

Način okraševanja keramike ljubljanske kulture in pramenaste keramike – eksperimentalna arheologija

Decorating the pottery of the Ljubljana culture and the Litzen pottery – an experimental archaeology case study

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Izvleček

Članek obravnava način okraševanja poznobakrenodobne in zgodnjebronastodobne keramike ljubljanske kulture ter pramenaste keramike. O okraševanju izdelkov ljubljanske kulture najdemo v literaturi različne razlage in poimenovanja. Natančna opredelitev tehnike okraševanja je pomembna tako kronološko kot kulturološko. Z eksperimenti smo poskušali dognati, s kakšnimi pripomočki bi bil lahko izdelan značilen okras odtisa niti. Ugotovili smo, da je bil najverjetneje vtisnjen s ploščatim orodjem, okrog katerega so bile navite niti živalskega ali rastlinskega izvora.

Ključne besede: Ljubljansko barje, Dežmanova kolišča, bakrena doba, ljubljanska kultura, keramika, tehnike okrasa, eksperimentalna arheologija, terminologija

Abstract

The article examines the technique used to decorate the Late Copper Age and Early Bronze Age pottery of the Ljubljana culture and the Litzen pottery. In literature, the technique is known under various names and is explained in different ways. A correct explanation being of both chronological and cultural significance, I set out to conduct experiments aimed at determining the tools used to make the characteristic cord impressions. The experiments have shown that the decoration was most probably made with a flat tool, around which a cord or fibres of either animal or plant material were wrapped.

Keywords: Ljubljansko barje, Dežman's pile-dwelling sites, Copper Age, Ljubljana culture, pottery, decorative techniques, experimental archaeology, terminology

UVOD

Najdbe s t. i. Dežmanovih kolišč na Ljubljanskem barju so že od odkritja široko poznane in slavne. Med njimi je veliko keramičnih najdb, ki veljajo za ene izmed najlepših ter najbolj bogato okrašenih iz pozne bakrene in zgodnje bronaste dobe na Slovenskem in tudi v širšem evropskem prostoru. Dežmanova kolišča pri Igu so bila odkrita leta 1875 med čiščenjem drenažnih jarkov vzdolž

Ižanske ceste med Ljubljano in naseljem Studenec (današnji Ig). Še istega leta in v naslednjih dveh letih je Dragotin Dežman (Karl Deschmann), takratni kustos Kranjskega deželnega muzeja v Ljubljani (*Krainisches Landesmuseum*), izvedel na tem območju prva arheološka izkopavanja.¹ Odkril je najmanj tri (različne) koliščarske naselbine, ki

¹ Korošec, Korošec 1969, 11; Kos 1978, 43 ss.



Karta 1: Ljubljansko barje, območje severno od Iga. Možne lokacije posameznih Dežmanovih izkopavanj.

Map 1: The Ljubljansko barje, area north of Iga. Presumed locations for the sites excavated by Dežman.

Leto izkopavanj / year of excavations: a – 1875; b – 1876; c – 1876; d – 1877; e – 1877.

so stale severno od Iga, na ledinah Kepje in Parti na levem bregu reke Iščice (karta 1).

V dvajsetem stoletju je te najdbe parcialno obravnavalo več avtorjev,² šele leta 1969 so bile objavljene v celoti.³ Večina keramičnih najdb, presenetljivo zelo dobro ohranjenih, je okrašenih z različnimi tehnikami. Med tehnikami okraševanja razlikujemo navadne in brazdaste vreze, vbode, izdolbene površine, aplicirana rebra ter tudi t. i. odtise ovite niti. Z zadnjimi je okrašena keramika, značilna za ljubljansko kulturo oz. fa-

zo Ig II (po Paoli Korošec), ki naj bi po mnenju različnih avtorjev sledila pozni vučedolski fazi na Ljubljanskem barju.⁴

Med pregledovanjem znanstvene literature, v kateri je obravnavana tovrstna keramika, opazimo, da je pri poimenovanju in opisovanju t. i. okrasa z ovito nitjo uporabljenih več različnih terminov in razlag. Rajko Ložar je na primer leta 1941 keramiko z Dežmanovih kolišč, okrašeno na tak način, poimenoval *vrvičasta keramika* (oz. nem. *Schnurkeramik*) ter jo opisal kot keramiko z ornamentami, izdelanimi s pomočjo odtisov vrvic oz. z

² Npr. Ložar 1941; id. 1942; Laviosa Zambotti 1943; J. Korošec 1955; Korošec 1957; Korošec 1958–1959.

³ Korošec, Korošec 1969.

⁴ Korošec 1958–1959, 97, 102; Dimitrijević 1979, 317 ss; Govedarica 1989, 25 ss, 42 ss.

odtisi paličic, ovitih z vrvicami. Poleg tega omenja tudi tako imenovano *pseudovrvičasto keramiko*, ki pa ima ornament izdelan tako, da so na vrezano črto vtisnjene oz. z vbodi izdelane kratke črtice, ki posnemajo t. i. vrvičasti odtis.⁵ Josip Korošec je v svojem orisu predzgodovine Ljubljane opredelil te okrase kot rezultat *tehnike žigosanih vbodov*, ki so bili izdelani z zobatim koleščkom, redkeje pa z uporabo deščice z zobci.⁶ V petdesetih letih prejšnjega stoletja je Paola Korošec začela raziskovati keramiko z Dežmanovih kolišč. Po njenem mnenju t. i. *okras z ovito nitjo* označuje drugo skupino keramičnega gradiva z Dežmanovih kolišč (skupino Ig II).⁷ Sprva je menila, da je bil ta okras izdelan z zobčastim koleščkom, nato je spremenila svojo razlago, češ da je bil izdelan s pomočjo paličice, ovite z nitjo, ali z nitjo, ki je bila ovita z drugo nitjo.⁸ Kasneje je Koroševa precizirala, da je bila lahko nit oz. tanka žica ovita okrog tankega ploščatega predmeta (npr. noža).⁹ Stojan Dimitrijević je tak okras razlagal kot rezultat uporabe koleščka za žigosanje (*kotačić za žigosanje*; nem. *Rollstempel, Rädchen*). Navedel je dva tipa: prvi je bil nazobčan izmenično in je puščal odtise cikcak trakov, drugi pa je bil ožji in zelo fino nazobčan.¹⁰ Zorko Harej je tovrstni način okraševanja poimenoval kot *tehniko zobčastega odtiskovanja oz. žigosanja*.¹¹ Stašo Forenbaher je okras na keramičnem gradivu iz Vaganačke pečine na Velebitu, ki je enak kot na keramiki z Dežmanovih kolišč, opredelil kot *žigosanje s pomočjo koleščka*.¹² Blagoje Govedarica je nekaj let kasneje v svojem pregledu zgodnje bronaste dobe v vzhodno-jadranskem zaledju kot glavna načina okraševanja keramike ljubljanske kulture, tako na Ljubljanskem barju kot na tržaškem Krasu, opredelil *odtise niti in/ali odtise koleščka*.¹³ Emanuela Gilli in Emanuela Montagnari Kokelj sta okras na keramiki iz jame Orehova pejca/Grotta dei Ciclami, ki je podoben okrasu na keramiki ljubljanske kulture, razlagali kot sledove *odtisov koleščka oz. ovite niti in odtisov niti* (ital. *a rotella o filo avvolto* ali *a cordicella*).¹⁴ V zadnjih objavah gradiva z Ljubljanskega barja se za

tak okras uporabljata izraza *odtisi ovite niti* (nem. *Wickelschnur*) in *žigosanje z omotano nitjo*.¹⁵

