northern Montenegro.[156] A part of the habitat level at Mališina Stijena has been ascribed to the final Gravettian and Tardigravettian.[157] Based on the terminology used herein, the Tardigravettian would correspond to the Epigravettian, while the typical tools are primarily backed bladelets and backed points. The stone industry of Medena Stijena has been ascribed to the Epigravettian (layers X-V) and the local Mesolithic (layer IV) which contains a trapezes.[158] The early phase of the Epigravettian at Medena Stijena (X and IX) does not contain truncated bladelets, nor shouldered points, which are absent in the eastern Balkans.[159] However, shouldered points are present in Šandalja and on the Apennine Peninsula. The late phase of the Epigravettian at Medena Stijena (layers VIII-V) actually constitute the final Epigravettian with a considerable share of short, thumbnail and circular endscrapers, and geometric forms.[160] These features are similar to the late Epigravettian at Šandalja and other Adriatic region sites, although geometric forms (besides circular segments) are much more rarely present in Šandalja.

150 Miracle 1995.
151 Miracle 1995; Miracle, Sturdy 1991.
152 Kujundžić 1989, note 24; Mulaomerović 1985.
153 Mulaomerović 1984.
154 Basler 1975; 1979a; Montet-White 1996; Mihailović 2009.
155 Mihailović 2009, P. 18.
156 Mihailović 1996; Radovanović 1986.
157 Radovanović 1986.
158 Mihailović 1996; 1999.
159 Mihailović 1996.
160 Mihailović 1996.

Još jedno epigravetijensko nalazište u Crnoj Gori je Trebački krš, koji se nalazi na lijevoj strani rijeke Lima u sjeveroistočnoj Crnoj Gori.[161] Međutim, preciznija usporedba s drugim nalazištima prema Lj. Đuričić[162] nije precizno provediva jer Trebački krš ne pokazuje izražene razlike po slojevima. D. Mihailović[163] smatra da sloj II iz Trebačkog krša pripada kasnoepigravetijenskoj industriji, a da su slojevi Ia i Ib ranoholocenske, odnosno mezolitičke starosti.

Usporedba s epigravetijenskim nalazištima južno od Crne Gore, može biti provedena s grčkim nalazištima jer za prostor Albanije, koji je slabo istražen, postoje vrlo oskudni podaci. Na prostoru Grčke, u Epiru, ima značajnih nalazišta iz razdoblja epigravetijena. Ovdje ih valja barem spomenuti, uz napomenu da njihov epigravetijen pokazuje vidne kronološke i tipološke sličnosti s epigravetijenom jadranske regije. Ta nalazišta su: Asprochaliko, Kastritsa[164] i Klithi.[165] Valja spomenuti još jedno nalazište Grčke, koje zbog bogatstva litičkog materijala i vrlo detaljnih objavljenih rezultata analize privlači posebnu pozornost. To je špilja Franchthi, koja se nalazi na Peloponezu u Argolidi.[166] Ako bi sloj C/d Šandalje pripadao ranom epigravetijenu, on bi vremenski odgovarao fazi II nalazišta Franchthi, dok se kasni epigravetijen (kompleks B) preklapa s fazom IV - VI.

Osim navedenih grčkih lokaliteta, do sada je bilo riječi samo o epigravetijenskim nalazištima istočne jadranske obale i njezina zaleđa. Italija obiluje nalazištima epigravetijenske industrije, a dio njih pripada i jadranskoj regiji.[167] Epigravetijen Italije podijeljen je u tri osnovne tipološko-kronološke faze: rani epigravetijen (oko 20000 prije sadašnjosti), razvijeni epigravetijen (oko 16000 prije sadašnjosti) i završni epigravetijen (po ovdje korištenoj terminologiji kasni epigravetijen) koji počinje približno 14000 godina prije sadašnjosti i traje do 10000 godina prije sadašnjosti.[168] Pojedine su faze, međutim, podijeljene dalje u potfaze ili regionalne tipove, što nam u ovoj globalnoj usporedbi nije od interesa.[169] Važno je napomenuti da se navedene faze u kronološkom smislu uvijek striktno ne poklapaju, s obzirom na različita nalazišta. Nasuprot spomenutoj podjeli epigravetijena, M. Mussi[170] smatra da nije opravdano izdvajati razvijeni epigravetijen kao zasebnu fazu, te ona dijeli epigravetijen u dvije faze: ranu, koja traje do približno 16000 godina prije sadašnjosti, i kasnu, koja traje od približno 16000 pa do 10000 godina prije sadašnjosti. Glavnu stratigrafsku sekvencu za rani epigravetijen sadrži špilja Paglicci na Monte Garganu u Apuliji.[171] A. Montet-White[172] je primijetila da datiranja sloja 18 špilje

161 Đuričić 1996.
162 Đuričić 1996, str. 91.
163 Mihailović 1999; 2000.
164 Bailey *et al*. 1983; Adam 1999.
165 Bailey *et al*. 1984; 1986; vidi također Bailey, Gamble 1990; Adam 1999.
166 Perlès 1987; 1999.
167 Vidi Bietti 1990; Mussi 1992.
168 Bartolomei *et al.* 1979.
169 Bartolomei *et al.*1979; Mussi 1990.
170 Mussi 2002.
171 Mussi 1990.
172 Montet-White 1996, str. 123; vidi također Palma di Cesnola, Bietti 1983.

Another Epigravettian site in Montenegro is Trebački Krš, which is on the left bank of the Lim River in north-eastern Montenegro.[161] However, a more precise comparison with other sites, according to Lj. Đuričić,[162] is not feasible, because there are no notable differences between layers at Trebački Krš. D. Mihailović[163] believes that layer II from Trebački Krš belongs to the late Epigravettian industry, and that layers Ia and Ib are early Holocene, i.e. Mesolithic.

A comparison with the Epigravettian sites south of Montenegro may only be made with Greek sites, because the territory of Albania has been scantly researched and the data are rather meagre. In the territory of Greece, in Epirus, there are significant sites from the Epigravettian period. They should nonetheless be mentioned here with the note that their Epigravettian shows visible chronological and typological similarities with the Adriatic region's Epigravettian. These sites are: Asprochaliko, Kastritsa[164] and Klithi.[165] Another Greek site bears mention, as it draws attention with the abundance of its lithics and very copiously published results. This is Franchthi cave, which is in Argolis on the Peleponnese.[166] Insofar as layer C/d at Šandalja belongs to the early Epigravettian, then it would chronologically correspond to phase II of the Franchthi site, while the late Epigravettian (complex B) would correspond to phases IV-VI.

Besides the aforementioned Greek sites, thus far only Epigravettian sites of the eastern Adriatic coast and its hinterland have been covered. Italy abounds in Epigravettian industry sites, and some of them belong to the Adriatic zone.[167] Italy's Epigravettian is divided into three basic typological/chronological phases: the early Epigravettian (ca 20,000 BP), the evolved Epigravettian (ca 16,000 BP) and the final Epigravettian (the late Epigravettian in the terminology used herein) which began at roughly 14,000 and endured until 10,000 years BP.[168] However, individual phases are further divided into sub-phases or regional types, which is not of interest here in this global comparison.[169] It is worth mentioning that in the chronological sense these phases do not strictly correspond given the different find sites. In contrast to this division of the Epigravettian, M. Mussi[170] felt that it was not justified to separate the evolved Epigravettian as a separate phase, and she divided the Epigravettian into two phases: an early one which lasted from ca. 16,000 years BP and a late one which lasted from ca. 16,000 to 10,000 years BP. The main stratigraphic sequence for the early Epigravettian can be found in the Paglicci cave at Monte Gargano in Apulia.[171] A. Montet-White[172] observed that the

161 Đuričić 1996.
162 Đuričić 1996, p. 91.
163 Mihailović 1999; 2000.
164 Bailey et al. 1983; Adam 1999.
165 Bailey et al. 1984; 1986; see also Bailey, Gamble 1990; Adam 1999.
166 Perlès 1987; 1999.
167 See Bietti 1990; Mussi 1992.
168 Bartolomei et al. 1979.
169 Bartolomei et al.1979; Mussi 1990.
170 Mussi 2002.
171 Mussi 1990.
172 Montet-White 1996, p. 123; see also Palma di Cesnola, Bietti 1983.

Paglicci (Monte Gargano, Apulija) njezin epigravetijen određuju na približno 20000 godina prije sadašnjosti, a razvoj šiljaka s usjekom pada između 19000 i 16000 godina prije sadašnjosti.[173] Već je navedeno da su šiljci s usjekom nađeni i u kompleksu C Šandalje.[174] Premda su oni pouzdan indikator epigravetijena, ne bi bilo dobro vezati ih za pojedinu fazu te industrije. M. Mussi[175] je upozorila da etnografska analiza pokazuje povezanost šiljaka projektila (kao što su šiljci s usjekom) s lovačkim aktivnostima,[176] te njihovo neučestalo odbacivanje na glavnim nalazištima, pa oni ne mogu biti pouzdan kronološki indikator. Štoviše, znamo da te rukotvorine na nalazištima Zapadne Europe mogu doći ranije ili kasnije, a negdje se i ne pojavljuju.[177]

U epigravetijenskim slojevima nalazišta Paglicci alatke s hrptom su česte, a grebala su znatno manje zastupljena,[178] dok su u kasnom epigravetijenu špilje Romanelli, u Apuliji, južno od nalazišta Paglicci, kratka grebala značajno zastupljena, a ima alatki s hrptom i geometrijskih mikrolita.[179] Zanimljivo je da nalazište Romanelli sadrži mala kružna i noktolika grebala, što je slično kasnom epigravetijenu Šandalje (kompleks B), dok industrija nalazišta Riparo di Tagliente u Venetu, koje je zemljopisno znatno bliže Šandalji, pokazuje vidne razlike u usporedbi sa šandaljskim materijalom.[180] Te su razlike u skladu s idealnim modelom R. Whallona[181] o teritorijalnoj organizaciji tijekom kasnog epigravetijena.[182]

Što se tiče komadića s urezanim linijama na okorini koje čine mrežasti motiv, iz sloja B/s Šandalje (sl. 9, 40), također su uočljive sličnosti s navedenim talijanskim nalazištima, odnosno s nalazom iz Grotta Romanelli[183] i nalazima s lokaliteta Riparo di Tagliente.[184] Iz Šandalje (iz jednog od slojeva kompleksa B) potječe još jedan odbojak s urezima na dijelu okorine. Prije nekoliko godina otkriven je i komadić gomolja s urezanim linijama na okorini u špilji Vlakno na Dugom otoku.[185]

Epigravetijenska nalazišta istočne jadranske obale pokazuju niz sličnosti u smislu tipologije i tehnologije litičke industrije, ali i razlike između stratigrafskih sekvanci unutar jednoga nalazišta ili između različitih nalazišta. Određeni tehnološki i tipološki parametri ustanovljeni na jednom nalazištu nužno ne moraju vrijediti za druga nalazišta, čak i ako su pojedine stanišne razine različitih nalazišta kronološki istovremene. Proizvodnja ustaljenih

dating of layer 18 in Paglicci (Monte Gargano, Apulia) places its Epigravettian at roughly 20,000 years BP, and the development of shouldered points fell between 19,000 and 16,000 years BP.[173] It has already been stated that shouldered points also appeared in Šandalja's complex C.[174] Although they are a reliable indicator of the Epigravettian, it would not be good to tie them to an individual phase of this industry. Mussi[175] warned that ethnographic analysis indicates a tie between projectile points (like the shouldered points) and hunting,[176] and their infrequent discarding at main sites, so they cannot be a reliable chronological indicator. Moreover, we know that these artefacts from western European sites may have come earlier or later, or may not have appeared at all in some places.[177]

Backed tools are frequent in the Paglicci site's Epigravettian layers, while endscrapers are less prevalent.[178] However, at the late Epigravettian cave of Romanelli, in Apulia south of the Paglicci site, short endscrapers are significantly present, and backed tools and geometric microliths also appear.[179] It is interesting that the Romanelli site contains small circular and thumbnail endscrapers, which is similar to the Epigravettian at Šandalja (complex B), while the industry of the Riparo di Tagliente site in Veneto, which is geographically much closer to Šandalja, exhibits visible differences when compared to the Šandalja materials.[180] These differences comply with the ideal model devised by R. Whallon[181] on territorial organization during the late Epigravettian.[182]

As to pieces with engraved lines on the cortex forming lattice motifs from layer B/s in Šandalja (Fig. 9, 40), similarities are also noticeable at the aforementioned Italian sites, i.e., with the find from Grotto Romanelli[183] and the finds from Riparo di Tagliente.[184] Another flake with incisions on part of the cortex also originated in Šandalja (from one of the complex B layers). Several years ago, a nodule piece with an engraved line on the cortex was found in Vlakno cave on Dugi Otok.[185]

The Epigravettian sites of the eastern Adriatic exhibit a series of similarities in the sense of typology and technology of the lithic industry, but also differences between stratigraphic sequences inside one or between different sites. Certain technological and typological parameters established at one site need not apply to other sites, even if individual habitat levels at different sites are contemporaneous. The production of established types of

173 Za detaljnije datiranje vidi Gamble 1989, str 237.
174 Kozlowski 1979; 1992; Montet-White, Kozlowski 1983.
175 Mussi 1990.
176 Vidi Wiessner 1983.
177 Straus 1993.
178 Mussi 2001, T. 7.2.
179 Bietti 1990; Mussi 2002.
180 Karavanić 1999; Mussi 2001; o tim razlikama detaljnije vidi u: Janković *et al.* 2012.
181 Whallon 2007.
182 Janković *et al.* 2011; 2012.
183 Mussi 2001.
184 Guerreschi 2005.
185 Vujević, Parica 2011.