Okras na ljubljanski keramiki lahko primerjamo z nekaterimi okrasi na keramiki kulture zvončastih čaš, izdelanimi s t. i. tehniko *barbelé* (ang. *barbed wire*, nem. *Stacheldraht* ali *Wickeldraht*), za katero je značilen "efekt bodeče žice" (ital. *a filo spinato*). Po mnenju Franca Nicolisa, ki je to tehniko prepoznal, je orodje, s katerim so izdelali tovrsten okras, težje natančneje opredeliti, gre pa najverjetneje za vrstico, navito na trdno ali fleksibilno oporo.¹⁶ Keramika, okrašena s tehniko *barbelé*, je značilna predvsem za t. i. fazo épícampaniforme-barbelée na območju jugovzhodne Francije, ki pomeni pozno fazo kulture zvončastih čaš in naj bi trajala do zgodnje bronaste dobe.¹⁷ Francoski kolegi so tehniko okraševanja *barbelé* v zadnjih desetih letih natančneje preučevali in opravili več različnih poskusov z namenom prepoznati različna orodja, s katerimi bi lahko bil izdelan tovrsten okras.¹⁸ Njihove raziskave so ovrgle hipotezo, da je bil okras *barbelé* izdelan s pomočjo nazobčanega koleščka (*roulette crantée*). Ugotovili so, da se instrument, uporabljen za tak okras, razlikuje po posameznih območjih, gre pa v glavnem za opore – lahko kovinske, kamnite, lesene, trdne ali fleksibilne, okrog katerih so bile navite niti.¹⁹

¹⁵ Velušček, Čufar, Levanič 2000, 85, t. 6: 3. Velušček, Čufar 2003, 126, 129; t. 3: 2; 14: 4; 15: 9.

¹⁶ Nicolis 1998, 57.

¹⁷ Strahm 1998, 40; Vital, Convertini, Lemerrier 2012, 1 ss.

¹⁸ Vital, Convertini, Lemerrier 2012, 91 ss.

¹⁹ Vital, Convertini, Lemerrier 2012, 96 ss, 109. Eksperimentalne analize, opravljene v Aix-en-Provence v Provansi, so obsegale tudi določitev vseh različnih možnih naravnih surovin, uporabljenih za izdelavo okrasa (npr. les, stebela trav, vejice, kovinske paličice, ploščice iz kamna, rastlinske in živalske niti, naravni glavniki – npr. školjke *Cerastoderma edule*, *Chlamys varia*, *Cardium echinatum* itd.). Pri preučevanju izdelanih primerov so upoštevali ne le tlorisno obliko, temveč tudi presek in smer vtiskovanja. Avtorji raziskav so opazili podobnosti s keramiko, okrašeno s t. i. tehniko "Wickelschnur", z območja Ljubljane in tržaškega Krasa.

⁵ Ložar 1941, 9 op. 27.

⁶ J. Korošec 1955, 254.

⁷ Korošec 1958–59, 97.

⁸ Korošec 1957, 10 op. 9a.

⁹ Korošec 1967, 301 op. 11.

¹⁰ Dimitrijević 1979, 320.

¹¹ Harej 1978, 78 ss; id. 1981–1982, 96.

¹² Forenbaher 1985, 10.

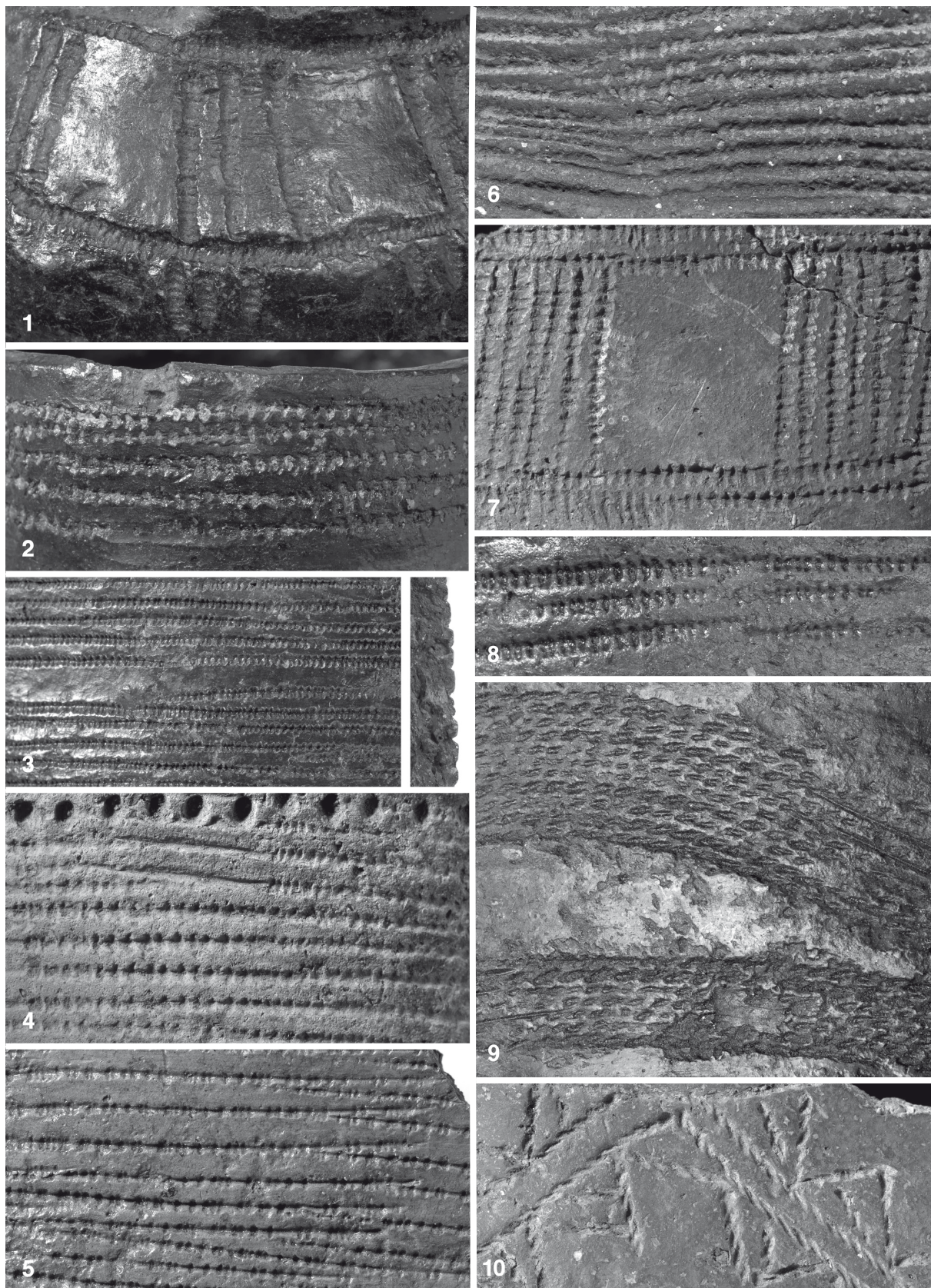
¹³ Govedarica 1989, 42, 43.

¹⁴ Gilli, Montagnari Kokelj 1993, 158.

Sl. 1: Keramika z Dežmanovih kolišč. Posode in odlomki, okrašeni z vtiskovanjem niti, navite na ploščico, in z odtisi sukane dvojne niti (prim. *Seznam najdb*). M. = 1:2.

Fig. 1: Pottery from Dežman's pile-dwelling sites. Vessels and fragments decorated with impressions of cord wrapped around a plate and with impressions of twisted double cord (cf. *List of finds*). Scale = 1:2.





Sl. 2: Keramika z Dežmanovih kolišč. Detajli okrasa na izbranih posodah; prim. sl. 1 (sl. 2: 1 = sl. 1: 1 ...). Povečano.
 Fig. 2: Pottery from Dežman's pile-dwelling sites. Detail of the decoration on selected vessels; cf. Fig. 1 (Fig. 2: 1 = Fig. 1: 1 ...). Enlarged. (foto / photo: T. Lauko)

ANALIZE NAČINA IZDELAVE OKRASA

Številne različne razlage tovrstnega okrasa so bile razlog, da sem na keramiki, značilni za ljubljansko kulturo, opravila raziskave in preizkuse o načinu okraševanja. Z raziskavami sem želela odkriti, s katero tehniko je bil okras izdelan ter kakšen predmet in iz kakšne snovi je bil uporabljen pri izdelavi takega okrasa. Ali je bil predmet, vtisnjen v površino glinene posode, namensko izdelan ali ga je že bilo mogoče najti v naravi? Ali je način izdelave okrasa na keramiki ljubljanske kulture enak tistemu na t. i. keramiki *barbelé*?

Raziskavo sem začela z izborom keramičnih najdb z Dežmanovih kolišč pri Igu, na katerih je okras najboljše viden in prepoznaven. V izbor je bilo vključenih sedem odlomkov posod in tri skoraj v celoti ohranjene posode. Večina najdb je premazana s konservatorskim svetlečim premazom, vendar sta kljub temu okras in motiv še vedno dobro prepoznavna. V analizo vključene najdbe so prikazane na *sliki 1*.

Med natančnim pregledom okrasa sem opazovala značilnosti, kot so smer, oblika in gostota posameznih odtisov. Z izjemo dveh primerov (*sl. 1: 9 in 10*) gre za vtise (*sl. 2: 4,5*) z ravnim predmetom, katerega dolžina je merila povprečno 3 do 5 cm. Poleg tega se zdi, da je bil pri vsaki posamezni posodi za izdelavo okrasa uporabljen isti predmet, saj se odtisi ponavljajo. Večina odtisov je v preseku zaobljene V-oblike (*sl. 2: 3 – desno*). Okras sestavljajo ravne črte, večkrat neskljenjene, prek katerih so skoraj pod kotom 90° kratki, zaobljeni in različno gosti odtisi. Nekoliko drugačen je odtis na posodi na *sliki 1: 1*, kjer so prečni odtisi gostejši in zelo fini (*sl. 2: 1*).

V analizo sem vključila tudi odlomek in posodo, ki sta drugače okrašena kot prej omenjeni primeri (*sl. 1: 9,10*). Poleg tega se razlikujeta tudi glede kulturne opredelitve, saj ne sodita v okvir ljubljanske kulture, temveč jih je več avtorjev uvrstilo v skupino t. i. litzenske oz. pramenaste keramike.²⁰ Okras na taki keramiki je sestavljen iz kratkih prečnih zaobljenih odtisov, ki ležijo drug poleg drugega pod kotom približno 45° (*sl. 2: 9,10*). Pri posodi na *sliki 1: 10* so linije s takimi odtisi enojne, pri odlomku na *sliki 1: 9* pa sta dva pasova, sestavljena iz več vzporednih vrst.²¹ Že Johannes-Wolfgang Neugebauer je leta

1994 na primeru posod iz vzhodne Avstrije dokazal, da je litzenski okras mogoče narediti z vtiskanjem vzporedno položenih sukanih vrvic.²² Matija Črešnar je s poskusi preveril okras sukane (dvojne) vrvice, značilen za litzensko oz. pramenasto keramiko, ter ga ločil od okrasa navite vrvice, ki je značilen za kulturo Kisapostag.²³

Med gradivom z Dežmanovih izkopavanj najdemo izjemoma tudi nekaj ostankov sukancev oz. niti (*sl. 3: 1*). Gre v glavnem za ostanke niti, izdelane iz listnatih vlaken rogoza (*Typha angustifolia*) ali močvirskih trav in lana.²⁴ Ohranjene so tudi sukane dvojne vrvice, prav tako rastlinskega izvora (*sl. 3: 2*), s katerimi so lahko izdelali značilen litzenski okras. Poskusili smo ugotoviti, ali je možno izdelati valoviti pas odtisov s sukano dvojno nitjo in na kakšen način so izdelali kompleksnejši okras, ki krasi prej omenjeno posodo?

Raziskave so bile opravljene na Oddelku za konserviranje in restavriranje Narodnega muzeja Slovenije.²⁵ Pri izbiri pripomočkov, s katerimi so lahko izdelali tak okras, je bilo treba upoštevati vse opisane značilnosti. Predmeti s takimi značilnostmi, ki jih najdemo v naravi, so npr. nekatere školjke ali zobje morskih psov.²⁶ Školjka, uporabljena pri analizah, je t. i. noetova barčica (lat. *Arca noae*), ki živi v Sredozemlju, predvsem v Jadranskem morju.²⁷ Sklepni del te školjke je zelo ozek in fino nazobčan (*sl. 4*). Zobje morskih psov so na celini ohranjeni kot fosili. Nahajališča takih fosilnih zob so predvsem v osrednji Sloveniji, npr. pri Moravčah, Trbovljah, Zagorju itd.²⁸ Za našo raziskavo smo uporabili fosilni zob morskega psa vrste

²² Neugebauer 1994, sl. 77.

²³ Črešnar 2010, 112, sl. 2; o tehniki okraševanja pramenaste keramike: Markovič 2003, 123 ss.

²⁴ Hrani Narodni muzej Slovenije, inv. št.: B 1088, B 1089, B 1090, B 1091 in B 1092; Greif 1997, 41.

²⁵ Za pomoč pri izvedbi raziskave se na tem mestu najlepše zahvaljujem Igorju Ravbarju z Oddelka za konserviranje in restavriranje NMS, ki mi je priskočil na pomoč z izdelavo glinenih modelov, lesenih in koščenih nastavkov, in Boštjanu Laharnarju z Arheološkega oddelka NMS.

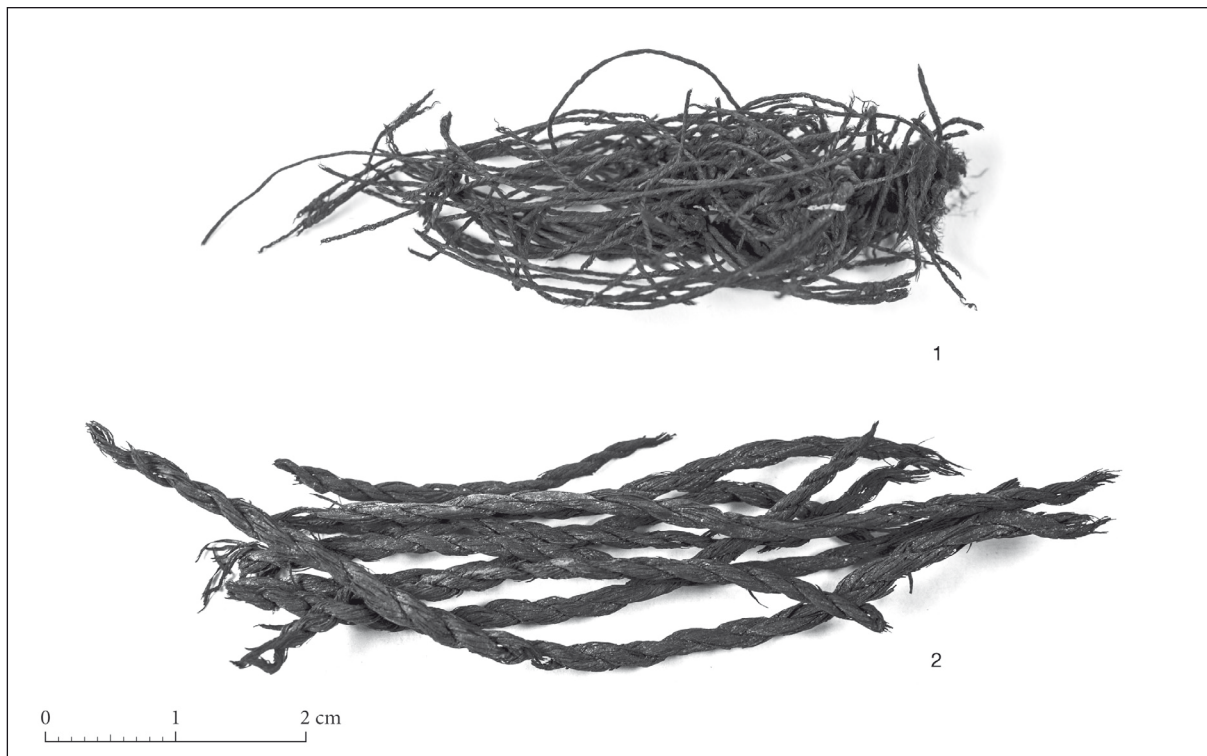
²⁶ Zahvaljujem se Matiji Križnarju iz Prirodoslovnega muzeja Slovenije za nasvet, naj v analizo vključim tudi zob morskega psa, ter za pomoč pri iskanju referenčne literature.