173 For more detailed dating, see Gamble 1989, p 237.
174 Kozlowski 1979; 1992; Montet-White, Kozlowski 1983.
175 Mussi 1990.
176 See Wiessner 1983.
177 Straus 1993.
178 Mussi 2001, P. 7.2.
179 Bietti 1990; Mussi 2002.
180 Karavanić 1999; Mussi 2001; for more details on these differences, see Janković et al. 2012.
181 Whallon 2007.
182 Janković et al. 2011; 2012.
183 Mussi 2001.
184 Guerreschi 2005.
185 Vujević, Parica 2011.

tipova epigravetijenskih alatki varirala je s obzirom na različite funkcionalne zahtjeve i trenutne potrebe koje je svakodnevica postavljala pred lovce i skupljače tog razdoblja.

6. ZAKLJUČNA RAZMATRANJA

Orinjasijenski slojevi Šandalje obično sadrže znatno manje alatki u usporedbi s kasnijim epigravetijenskim, a to se odnosi i na ostali litički materijal. Razlog tomu može biti u različitoj namjeni staništa tijekom orinjasijena, manjoj populaciji koja je u orinjasijenu nastavala špilju u odnosu na onu u epigravetijenu, te manje intenzivnoj djelatnosti i kraćem boravku orinjasijenske populacije u usporedbi s epigravetijenskom.

Tehnološke razlike između epigravetijenskog sloja C/d i epigravetijenskih slojeva kompleksa B Šandalje temelje se na proizvodnji sječiva i pločica. Proizvodnja sječiva intenzivnija je u odnosu na pločice u sloju C/d, dok je u slojevima kompleksa B obrnuto. Sloj C/d se na temelju statističke učestalosti pojedinih tipova alatki i tehnoloških specifičnosti litičkog materijala razlikuje od mlađih slojeva kompleksa B istog nalazišta. Sloj C/d označuje veći udio gravetica i pločica s hrptom te minimalna prisutnost kružnih segmenata. U mlađim slojevima udio gravetica i pločica s hrptom znatno je manji, a kružnih segmenata vidno veći. Premda je ranije dokazana prisutnost šiljaka s usjekom u šandaljskom kompleksu C,[186] ne može se pouzdano ustanoviti pripadaju li oni sloju C/d ili sloju C/s ili C/g.

Ustanovljene su razlike u učestalosti pojedinih tipova alatki između sloja B/d, s jedne strane, te slojeva B/s i B/g, s druge. Potonji ne pokazuju znatnije razlike u zastupljenosti pojedinih kategorija alatki, pa ih valja tretirati kao cjelinu.

Uz tehnološke i tipološke promjene između sloja C/d i slojeva kompleksa B Šandalje zamijećene su vidne promjene u zastupljenosti pojedinih životinjskih vrsta.[187] Stoga možemo pretpostaviti da su promjene unutar industrije barem djelomično uvjetovane potrebom za drukčijim funkcionalnim specifičnostima alatki povezanim sa zahtjevima lova i drugim aktivnostima. Štoviše, s obzirom na činjenicu da je kompleks B nastao tijekom kasnog glacijala, ako je sloj C/d nastao pred zadnji glacijalni maksimum, epigravetijen Šandalje bilo bi moguće podijeliti u dvije kronološko-tipološke faze (ranu i kasnu),[188] s već opisanim razlikama. Objašnjenja razlika u litičkoj industriji između tih faza tada bi se mogla tražiti u prilagodbenim naporima šandaljskih lovaca na nove uvijete, odnosno pokušaju da se tehnološkim usavršavanjem oružja poveća efikasnost lova i time nadoknadi gubitak lovnih i životnih prostora nakon podizanja morske razine zbog klimatskih promjena i/ili odgovori na nove zahtjeve nastale s porastom populacije, što se primjerice potkraj paleolitika i tijekom

186 Montet-White, Kozlowski 1983.
187 Miracle 1995; 1996.
188 Karavanić 1999.

Epigravettian tools varied given the different functional demands and current needs which everyday life placed before the hunters and gatherers of that period.

6. CONCLUDING CONSIDERATIONS

The Aurignacian layers of Šandalja contain considerably less tools in comparison to the later Epigravettian layers, and this also applies to the lithic assemblage in general. The reason for this may lie in the different use of the habitat during the Aurignacian, a smaller population which continued to reside in the cave than in the Epigravettian, and less intense activities and a briefer stay by the Aurignacian population in comparison to the Epigravettian.

The technological differences between Epigravettian layer C/d and the Epigravettian layers of complex B in Šandalja are based on the production of blades and bladelets. Blade production was more intense in comparison to that of bladelets in layer C/d, while in the complex B layers the opposite is the case. Layer C/d differs from the younger layers of complex B at the same site in terms of the statistical frequency of individual tool types and the technological features of the lithic assemblages. Layer C/d is characterized by a higher share of micro-Gravettes and backed bladelets and the minimum presence of circular segments. In the younger layers, the share of micro-Gravettes and backed bladelets is considerably less, while the share of circular segments is visibly higher. Although the presence of shouldered points in Šandalja complex C has been demonstrated earlier,[186] it cannot be reliably ascertained whether they belong to layer C/d or layer C/s or C/g.

Differences in the frequency of individual tool types between layer B/d on the one hand and layers B/s and B/g on the other have been ascertained. The latter do not exhibit any differences in the presence of individual tool categories, so they should be treated as a single unit.

Besides the technological and typological changes between layer C/d and the complex B layers of Šandalja, perceptible changes in the presence of individual animal species have also been noted.[187] It is therefore possible to hypothesize that the changes inside the industry were at least partially contingent upon the need for different functional specifications for their tools, tied to the demands of hunting and other activities. Moreover, given the fact that complex B emerged during the Late Glacial, and insofar as layer C/d was formed before the Last Glacial Maximum, Šandalja's Epigravettian may possibly be divided into two chronological/typological phases (early and late),[188] with the above-described differences. Explanations of the differences in the lithic industry between these two phases could then be sought in the adaptive efforts of the Šandalja hunters under new conditions, i.e., attempts to increase the efficiency of hunting by technologically refining their weapons, thereby compensating for the loss of hunting and living spaces due to rising sea levels caused by climate change and/or responding to the new demands of a growing population, which is what happened, for example, at the end of the

186 Montet-White, Kozlowski 1983.
187 Miracle 1995; 1996.
188 Karavanić 1999.

mezolitika dogodilo u sjevernoj Španjolskoj.[189]

Poput Šandalje, trend opadanja zastupljenosti gravetica tijekom vremena uočen je i u Badnju. Međutim, zastupljenost pojedinih životinjskih vrsta na ova dva nalazišta vidno je različita,[190] pa se čini da uzroke variranja litičke tehnologije i tipologije unutar epigravetijena ne treba isključivo tražiti u promjenama lova na strogo određene životinjske vrste, premda je to mogao biti važan uzrok tih promjena.

Razlike između dvaju asortimana alatki unutar kompleksa B (B/d te B/s+B/g) Šandalje možda se mogu objasniti variranjem funkcionalnih zahtjeva zbog manjih promjena ustaljenih aktivnosti, primjerice primjenom neselektivnoga ili selektivnog lova na određene životinje.[191]

Faunistički pokazatelji za sve slojeve upućuju na dosljedno privremeno ili dugotrajno korištenje špilje tijekom različitih godišnjih doba.[192] Na temelju izrazite mnogobrojnosti kremenih alatki u kompleksu B te različite zastupljenosti sezonskih vrsta lovnih životinja[193] čini se vjerojatnim da je Šandalja tijekom kasnog epigravetijena bila dugotrajno osnovno stanište, s očitim dokazima radionice alatki na tome mjestu, premda je možda mogla biti i kratkotrajno specijalizirano stanište, koje je često bilo nastavano. Dakako, moglo je doći do promjene namjene staništa tijekom istog razdoblja, što bi značilo da je špilja bila korištena na oba navedena načina.

Pojedine asocijacije epigravetijenskih industrija mogu se u mnogim detaljima tehnoloških i tipoloških značajki razlikovati od lokaliteta do lokaliteta ili pak od jedne do druge stratigrafske razine istoga nalazišta ili različitih nalazišta. Na temelju dosadašnjih rezultata čini se da zamijećene razlike unutar epigravetijena između pojedinih nalazišta na istočnoj jadranskoj obali valja ponajprije tumačiti funkcionalnim specifičnosti kremenih alatki koje odražavaju trenutne zahtjeve lovačko-skupljačke djelatnosti jedne skupine. Možda su te razlike ponekad djelomično uvjetovane i upotrebom drukčije sirovine. Pri sagledavanju jadranske regije neprestano valja imati na umu činjenicu da su mnogi epigravetijenski lokaliteti potopljeni podizanjem razine mora krajem pleistocena, što mogućnost naših spoznaja o ranom epigravetijenu znatno ograničava. Rezultati dosadašnjih istraživanja pokazuju segment cjelokupnog epigravetijenskog "mozaika" istočnog Jadrana koji neprestano valja popunjavati sagledavanjem potreba tadašnjih ljudskih skupina i njihove djelatnosti u okviru zahtjeva koji je pred njih postavljao okoliš.

Palaeolithic and during the Mesolithic in northern Spain.[189]

Like Šandalja, the declining trend in the share of micro-Gravettes over time was also observed at Badanj. However, the share of individual animal species at these two sites is clearly different,[190] so it would appear that the causes of variation in lithic technology and typology within the Epigravettian should not be sought exclusively in changes in the hunting of very specific animals, although this may have been a vital cause of such changes.

The differences between the two assortments of tools inside complex B (B/d and B/s+B/g) at Šandalja may be explained by the variation in functional requirements as a result of minor changes in customary activities, such as non-selective or selective hunting of specific animals.[191]

The fauna indicators for all layers indicate consistent temporary or long-term use of the cave during various seasons of the year.[192] Based on the considerably high number of flint tools in complex B, and the different shares of seasonal species of hunted animals,[193] it appears likely that Šandalja was a long-term basic habitat during the late Epigravettian, with obvious evidence of a tool workshop at the site, although it may have been a short-term specialized habitat, which was frequently inhabited. To be sure, a change in the purpose of the habitat may have occurred during the same period, which would mean that the cave was used in both ways.

Individual associations of Epigravettian industry may be distinguished by many technological and typological details from site to site or even from one to another stratigraphic level of the same or different sites. Based on the results obtained thus far, it would appear that the noted differences within the Epigravettian between individual sites on the eastern Adriatic seaboard should primarily be interpreted in terms of the functional specifications of flint tools which reflected the current demands of hunting and gathering by a single group. Perhaps these differences were sometimes partially influenced by the use of different raw materials. When considering the Adriatic region, one must always bear in mind that many Epigravettian sites were flooded by rising sea levels at the end of the Pleistocene, which considerably limits the scope of our knowledge on the early Epigravettian. The results of previous research have shown a segment of the overall Epigravettian "mosaic" of the eastern Adriatic, which should be continually expanded with consideration of the needs of the hunting groups of the time and their activities within the context of the demands put before them by the environment.

189 Clark, Straus 1986; usporedi Cohen 1975; 1977; Miracle 1995.
190 Usporedi Miracle 1995; Miracle, Sturdy 1991.
191 Vidi Brajković, Miracle 1997; Miracle 1995.
192 Vidi Miracle 1995, str. 456.
193 Miracle 1995, str. 456.

189 Clark, Straus 1986; Cf. Cohen 1975; 1977; Miracle 1995.
190 Cf. Miracle 1995; Miracle, Sturdy 1991.
191 See Brajković, Miracle 1997; Miracle 1995.
192 See Miracle 1995, p. 456.
193 Miracle 1995, p. 456.

Zahvale

Na stručom mišljenju o pojedinim aspektima ili informacijama relevantnim za ovaj rad najljepše zahvaljujemo: Frédéricu Blaseru, Giovanniju Boschianu, Emanueleu Cancelieriu, Ivoru Jankoviću, Snježani Karavanić, Darku Komšu, Januszu Kozlowskom, Kristini Mihovilić, Prestonu Miracleu, Anti Montet-Whiteu, pokojnoj Maji Paunović, Jacquesu Pelegrinu, Marcu Peresaniju, Vidi Pohar, Mikeu Richardsu, Darku Rukavini, Lawrenceu G. Strausu, Tihomili Težak-Gregl, Romani Videka-Blaser. Na izradi crteža najljepše zahvaljujemo Krešimiru Rončeviću. Na uloženom trudu i vremenu u postupku objavljivanja rada zahvaljujemo Zrinki Buljević i Sanji Ivčević. Materijal su učinili dostupnim Zavod za paleontologiju i geologiju kvartara HAZU u Zagrebu i Arheološki muzej Istre u Puli.

Acknowledgements

For their expert opinions on individual aspects or information relevant to this work, we would like to extend our warmest gratitude to Frédéric Blaser, Giovanni Boschian, Emanuele Cancellieri, Ivor Janković, Snježana Karavanić, Darko Komšo, Janusz Kozlowski, Kristina Mihovilić, Preston Miracle, Ante Montet-White, the late Maja Paunović, Jacques Pelegrin, Marco Peresani, Vida Pohar, Mike Richards, Darko Rukavina, Lawrence G. Straus, Tihomila Težak-Gregl, and Romana Videka-Blaser. We would also like to convey our deepest thanks to Krešimir Rončević for drawing the sketches. Thanks are also due to Zrinka Buljević and Sanja Ivčević for their time and effort in seeing to the publication of this work. The Institute for Quaternary Palaeontology and Geology of the Croatian Academy of Sciences and Arts in Zagreb and the Archaeological Museum of Istria in Pula made the necessary materials available.