²⁷ V analizo sem vključila to morsko školjko izključno zaradi njenih fizičnih značilnosti, sicer podobno kot za zob morskega psa nimam podatkov, da bi bile take najdbe odkrite tudi na Dežmanovih koliščih. V analizo sta bila primera vključena zato, da bi predstavili eno izmed možnih orodij, ki jih najdemo v naravi in imajo značilen nazobčan del.

²⁸ Mikuž 2000, sl. 4; Križnar 2012, 367 ss; Mikuž, Šoster 2013, 113 ss.

²⁰ Glej npr. Korošec 1957; Parzinger 1984.

²¹ Med gradivom z Dežmanovih kolišč sta poleg omenjenega primera le še dva odlomka, okrašena na tak način. Gre za odlomka z inv. št. B 1799 in B 1800 (Korošec, Korošec 1969, t. 54: 14; 56: 6; 118: 7).



Sl. 3: Ostanki niti rastlinskega izvora z Dežmanovih kolišč. Nit (1) in sukana dvojna vrvica (2).
 Fig. 3: Remains of plant cords from Dežman's pile-dwelling sites. Cord (1) and twisted double cord (2).
 (Narodni muzej Slovenije, inv. št. / Inv. No.: B 1088; [1], B 1091 [2]. Foto / Photo: M. Lukić)



Sl. 4: Morska školjka noetova barčica (*Arca noae*).
 Fig. 4: Noah's ark seashell (*Arca noae*).
 (foto / photo: M. Lukić)

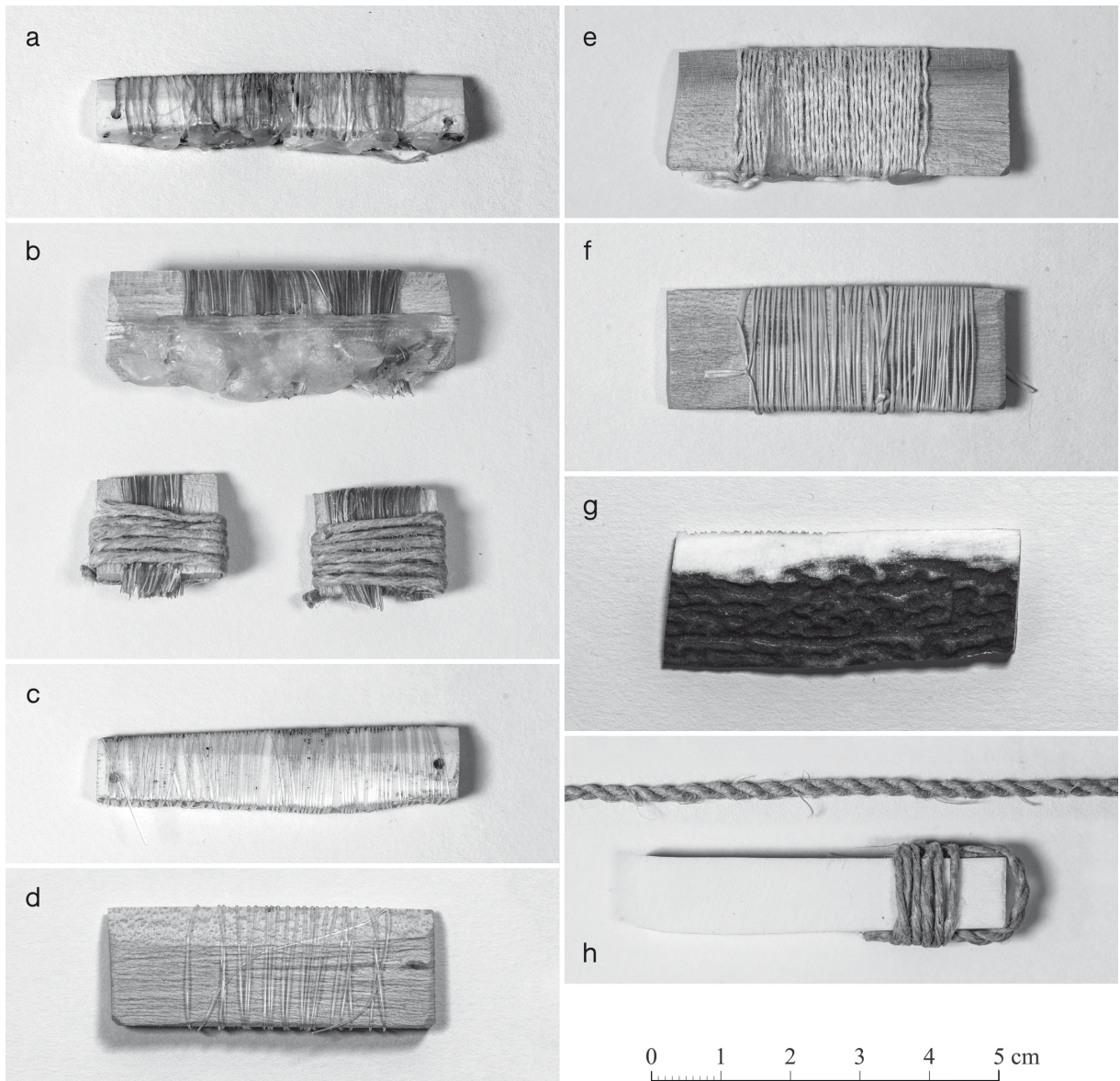
Carcharocles megalodon (sl. 5), ki je bil najden na prazgodovinskem grobišču na Vačah, kjer je ležal v sedimentu nad grobovi 12–24.²⁹ Najverjetneje ta primerek izvira iz okolice Moravč.³⁰

²⁹ Stare 1955, 61, t. XCV: 1; gre za najdbo z inv. št. P 8257, hrani jo Narodni muzej Slovenije.

³⁰ Zahvaljujem se M. Križnarju, ki je prepoznal nahajališče fosilnega zoba z Vač.



Sl. 5: Fosilni zob morskega psa (*Carcharocles megalodon*).
 Fig. 5: Fossilized tooth of a (*Carcharocles megalodon*) shark.
 (Narodni muzej Slovenije, inv. št. / Inv. No.: P8257.
 Foto / Photo: M. Lukić)



Sl. 6: Sestavljeni predmeti za vtiskovanje: koščena ploščica in nit iz živalskega črevesa (a); lesena ploščica in nit iz goveje žime (b); koščena ploščica in laks (c); lesena ploščica in laks (d); lesena ploščica in lanena nit (e); lesena ploščica in nit iz suhe trave (f); glavniček iz roga (g); sukana konopljna vrstica in sukana vrstica na leseni ploščici (h).

Fig. 6: Tools for creating cord impressed decoration: bone plate and gut cord (a); wooden plate and cattle-tail hair (b); bone plate and perlon cord (c); wooden plate and perlon cord (d); wooden plate and a flax thread (e); wooden plate and cord of dry grass (f); horn comb (g); twisted hemp cord and twisted cord wrapped around a wooden plate (h).

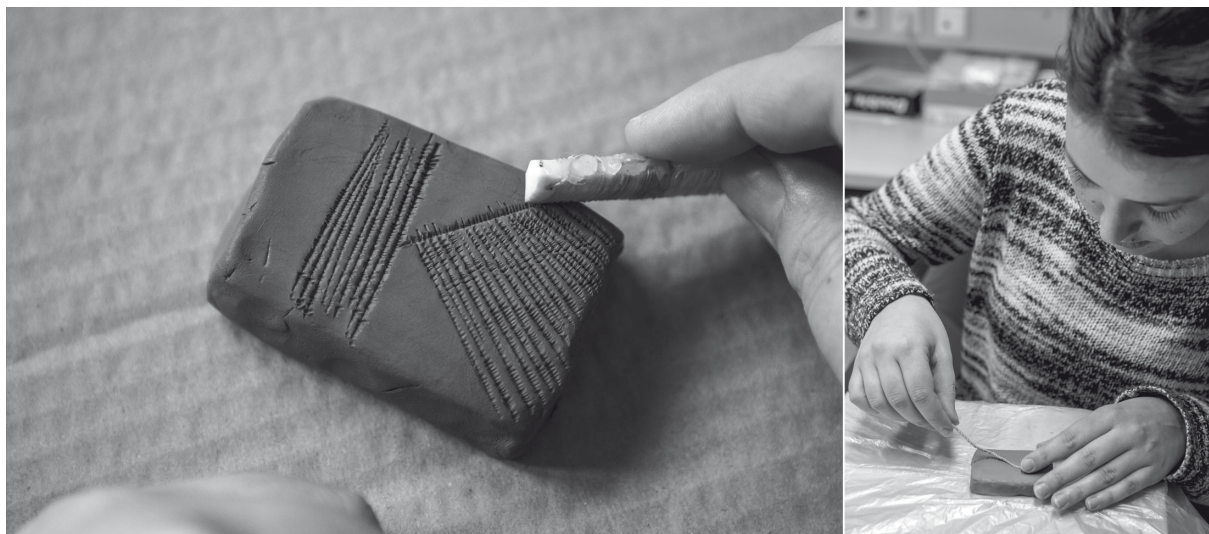
(foto / photo: M. Lukić)

Ostale pripomočke smo izdelali sami. Najprej je bilo treba izdelati trden predmet, okoli katerega bi navili nit. Glede na presek in tloris odtisov na keramiki smo naredili tanko ploščico z enim nekoliko bolj ostrim robom V-preseka, dolžine skoraj 5 cm oz. v dveh primerih dolžine skoraj 2 cm. Izdelali smo dva primerka iz kosti (sl. 6: a,c), ostale pa iz lesa (sl. 6: b,d-f). Zaradi odsotnosti koščenih najdb take oblike med gradivom z Dežmanovih kolišč lahko sklepamo, da je bila podlaga najverjetneje

lesena in se ni ohranila. Okoli lesenih ploščic smo navili različne niti v različnih gostotah, in sicer niti, narejene iz živalskega črevesa (sl. 6: a),³¹ iz dlak govejega repa oz. goveje žime (sl. 6: b),³² niti

³¹ Zahvaljujem se Luciji Lavrenčič, ki mi je priskrbela rabljene strune harfe, narejene iz živalskega črevesa. Zaradi prevelike debeline sem strune odvila in s tem dobila tanjše niti.

³² Goveja dlaka je bila navita okoli podlage, tako posamezno (sl. 6: b zgoraj in spodaj levo) kot šop govejih



Sl. 7: Eksperiment. Vtiskovanje orodij v glino.
Fig. 7: Experimentation in process. Creating cord impressed decoration.
(foto / photo: M. Lukić)

rastlinskega izvora (sl. 6: e,f) in današnjo moderno perlonsko nit oz. laks³³ (sl. 6: c,d).

Nit smo pritrdili na ploščice na dva načina. V dveh primerih smo jo potegnili skozi majhni prevrtani luknjici (sl. 6: a,c), pri čemer smo konca zavezali (sl. 6: d,f), v drugih primerih pa smo jo pritrdili tudi z dodatno nitjo oz. vrvico in voskom (sl. 6: b,e).³⁴ Iz rogovja je bil izdelan tudi majhen glavniček (sl. 6: g).³⁵

Zadnja dva pripomočka za vtiskovanje sta bila sukana dvojna konopljna vrvica in sukana dvojna konopljna vrvica, navita na trdno ploščato osnovo različnih širin (sl. 6: h).

Vsa tako pripravljena orodja sem vtiskovala v glino z blago zaobljeno, rahlo posušeno površino (sl. 7). Poskusila sem poustvariti okrase, primerljive s tistimi na arheoloških najdbah – na omenjenih posodah z Dežmanovih kolišč (prim. *Seznam najdb*).

dlak sočasno na podlago (sl. 6: b spodaj desno).

³³ To smo uporabili izključno z namenom preveriti rezultat odtiskovanja z zelo trdo nitjo.

³⁴ Orodje (na sl. 6: a) je bilo izdelano tako, da smo nit iz drobovja potegnili skozi luknjici in jo dodatno učvrstili z voskom.

³⁵ Odtiskovanje z glavničkom sodi med glavne tehnike okrasa kulture zvončastih čaš (Nicolis 1998, 57). Med gradivom z Dežmanovih kolišč ni bilo najdenih glavničkov. Na splošno so najdbe glavničkov za okraševanje keramike izredno redke. Koščen glavniček je bil npr. najden na najdišču Praelle di Novaglie (Verona) (Nicolis 1998, Fig. 6). Glavniček, izdelan na Oddelku za konserviranje in restavriranje NMS, ima podobno obliko kot lesene oz. koščene ploščate ploščice, kar omogoča lažje odtiskovanje.

REZULTATI

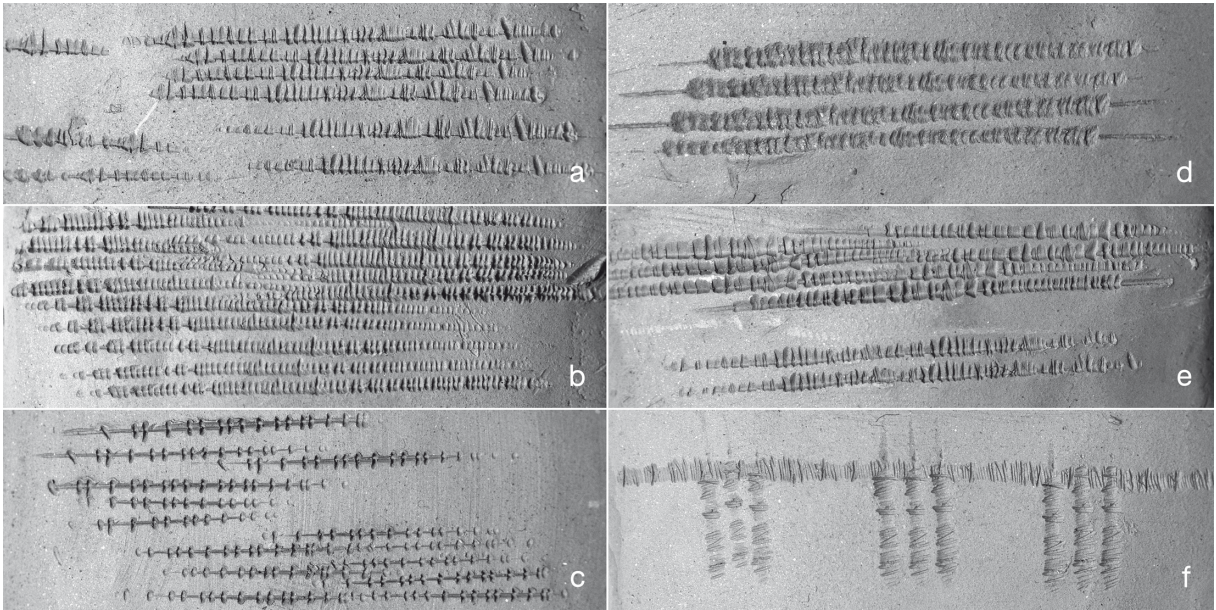
ANALIZ POSKUSOV IZDELAVE OKRASA

Vtiskovanje živalskih ali rastlinskih vlaken, navitih na deščice

Najbolj podobni odtisom na Dežmanovi keramiki so tisti, ki smo jih vtisnili s ploščato deščico, koščeno ali leseno, okoli katere so bile navite niti rastlinskega in živalskega izvora oziroma različna vlakna ali dlake. Odtisi, narejeni z deščico, okrog katere je bilo navito živalsko črevo (sl. 6: a in 8: a), so še najbolj podobni okrasu na odlomkih in posodah na *sliki 1*: 1–8.