Literatura / Bibliography

Adam 1999
E. Adam, *The Upper Palaeolithic stone industries of Epirus in their regional setting*, u: *The Palaeolithic Archaeology of Greece and adjacent areas* (Proceedings of the ICOPAG Conference, Ioannina 1994), British School at Athens Studies 3, G.N. Bailey, E. Adam, E. Panagopoulou, C. Perlès, K. Zachos (eds.), London 1999, 137-147.

Bailey et al. 1983
G. N. Bailey, P.L. Carter, C. S. Gamble, H.P. Higgs, *Asprochaliko and Kastritsa: further investigations of Palaeolithic settlement and economy in Epirus (North-West Greece),* Proceedings of the Prehistoric Society 49, London 1983, 15-42.

Bailey et al. 1983
G. N. Bailey, P. L. Carter, C. S. Gamble, H.P. Higgs, *Palaeolithic investigations in Epirus: the results of the first season's excavations at Klithi, 1983*, The Annual of the British School of Archaeology at Athens 79, Athens 1984, 7-22.

Bailey, Gamble 1990
G. Bailey, C. Gamble, *The Balkans at 18000 BP: the view from Epirus*, in: *The World at 18000 BP,* O. Soffer, C. Gamble (eds), London, 148-167.

Bartolomei et al. 1979
G. Bartolomei, A. Broglio, A. Palma di Cesnola, *Chronostratigraphie et écologie de l'Epigravettien en Italie*, in: *La Fin des Temps Glaciaires en Europe. Chronostratigraphie et écologie des cultures du Paléolithique final,* D. de Sonneville-Bordes (ed.), Paris 1979, 297-324.

Basler 1976
Đ. Basler, *Paleolitsko prebivalište Badanj kod Stoca*, Glasnik Zemaljskog muzeja Bosne i Hercegovine u Sarajevu (arheologija, nova serija) 29, Sarajevo 1976, 5-13.

Basler 1979a
Đ Basler, *Paleolitske i mezolitske regije i kulture u Bosni i Hercegovini*, in: Praistorija jugoslavenskih zemalja 1, A. Benac (ed), Sarajevo 1979, 331-355.

Basler 1979b
Đ. Basler, Paleolitske i mezolitske regije i kulture u Crnoj Gori, in: *Praistorija jugoslavenskih zemalja* 1, A. Benac (ed.), Sarajevo 1979, 387-403.

Basler 1983
Đ. Basler, *Paleolitske kulture u jadranskoj regiji Jugoslavije*, Glasnik Zemaljskog muzeja Bosne i Hercegovine u Sarajevu (arheologija, nova serija) 38, Sarajevo 1983, 1-63.

Bietti 1990
A. Bietti, *The Late Upper Paleolithic in Italy: An overview*, Journal of World Prehistory 4 (1), New York 1990, 95-155.

Bietti et al. 2004
A. Bietti, G. Boschian, G. M. Crisci, E. Danese, A. M. De Francesco, M. Dini, F. Fontana, A. Giampietri, R. Grifoni, A. Guerreschi, J. Liagre, F. Negrino, G. Radi, C. Tozzi, R. Tykot, *Inorganic Raw Materials Economy and Provenance of Chipped Industry in Some Stone Age Sites of Northern and Central Italy*, Collegium Anthropologicum 28 (1), Zagreb 2004, 41 - 54.

Brajković, Miracle 1997
D. Brajković, P. Miracle, *Pragovedo (Bos primigenius) u Istri i problemi podrijetla istarskog goveda (Bos taurus primigenius)*, in: *Arheološka istraživanja u Istri* , B. Čečuk (ed.), Izdanja Hrvatskog arheološkog društva 18, Zagreb 1997, 9-20.

Brézillon 1983
M. Brézillon, *La dénomination des objets de pierre taillée*, IV[e] supplément à Gallia préhistoire, Centre national de la recherche scientifique, Paris 1983.

Boschian, Zamagni 2005
G. Boschian, Zamagni, *The area distribution of the artefacts in the flint workshop of the San Bartolomeo Rock-shelter (Abruzzo, Central-Italy)*, in: *Stone Age - Mining Age.* Proceedings of the VIII International Flint Symposium, Bochum, 13-17 September 1999., Der Anschnitt 19, G. Weisgerber (ed.), Bochum 2005, 119 - 124.

Brusić 2005
Z. Brusić, *Pećina Vlakno*, Hrvatski arheološki godišnjak 1/2004, Zagreb 2005, 197-199.

Camps-Fabrer 1974
H. Camps-Fabrer, *III. Projet de code pour l'analyse des objets en os*, Banques de donnés archéologiques 932, Paris 1974, 69-80.

Cancellieri 2011
E. Cancallieri, *From the watershed to the Great Adriatic Plain: an investigation on humans and landscape ecology during the late Upper Paleolithic. The significance of lithic technology,* neobjavljena doktorska disertacija. Università degli Studi di Ferrara, Ferrara 2011.

Cohen 1975
M. Cohen, *Archaeological evidence of population pressure in preagricultural societies*, American Antiquity 40 (3), Washington 1975, 471-474.

Cohen 1977
Cohen M., *The Food Crisis in Prehistory*. New Haven 1977.

Clark, Straus 1986
G. Clark, L. G. Straus, *Synthesis and Conclusions - Part I: Upper Paleolithic and Mesolithic hunterg-gatherer subsistence in Northern Spain*, in: La *Riera Cave Stone Age Hunter-Gatherer Adaptations in Northern Spain*, L. G. Straus, G. A. Clark (eds), Anthropological research papers 36, Tempe 1986, 351-365.

Čečuk 1993
B. Čečuk, *Istraživanja u špilji Kopačini pokraj Donjeg Humca na otoku Braču*, Obavijesti Hrvatskog arheološkog društva 25(3), Zagreb 1993, 46-52.

Čečuk 1996
B. Čečuk, *Špilja Kopačina kod Donjeg Humca na otoku Braču*, Arheološki radovi i rasprave Jugoslavenske akademije znanosti i umjetnosti 12, Zagreb 1996, 13-30.

Dimitrijević et al. 1998
S. Dimitrijević, T. Težak-Gregl, N. Majnarić-Pandžić, *Prapovijest*, Povijest umjetnosti u Hrvatskoj, Knjiga prva, Zagreb 1998.

Durn et al. 2003
G. Durn, E. Ottner, J. Tišljar, A. Mindszenty, U. Barudžija, *Regional subaerial unconformities in shallow - marine carbonate sequences of Istria: sedimentology, mineralogy, geochemistry and micromorphology of associated bauxites, palaeosols and pedo - sedimentary complexes,* in: *Evolution of Depositional Environments from the Palaeozoic to the Quaternary in the Karst Dinarides at the Panonian Basin,* I. Vlahović, J. Tišljar (eds.), Field Trip Guidebook, 22nd IAS Meeting of Sedimentology, Opatija 2003, 209-254.