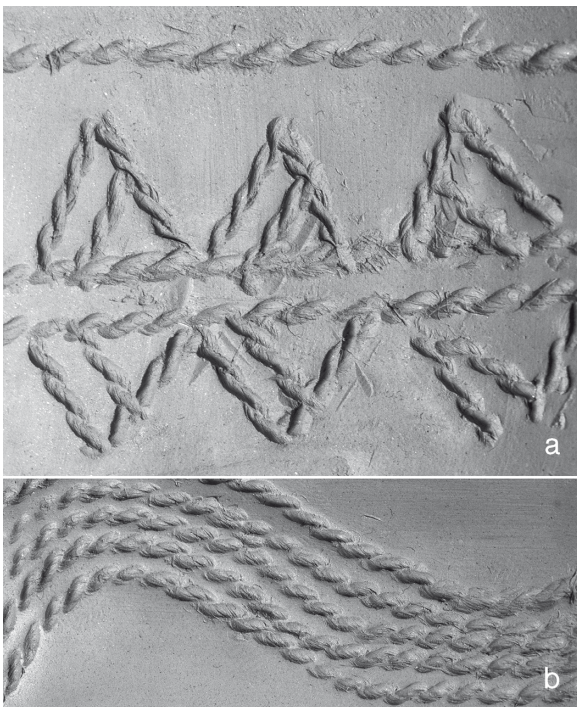
Razlika je predvsem ta, da so posamezni deli poskusnih odtisov nekoliko preveč podolgovati in neenakomerno oblikovani, kar pa je posledica preveč suhega živalskega črevesa, ki smo ga uporabili. Trakove živalskega črevesa je treba namreč še "sveže" spiralno sukati in napeti ter nato posušiti, da obdržijo zaobljen presek in elastičnost.³⁶ Z nitmi, izdelanimi na tak način, bi lahko naredili odtise, ki bi bili najverjetneje zelo podobni odtisu, izdelanemu s ploščico, okrog katere je bil navit laks (sl. 6: c,d; 8: b,c). Ti odtisi so namreč zelo podobni tistim na keramičnih odlomkih na *sliki 1*: 3,5 (glej tudi sl. 2: 3,5).

³⁶ Tako so izdelane strune: namreč, potem ko dve daljši črevesi spiralno sukajo, se začne sušenje, med katerim sproti obnavljajo njuno spiralno zavistost. Na koncu z naravnimi snovmi zbrusijo strune, da postanejo gladke in svetleče.



Sl. 8: Odtisi ploščic, okoli katerih so bile navite niti različnega izvora: vlakna živalskega črevesa (a); laks (b,c); lan (d); suha trava (e); goveja žima (f).

Fig. 8: Impressions of various cords wrapped around plates: gut (a); perlon (b,c); flax (d); dry grass (e); cattle-tail hair (f). (foto / photo: M. Lukić)



Sl. 9: Odtisi sukane dvojne niti in sukane dvojne niti, pritrjene na različno široke ploščice (a) in odtisi sukane dvojne niti v motivu valovnice (b).

Fig. 9: Impressions of a twisted double cord and of twisted double cords wrapped around variously wide plates (a) and impressions of a twisted double cord forming a wavy band (b). (foto / photo: M. Lukić)

Podobni so tudi odtisi, pridobljeni z vtiskovanjem ploščice, okoli katere je bila navita zelo tanka lanena nit (sl. 8: d).

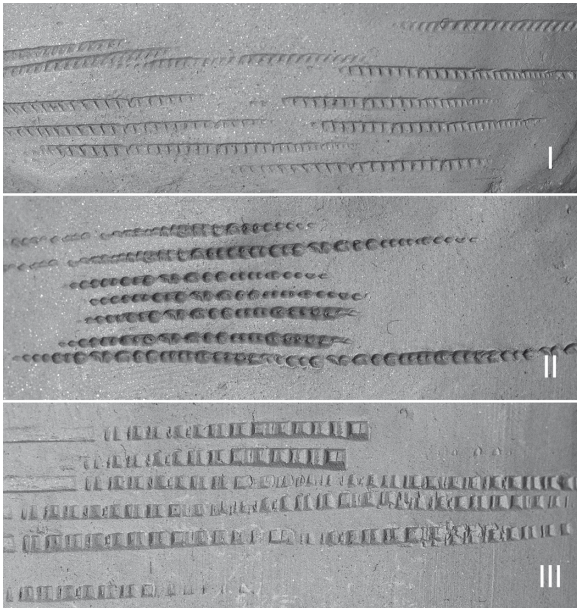
Odtisi, izdelani s ploščico, okoli katere je bila navita suha trava, so podobni odtisom, izdelanim iz živalskega črevesa (sl. 6: f; 8: e). Posamezni segmenti odtisov so neenakomerne dolžine in širine ter nekoliko bolj podolgovati v primerjavi z npr. odtisi na izbranih keramičnih najdbah.

Odtisi ploščice, okoli katere je bila navita goveja dlaka, so najbolj fini in najbolj gosti med vsemi (sl. 6: b; 8: f). Najbolj so podobni tistim, ki krasijo posodo na sliki 1: 1 (prim. tudi sl. 2: 1). Z različno dolgimi ploščicami je torej mogoče izdelati podoben okras kot na omenjeni posodi (sl. 2: 1; 8: f).

Vtiskovanje sukane dvojne vrvice

Okras na posodi in odlomku na sliki 1: 9 in 10 smo izdelali z vtiskovanjem sukane dvojne vrvice, s katero lahko naredimo daljše vodoravne ter tudi navpične in poševne črte.

S sukano dvojno vrstico, ki je pritrjena na različno široke ploščate podlage, lahko ustvarimo krajše odtise in s tem izdelamo na primer motiv šrafirane trikotnika (prim. sl. 2: 10; 9: a). Z vtiskovanjem vsaj dveh sukanih dvojnih niti, ki sta



Sl. 10: Odtisi morske školjke (I), zoba morskega psa (II) in glavnička iz roga (III).

Fig. 10: Impressions of a seashell (I), shark tooth (II) and a horn comb (III). (foto / photo: M. Lukić)

položeni druga poleg druge v vijugastem položaju, pa lahko izdelamo okras, ki je podoben tistemu na odlomku na *sliki 1*: 9 (prim. *sl.* 2: 9; 9: b).³⁷

Vtiskovanje školjčnega roba, zoba morskega psa in glavnička

Če primerjamo dobljene odtise sklepnega dela školjke (*sl.* 4) in glavnička (*sl.* 6: g) z odtisi na izbranih keramičnih kosih z Dežmanovih kolišč, ne opazimo podobnosti. Odtisi morske školjke so namreč sestavljeni iz posameznih zaobljenih rombičnih odtisov (*sl.* 10: I). Odtisi glavnička so kvadratne oblike in niso tako gosti (*sl.* 10: III). Zadnji so predvsem podobni okrasu, ki ga najdemo na posodah kulture zvončastih čaš npr. iz severne Italije.³⁸

Rezultat vtiskovanja z zobom morskega psa (*sl.* 5; 10: II) prav tako ni primerljiv s tistim na izbra-

nih najdbah. Odtisi posameznih izrastkov zoba so preveč okrogli in zaobljeni ter različnih velikosti.