Đuričić 1996
Lj. Đuričić, *The chipped stone industry from the rock-shelter of Trebački Krš*, in: *Prehistoric Settlements in Caves and Rock-Shelters of Serbia and Montenegro* 1, D. Srejović (ed.), Beograd 1996, 75-102.

Gamble 1989
Gamble, *The Palaeolithic Settlement of Europe*, Cambridge 1989.

Guerreschi 2005
A. Guerreschi, *La produzione epigravettiana dell'area veneta e i repporti con altre manifestazioni mobiliari*, in: P*itture paleolitische nelle Prealpi Venete - Grotta Fumane e Riparo Dalmeri*, A. Broglio, G. Dalmeri (eds), Verona 2005, 179-183.

Inizian et al. 1992
M. L. Inizian, H. Roche H., J. Tixier, *Technology of Knapped Stone*, Meudon 1992.

Janković, Karavanić 2009
I. Janković, I. Karavanić, *Osvit čovječanstva: početci našega biološkog i kulturnog razvoja.* Zagreb 2009.

Janković et al. 2011
I. Janković, J. C. M. Ahern, I. Karavanić, F. H. Smith, *Biokulturalni aspekti epigravetijenske okupacije sloja B/s nalazišta Šandalje II*, Radovi Zavoda za znanstveni rad HAZU 22, Varaždin 2011, 185-200.

Janković et al. 2012
I. Janković, J. C. M. Ahern, I. Karavanić, T. Stockton, F. H. Smith, *Epigravettian Human Remains and Artifacts from Šandalja II, Istria, Croatia*, Paleoanthropology, Philadelphia 2012, 87-122.

Karavanić 1993
I. Karavanić, *Prijedlog osnovnoga strukovnog nazivlja za srednji i mlađi paleolitik*. Opuscula archaeologica 16 (1992), Zagreb 1993, 15-35.

Karavanić 1994
I. Karavanić, *Gornjopaleolitičke kamene i koštane rukotvorine iz špilje Vindije*, Opuscula archaeologica 17(1993), Zagreb 1994, 53-163.

Karavanić 1999
I. Karavanić, *Gornji paleolitik Šandalje II u okviru jadranske regije*, neobjavljena doktorska disertacija, Sveučilište u Zagrebu, Zagreb 1999.

Karavanić 2003
I. Karavanić, *L'industrie aurignacienne de la grotte de Šandalja II (Istrie, Croatie) dans le contexte de la région de l'est de l'Adriatique*, L'Anthropologie 107, Paris 2003, 577-602.

Karavanić 2008
I. Karavanić, *Prijedlog strukovnog nazivlja za lomljevinu gornjeg paleolitika*, Obavijesti Hrvatskog arheološkog društva 40/3, Zagreb 2008, 82-89.

Karavanić, Janković 2010.
I. Karavanić, I. Janković, *Šandalja II i problem orinjasijenske industrije u istočnom Jadranskom području/ Šandalja II and the Problem of Aurignacian Industry in the Eastern Adriatic*, in: *100 Godina Arheološkog Muzeja Istre u Puli. Nova Istraživanja u Hrvatskoj*, D. Komšo (ed.), Izdanja Hrvatskog arheološkoga društva 25, Zagreb/Pula 2010, 35-59.

Komšo 2004
D. Komšo, *Istraživanje Vergotinove pećine kod Poreča*, Obavijesti Hrvatskog arheološkog društva XXXVI/2, Zagreb 2004, 62-67.

Komšo 2008a
D. Komšo, *Limski kanal*, Hrvatski arheološki godišnjak 4 (2007), Zagreb 2008, 264-268.

Komšo 2008b
D. Komšo, *Mezolitik u Hrvatskoj*, Opuscula archaeologica 30, Zagreb 2008 (2006), 55-91.

Komšo 2009
D. Komšo, *Limski kanal*, Hrvatski arheološki godišnjak 5 (2008), Zagreb 2009, 338-342.

Komšo, Pellegati 2007
D. Komšo, P. Pellegati, *The Late Epigravettian in Istria. Late Paleolithic colonization and lithic technology in the northern Adriatic area*, in: *Late Paleolithic Environments and Cultural Relations around the Adriatic*, R. Whallon (ed.), BAR International Series 1716, Oxford 2007, 27-39.

Kozlowski 1979
J. Kozlowski, *La fin des temps glaciaires dans le bassin du Danube moyen et inférieur*, in*: La fin des temps glaciaires en Europe. Chronostratigraphie et écologie des cultures du Paléolithique final,* D. de Sonneville-Bordes (ed.), Paris 1979, 821-836.

Kozlowski 1992
J. Kozlowski, *The Balkans in the Middle and Upper Palaeolithic: The gate to Europe or a Cul-de-sac*?, Proceedings of the Prehistoric Society 58, London 1992, 1-20.

Kujundžić 1987
Z. Kujundžić, *Badanj/Borojevići. Paleolitsko nalazište.* Arheološki pregled 27 (1986), Beograd 1987, 34-35.

Kujundžić 1989
Z. Kujundžič, *Gravure na stijeni i gravirani ukrasi na upotrebnim predmetima - Badanj i Pećina pod lipom*, Glasnik Zemaljskog muzeja Bosne i Hercegovine u Sarajevu (arheologija, nova serija) 44, Sarajevo 1989, 21-38.

Malez 1963a
M. Malez M, *Paleontološka i stratigrafska istraživanja nekih kvartarnih lokaliteta u 1961. godini*, Ljetopis Jugoslavenske akademije znanosti i umjetnosti 68, Zagreb 1963, 253-263.

Malez 1963b
M. Malez, *Istraživanje pleistocenske stratigrafije i faune u 1962. godini*, Ljetopis Jugoslavenske akademije znanosti i umjetnosti 69, Zagreb 1963, 303-313.

Malez 1964
M. Malez, *Šandalja bei Pula - ein neuer und wichtiger paläolithischer fundort in Istrien*, Bulletin Scientifique / Conseil des Academies de la RSF de Yougoslavie 9 (6), Zagreb 1964, 154-155.

Malez 1969
M. Malez, *Šandalja bei Pula - eine bedeutende Ansiedlung der jungpaläolithischern Jäger in Istrien*, in: 5. Internationaler Kongress für Speläologie Stuttgart,3, Stuttgart 1969, 1-7.

Malez 1971
M. Malez, *Naseljavanje istočne jadranske obale u paleolitu*, Zbornik za narodni život i običaje 45, Zagreb 1971, 503-513.

Malez 1972
M. Malez, *Ostaci fosilnog čovjeka iz gornjeg pleistocena Šandalje kod Pule (Istra),* Palaentologia jugoslavica 12, Zagreb 1972, 1-39.

Malez 1974a
M. Malez, *Noviji rezultati istraživanja paleolitika u Velikoj pećini, Veternici i Šandalji*, Arheološki radovi i rasprave Jugoslavenske akademije znanosti i umjetnosti 7, Zagreb 1974, 7-44.