ZAKLJUČEK

Že leta 2010 je Črešnar nazorno pokazal, da sta natančna določitev in opredelitev okrasa na keramiki kulture Kisapostag in okrasa pramenaste keramike ključni za ločevanje keramike obeh kultur.³⁹ Zaradi napačne določitve ali zgolj poimenovanja nekega okrasa oz. načina njegove izdelave lahko napačno opredelimo najdbo, tako kronološko kot kulturološko. Z analizo načina izdelave okrasa na gradivu z Dežmanovih kolišč smo ugotovili, da okras na keramiki ljubljanske kulture ni bil izdelan s koleščkom oz. z žigosanjem z glavničkom ali kakšnim naravnim nazobčanim predmetom, temveč z vtiskovanjem sukane vrvice oz. niti, ki je bila lahko rastlinskega ali živalskega izvora. Vrvica ni bila navita na paličico, temveč na ploščico, najverjetneje na kratko deščico, tako kot je že v šestdesetih letih predvidevala Paola Korošec.⁴⁰ Podobno kot vrvica, navita na paličico, s katero izdelamo okras, značilen za kulturo Kisapostag,⁴¹ tudi nit, navita na deščico, omogoča izdelavo okrasa, pri katerem so posamezni navoji med seboj ločeni s skoraj poljubnimi vmesnimi prostori. Okras, kjer so prečni odtisi bolj fini, bi bil lahko izdelan z odtiskovanjem navite dlake (*sl.* 2: 1; 8: f). Napačna se torej zdi uporaba termina odtis ovite niti, nepopoln pa je izraz žigosanje z omotano nitjo.⁴² Za okras na keramiki ljubljanske kulture torej velja, da je bil izdelan z vtiskovanjem niti, navite na ploščico. Glede na rezultate naših analiz je očitna tudi podobnost s t. i. okrasom *barbelé*, značilnim za keramiko kulture zvončastih čaš, predvsem njene mlajše zaključne faze, na območju severne Italije in jugovzhodne Francije.⁴³ Iskanje odgovora na vprašanje, ali podobnosti, povezane z načinom izdelave okrasa na keramiki, kažejo tudi na druge tipološko-kulturne povezave med omenjenimi zahodnimi območji in Dežmanovi kolišči in širše v Sloveniji, pa je izziv za prihodnje raziskave.

³⁷ Okras lahko izdelamo tudi le z eno sukano dvojno vrvico oz. nitjo, vendar je nekoliko težje pri izdelavi vzporednih vijugastih linij. Z dvema vrvicama pa okras izdelamo tako, da najprej položimo eno vrvico, jo vtisnjeno pustimo na površini in ob njo položimo drugo vrvico. Prvo vrvico nato odstranimo in jo položimo na drugo stran ob drugo itd.

³⁸ Mottes, Nicolis 1998, sl. 4; Nicolis, Mottes 1998, kat. št. 13, 35, 52, 59, 69, 61 itd.

³⁹ Črešnar 2010.

⁴⁰ Korošec 1967, 301.

⁴¹ Črešnar 2010, 112.

⁴² Velušček, Čufar, Levanič 2000, 85, t. 6: 3. Velušček, Čufar 2003, 126, 129; t. 3: 2; 14: 4; 15: 9.

⁴³ Strahm 1998, 40; Vital, Convertini, Lemerrier 2012, 1 ss.

SEZNAM OBRAVNAVANIH NAJDB

(sl. 1; 2)

V opisih so uporabljeni izrazi na novo ugotovljenega načina okraševanja.

1. Keramična miniaturna posoda blago sploščene kroglaste oblike z odlomljenim vratom in ustjem. Vtisnjen okras na ramenu, geometrijski motiv: odtisi zelo tanke niti, navite na ploščico. Inv. št. B 1183 (sl. 1: 1; 2: 1).

Lit.: Korošec, Korošec 1969, t. 11: 3.

2. Keramična miniaturna posoda s polkrožno oblikovanim robom ustja in nizkim cilindričnim vratom, ki prehaja v kroglasto oblikovan trup; dno je sferično; odlomljen trakast ročaj, ki je izhajal iz ustja in se pripenjal na ramo posode. Vtisnjen okras na vratu in ramenu, linearni motiv: gosti vodoravni nizi odtisov niti, navite na ploščico. Inv. št. B 1286 (sl. 1: 2; 2: 3).

Lit.: Korošec, Korošec 1969, t. 35: 1.

3. Odlomek keramične posode s polkrožno oblikovanim robom ustja in cilindričnim vratom. Vtisnjen okras na vratu, linearni motiv: gosti vodoravni nizi odtisov niti, navite na ploščico. Inv. št. B 1787 (sl. 1: 3; 2: 3).

Lit.: Korošec, Korošec 1969, t. 55: 4; 118: 8.

4. Odlomek keramične posode s polkrožno oblikovanim robom ustja in cilindričnim vratom. Vtisnjen okras na vratu, linearni motiv: gosti vodoravni neskljenjeni nizi odtisov niti, navite na ploščico, in dve vodoravni vrsti okroglih vbodov. Inv. št. B 1795 (sl. 1: 4; 2: 4).

Lit.: Korošec, Korošec 1969, t. 54: 13.

5. Odlomek keramične posode s polkrožno oblikovanim robom ustja in cilindričnim vratom. Vtisnjen okras

na vratu, linearni motiv: gosti vodoravni neskljenjeni nizi odtisov niti, navite na ploščico. Inv. št. B 1781 (sl. 1: 5; 2: 5).
Lit.: Korošec, Korošec 1969, t. 56: 3.

6. Odlomek keramične posode s polkrožno oblikovanim blago izvihanim ustjem in usločenim vratom. Vtisnjen okras na vratu, linearni motiv: gosti vodoravni neskljenjeni nizi odtisov niti, navite na ploščico. Inv. št. B 1798 (sl. 1: 6; 2: 6).

Lit.: Korošec, Korošec 1969, t. 55: 6.

7. Odlomek keramične posode z ravno odrezanim zaobljenim ustjem in cilindričnim vratom, ki poudarjeno prehaja v ramo posode. Vtisnjen okras na vratu in rami, linearni motiv: vodoravni in navpični nizi odtisov niti, navite na ploščico. Inv. št. B 1804 (sl. 1: 7; 2: 7).

Lit.: Korošec, Korošec 1969, t. 55: 2.

8. Odlomek keramične posode s cilindričnim vratom in kroglasto oblikovanim trupom; na ramenu podolgovata aplika z odtisom prsta. Vtisnjen okras na ramenu, geometrijski motiv: pasovi vodoravnih in navpičnih nizov odtisov niti, navite na ploščico. Inv. št. B 1802 (sl. 1: 8; 2: 8).

Lit.: Korošec, Korošec 1969, t. 61: 1.

9. Odlomek keramične posode s polkrožno oblikovanim izvihanim ustjem. Vtisnjen okras na zunanji površini vrata, linearni motiv: dva valovita pasova iz več vrst odtisov sukane dvojne vrvice. Inv. št. B 1801 (sl. 1: 9; 2: 9).

Lit.: Korošec, Korošec 1969, t. 55: 11; 119: 3.

10. Keramičen lonec z blago izvihanim odebeljenim robom ustja in nizkim usločenim vratom, ki prehaja v kroglasto oblikovan trup; na ramenu dva tunelasta držaja. Dno je ravno in zaobljeno prehaja v steno posode. Vtisnjen okras na ramenu, geometrijski motiv: odtisi sukane dvojne vrvice. Inv. št. B 1321 (sl. 1: 10; 2: 10).

Lit.: Korošec, Korošec 1969, t. 7: 10 a,b; 108: 4.