Malez 1974b
M. Malez, *Tardigravetijen Lopara na otoku Rabu*, Arheološki radovi i rasprave Jugoslavenske akademije znanosti i umjetnosti 7, Zagreb 1974, 45-74.

Malez 1975a
M. Malez, *O značenju otkrića ostataka roda Homo u naslagama vilafranka Šandalje I kod Pule*, Rad Jugoslavenske akademije znanosti i umjetnosti 371 (17), Zagreb 1975, 181-201.

Malez 1975b
M. Malez, *Neki problemi paleolitika na istočnoj obali Jadrana*, Rad Jugoslavenske akademije znanosti i umjetnosti 371(17), Zagreb 1975, 121-153.

Malez 1979a
M. Malez, *Nalazišta paleolitskog i mezolitskog doba u Hrvatskoj*, in: Praistorija jugoslavenskih zemalja 1, A. Benac (ed.), Sarajevo 1979, 227-276.

Malez 1979b
M. Malez, *Paleolitske i mezolitske regije i kulture u Hrvatskoj*, in: Praistorija jugoslavenskih zemalja 1, A. Benac (ed.), Sarajevo 1979, 277-295.

Malez 1987
M. Malez, *Pregled paleolitičkih i mezolitičkih kultura na području Istre*, in: *Arheološka istraživanja u Istri i Hrvatskom primorju,* Izdanja Hrvatskog arheološkog društva 11, V. Jurkić (ed.), Zagreb 1987, 3-47.

Malez, Vogel 1969
M. Malez, J.C. Vogel, *Rezultati određivanja apsolutne starosti pleistocenskih naslaga Šandalje II kod Pule u Istri*. Geološki vjesnik 22, Zagreb 1969, 121-133.

Mihailović 1996
D. Mihailović, *Upper Palaeolithic and Mesolithic chiped stone industries from the rock-shelter of Medena Stijena*, in: *Prehistoric Settlements in Caves and Rock-Shelters of Serbia and Montenegro* 1, D. Srejović (ed.), Beograd 1996, 9-60.

Mihailović 1999
D. Mihailović, *The Upper Palaeolithic and Mesolithic stone industries of Montenegro*, in: *The Palaeolithic Archaeology of Greece and adjacent areas* (Proceedings of the ICOPAG Conference, Ioannina 1994), G. N. Bailey, E. Adam, E. Panagopoulou, C. Perlès, K. Zachos (eds), British School at Athens Studies 3, London 1999, 343-356.

Mihailović 2009
D. Mihailović, *Upper Palaeolithic and Mesolithic chipped stone industries from Crvena stijena (Prehistoric settlements in caves and rock-shelters of Serbia and Montenegro Fascicule II)*, Beograd 2009.

Miracle 1995
P. T. Miracle, *Broad-spectrum adaptations re-examined: Hunter-gatherer responses to late glacial environmental changes in the eastern Adriatic*, neobjavljena doktorska disertacija, University of Michigan, Ann Arbor 1995.

Miracle 1996
P. T. Miracle. *Diversification in Epipaleolithic subsis¬tence strategies along the eastern Adriatic coast: A sim¬ulation approach applied to zooarchaeological assem¬blages*, Atti del Museo Civico di Storia Naturale 9, Trst 1996, 33-62.

Miracle, Sturdy 1991
P. T. Miracle, D. Sturdy, *Chamois and the Karst of Herzegovina*. Journal of Archaeological Science 18, London, New York 1991, 89-108.

Miracle, Forenbaher 2000
P.T. Miracle, S. Forenbaher, *Pupićina Cave Project: Brief summary of the 1998 season*, Histria archaeologica 29 (1998), Pula 2000, 27-48.

Miracle, Brajković 2013
P.T. Miracle, D. Brajković, *Pleistocene environments and Palaeolithic occupations at Šandalja Cave (Istria, Croatia) : Results from new AMS ^{14}C dates.* Priopćenje na skupu Geologija kvartara u Hrvatskoj, Zagreb 21. - 23. 03. 2013.

Mirosavljević 1968
V. Mirosavljević, *Vela spilja - prethistorijsko nalazište na otoku Lošinju*, Arheološki radovi i rasprave Jugoslavenske akademije znanosti i umjetnosti 6, Zageb 1968, 27-60.

Montet-White 1996
A. Montet-White, *Le paléolithique en ancienne Yougoslavie*, Grenoble 1996.

Montet-White, Kozlowski 1983
A. Montet-White, J. K. Kozlowski, *Les industries à pointes à dos dans les Balkans*, Rivista di Scienze Preistoriche 38 (1-2), Firenze 1983, 371-399.

Mulaomerović 1984
J. Mulaomerović, *Paleolitsko nalazište Pećina u Rudoj glavici kod Trnova*, Glasnik Zemaljskog muzeja Bosne i Hercegovine u Sarajevu (arheologija, nova serija) 39, Sarajevo 1984, 1-10.

Mulaomerović 1985
J. Mulaomerović, 1985, *Prostor srednje Bosne u mlađem paleolitiku* , Naš krš 11(18-19), Sarajevo 1985, 137-139.

Mussi 1990.
M. Mussi, *Continuity and change in Italy at the Last Glacial Maximum*. in: The World at 18000 BP, O. Soffer, C. Gamble (eds.), London, 126-147.

Mussi 2002
M. Mussi, *Earliest Italy. An Overview of the Italian Paleolithic and Mesolithic*, New York, Boston, Dordrecht, London, Moscow 2002.

Obelić et al. 1994
B. Obelić, N. Horvatinčić, D. Srdoč, I. Krajcar-Bronić, A. Sliepčević, S. Grgić 1994, *Rudjer Bošković Institure radiocarbon measurements XIII*, Radiocarbon 36 (2), Tuscon 1994, 303-324.

Palma di Cesnola, Bietti 1983
A. Palma di Cesnola, A. Bietti, *Le Gravettien et l'Epigravettien ancien en Italie*, Rivista di Scienze preistoriche 38 (1-2), Firenze 1983, 181-228.

Pellegatti 2009
P. Pellegatti, *Hunter-gatherers of Istrian peninsula: the value of lithic raw material analysis to study small-scale colonizaton processes*, in: *Mesolithic Horizons* (Papers presented at the Seventh International Conference on the Mesolithic in Europe, Belfast 2005) Volume I, S.B. McCartan, R. Schulting, G. Warren, P. Woodman (eds.), Oxford, Oakville 2009, 45-52.

Percan et al. 2009
T. Percan, D. Komšo, L. Bekić, *Ljubićeva pećina*, Hrvatski arheološki godišnjak 5/2008, Zagreb 2009, 344-347.

Percan 2010
T. Percan, *Ljubićeva pećina*, Hrvatski arheološki godišnjak 6/2009, Zagreb 2010, 360-363.

Peresani 1998
M. Peresani, *La variabilité du débitage discoïde dans la grotte de Fumane (Italie du Nord)*, Paleo 10, Les Eyzies-de-Tayac 1998, 123-146.

Perlès 1987.
C. Perlès, *Les Industries lithiques taillées de Franchthi (Argolide, Grèce)*. Tome I. Présentation générale et industries paléolithiques, Indiana University Press, Bloomington, Indianapolis 1987.

Perlès 1999
C. Perlès, *Long-term perspectives on the occupation of the Franchthi Cave: continuity and discontinuity*, in: *The Palaeolithic Archaeology of Greece and adjacent areas* (Proceedings of the ICOPAG Conference, Ioannina 1994), British School at Athens Studies 3, G.N. Bailey, E. Adam, E. Panagopoulou, C. Perlès, K. Zachos (eds.), London 1999, 311-318.

Polšak 1956
A. Polšak, *Geologija južne Istre s osobitim obzirom na biostratigrafiju krednih naslaga*, Geološki vjesnik 18/2, Zagreb 1956, 415-510.

Radovanović 1986
I. Radovanović, *Novija istraživanja paleolita i mezolita u Crnoj Gori,* Glasnik Srpskog arheološkog društva 3, Beograd 1986, 63-77.

Sonneville-Bordes, Perrot 1953
D. de Sonneville-Bordes, J. Perrot, *Essai d´adaptation des méthodes statistiques au Paléolithique supérieur : Prémiers résultas*, Bulletin de la Société Préhistorique Française 50, Paris 1953, 323-33.

Sonneville-Bordes, Perrot 1954
D. de Sonneville-Bordes, J. Perrot, *Lexique typologique du Paléolithique supérieur*, Bulletin de la Société Préhistorique Française 51 (7), Paris 1954, 327-35.

Sonneville-Bordes, Perrot 1955
D. de Sonneville-Bordes, J. Perrot, *Lexique typologique du Paléolithique supérieur*, *Bulletin de la Société Préhistorique Française* 52 (1-2), Paris 1955, 76-79.

Sonneville-Bordes, Perrot 1956a
D. de Sonneville-Bordes, J. Perrot, *Lexique typologique du Paléolithique supérieur*, Bulletin de la Société Préhistorique Française 53(7-8), Paris 1956, 408-12.

Sonneville-Bordes, Perrot 1956b
D. de Sonneville-Bordes, J. Perrot, *Lexique typologique du Paléolithique* supérieur, Bulletin *de la Société Préhistorique Française* 53 (9), Paris 1956, 547-59.

Srdoč et al. 1973
D. Srdoč, A. Sliepčević, J. Planinić, B. Obelić, B. Breyer, *Rudjer Bošković radiocarbon measurements II*. Radiocarbon 15 (2), Tuscon 1973, 435-441.

Straus 1993
L. G. Straus, *Upper Paleolithic Hunting Tactics and Weapons in Western Europe*, in: *Hunting and Animal Exploitation in the Later Paleolithic & Mesolithic of Eurasia*, G. Peterkin, H. Bricker, P. Mellars (eds), Archeological Papers of the American Anthropological Association 4, American Anthropological Association, Washington DC 1983, 83-93.

Straus, Clark 1986
L. G. Straus, G. Clark, *La Riera Archaeological remains - level contents and characteristic*, in: *La Riera Cave Stone Age Hunter-Gatherer Adaptations in Northern Spain,* L. G. Straus, G. A. Clark (eds), Anthropological research papers 36, Tempe 1986, 75-187.

Šošić Klindžić et al., u pripremi
R. Šošić Klindžić, M. Richards, S. Radović, T. Težak-Gregl, J. Ahern, M. Šlaus, I. Janković, K. Gerometta, G. Boschian, Z. Perhoč, N. Vukosavljević, I. Karavanić, *Kamenodobni horizonti prapovijesnog nalazišta špilja Zemunica, Bisko*.

Tišljar 1978
J. Tišljar, *Tidal flat, lagoonal and shallow marine carbonates in the upper Jurassic and Cretaceous of Istria (Yugoslavia)*, Acta geologica IX/5, Zagreb 1978, 159-194.

Villa, Courtin 1983
P. Villa, J. Courtin, *The interpretation of stratified sites: a view from underground*, Journal of Archeological Science 10, London, New York 1983, 267-281.

Vlahović et al. 2003
I. Vlahović, J. Tišljar, I. Velić, D. Matičec; P. W. Skelton, T. Korbar, L. Fuček, Main events recorded in the sedimentary succession of the Adriatic Carbonate Platform from the Oxfordian to the Upper Santonian in Istria (Croatia), in: Evolution of Depositional Environments from the Palaeozoic to the Quaternary in the Karst Dinarides an the Panonian Basin, Field Trip Guidebook, 22nd IAS Meeting of Sedimentology, Opatija 2003, I. Vlahović, J. Tišljar (eds.), Zagreb 2003, 13-56.

Vujević, Parica 2011
D. Vujević, M. Parica, *Nakit i umjetnost pećine Vlakno*, Archaeologia Adriatica 3(2009), Zadar 2011, 23-34.

Vukosavljević et al. 2011
N. Vukosavljević, Z. Perhoč, B. Čečuk, I. Karavanić, *Kasnoglacijalna industrija lomljenog kamena pećine Kopačine*, Vjesnik za arheologiju i povijest dalmatinsku 104, Split 2011, 7-54.

Vukosavljević 2012
N. Vukosavljević, *Organizacija litičke proizvodnje lovačko-sakupljačkih zajednica na prijelazu iz pleistocena u holocen u Dalmaciji*, neobjavljena doktorska disertacija, Sveučilište u Zagrebu, 2012.

Whallon 1989
R. Whallon, *The Paleolithic site of Badanj: recent excavations and results of analysis,* Glasnik Zemaljskog muzeja Bosne i Hercegovine u Sarajevu (arheologija, nova serija) 44, Sarajevo 1989, 7-20.

Whallon 1999
R. Whallon, *The lithic tool assemblages at Badanj within their regional context*, u: *The Palaeolithic Archaeology of Greece and adjacent areas* (Proceedings of the ICOPAG Conference, Ioannina 1994), British School at Athens Studies 3, G.N. Bailey, E. Adam, E. Panagopoulou, C. Perlès, K. Zachos (eds.), London 1999, 330-342.

Whallon 2007
R. Whallon, *Social territories around the Adriatic in the late Pleistocene*, in: *Late Paleolithic Environments and Cultural Relations around the Adriatic*, R. Whallon (ed.), Britisch Archaeological Report, International Series 1716, Oxford 2007, 61-65.

Wiessner 1983
P. Wiessner, *Style and social information in Kalahari San projectile points*, American Antiquity 48, Washington 1983, 253-276.

Zupanič 1975
J. Zupanič, *Petrografske karakteristike paleolitskih artefakata iz Šandalje II kod Pule i porijeklo kamene sirovine za njihovu izradbu*, Rad Jugoslavenske akademije znanosti i umjetnosti 317 (17), Zagreb 1975, 267-273.