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Decorating the pottery of the Ljubljana culture and the Litzen pottery – an experimental archaeology case study

Translation

INTRODUCTION

The finds from the so-called Dežman's pile-dwelling sites at Ig in the Ljubljansko barje have been well and widely known ever since their discovery in the 1870s. They include numerous pottery finds, which rank among the most beautifully and richly decorated ceramic remains from the Late Copper and Early Bronze Age in Slovenia and wider in Europe. Dežman's pile dwellings were discovered in 1875 while cleaning the drainage canals along the road of Ižanska cesta between Ljubljana and Studenc (the present-day small town of Ig). Over the following two years, Karel Dežman (Karl De-

schmann), then curator at the provincial museum in Ljubljana (*Krainisches Landesmuseum*; present Narodni muzej Slovenije, Ljubljana), conducted the first archaeological excavations in that area.¹ He found the remains of at least three (different) pile-dwelling settlements located north of Ig, on the Kepje fallow and on the Parti fallow on the left bank of the Iščica river, respectively (*Map 1*).

In the 20th century, these finds were partially analysed by a number of scholars,² but were

¹ Korošec, Korošec 1969, 11; Kos 1978, 43 ff.

² E.g. Ložar 1941; id. 1942; Laviosa Zambotti 1943; J. Korošec 1955; Korošec 1957; Korošec 1958–1959.

only published as a whole in 1969.³ The ceramic finds are surprisingly well preserved and most are decorated with various motifs and in various techniques. The decoration includes simple and furrowed incisions, stabs, grooves, applied ribs, as well as cord impressions or cord marks. The latter technique is characteristic of the Ljubljana culture, i.e. Phase Ig II (after Paola Korošec), which is believed by many scholars to have succeeded the Late Vučedol phase in the Ljubljansko barje.⁴

An overview of the literature mentioning or dealing with this technique reveals that it is known under different names and that it is interpreted in different ways. Rajko Ložar, for example, in 1941 termed the pottery with cord impressions from Dežman's pile-dwelling sites as *vrvičasta keramika* (corded ware, *Schnurkeramik* in German) and described it as pottery decorated with impressions of cord or of cord wrapped around thin sticks. He also mentioned *pseudovrvičasta keramika* (pseudo-corded ware), where the decoration consisted of short lines either impressed or stabbed onto an incised line, all of which imitated cord impressions.⁵ Josip Korošec, in his overview of the prehistory of Ljubljana, described the decoration as *tehnika žigosanih vbodov* ('technique of stamped stabs') made with a toothed roulette, less frequently with a flat piece of wood with a serrated edge.⁶ Paola Korošec began studying the pottery in the 1950s and concluded that what she called *okras z ovito nitjo* ('decoration with a twisted cord') characterized the second group of ceramic finds from Dežman's pile-dwelling sites (Group Ig II).⁷ She initially thought that the decoration was made with a toothed roulette and afterwards believed that a cord was wrapped either around a thin stick or around another cord.⁸ She later added that a cord or a thin wire could also have been wrapped around a thin flat object (such as a knife).⁹ Stojan Dimitrijević saw the decoration as the result of the use of roulettes (*kotačić za žigosanje* in Croatian; *Rollstempel, Rädchen* in German), which were of two types: one was irregularly toothed, producing impressed zigzag bands, and the other thinner

and very finely toothed.¹⁰ Zorko Harej termed this technique *tehnika zobčastega odtiskovanja oz. žigosanja* ('dentate impressions or stamps').¹¹ Stašo Forenbaher analysed the ceramic finds from the cave site of Vaganačka pečina in the Velebit mountain range, Croatia, decorated in the same manner as the pottery from Dežman's pile-dwelling sites, and described the decorative technique as *žigosanje s pomočjo koleščka* (stamping with the aid of a roulette).¹² Several years later, in his overview of the Early Bronze Age in the northern Adriatic hinterland, Blagoje Govedarica determined two main decorative techniques for the pottery of the Ljubljansko barje and the Triestine karst, namely *odtisi niti* or *odtisi koleščka* ('cord and roulette impressions').¹³ Decoration comparable to that on the pottery of the Ljubljana culture is also to be found on the pottery from the cave of Orehova pejšca/Grotta dei Ciclami in the Triestine karst, which Emanuela Gilli and Emanuela Montagnari Kokelj described as *a rotella o filo avvolto* and *a cordicella*.¹⁴ Recent publications of the finds from the Ljubljansko barje write of *odtisi ovite niti* ('twisted cord impressions'; *Wickelschnur* in German) and *žigosanje z omotano nitjo* ('twisted cord stamping').¹⁵

The decoration on the pottery of the Ljubljana culture is comparable with the barbed-wire decoration (*barbelé* in French, *Stacheldraht* or *Wickeldraht* in German, *a filo spinato* in Italian) on part of the pottery of the Bell Beaker culture. Franco Nicolis, who was the first to identify this decoration, wrote that it was very difficult to precisely determine the tool with which this type of decoration had been made, but that it was most probably a cord wrapped around either a rigid or a flexible object.¹⁶ In France, the *barbelé* decorated pottery is primarily characteristic of the so-called *épicanpaniforme-barbelée* phase in south-eastern France, which represents a late phase of the Bell Beaker culture that presumably lasted to the Early Bronze Age.¹⁷ In recent years, French colleagues have studied the *barbelé* technique in great detail and also conducted several experiments aimed

³ Korošec, Korošec 1969.

⁴ Korošec 1958–1959, 97, 102; Dimitrijević 1979, 317 ff; Govedarica 1989, 25 ff, 42 ff.

⁵ Ložar 1941, 9 Fn. 27.

⁶ J. Korošec 1955, 254.

⁷ Korošec 1958–1959, 97.

⁸ Korošec 1957, 10 Fn. 9a.

⁹ Korošec 1967, 301 Fn. 11.

¹⁰ Dimitrijević 1979, 320.

¹¹ Harej 1978, 78 ff; id. 1981–1982, 96.

¹² Forenbaher 1985, 10.

¹³ Govedarica 1989, 42, 43.

¹⁴ Gilli, Montagnari Kokelj 1993, 158.

¹⁵ Velušček, Čufar, Levanič 2000, 85, Pl. 6: 3. Velušček, Čufar 2003, 126, 129, Pls. 3: 2; 14: 4; 15: 9.

¹⁶ Nicolis 1998, 57.

¹⁷ Strahm 1998, 40; Vital, Convertini, Lemerrier 2012, 1 ff.

at identifying the tools used to make such decoration.¹⁸ The results allowed them to reject the hypothesis of the *barbelé* decoration being made with a *roulette crantée*, as suggested by Nicolis, and found that different tools were used in different areas, but that most were flat pieces – either metal, wooden or stone, either rigid or flexible – around which cord was wrapped.¹⁹

ANALYSIS AND EXPERIMENTS

The numerous analyses of the decoration on the pottery of the Ljubljana culture and its very different explanations incited me to research the topic in more detail and also to perform experiments as to the decorative technique. The aim was to determine the manner in which the decoration was executed and the tools used in the process, more precisely to determine whether the object impressed into the surface of a clay vessel was purposely made or was simply picked up in nature, but also whether the decorative technique used on the pottery of the Ljubljana culture is the same as that on the pottery bearing barbed-wire decoration.

I began my research by selecting fragments with best visible and hence best identifiable decoration from among the pottery finds from Dežman's pile-dwelling sites at Ig. The selection comprised seven fragments and three almost complete vessels, shown on *Figure 1*. Most of these were conserved with a lustrous coating, but the decoration and the motif are still clearly identifiable.

The prehistoric finds were carefully examined, with particular attention paid to the direction, shape and density of individual impressions. On all but two finds (*Fig. 1: 9* and *10*), the impressions were made with a flat object, the width of which measured between 3 and 5cm (*Fig. 2: 4,5*). I also observed that a single tool was used for decorating a particular vessel, because the same impressions

are repeated over and over again. In cross section, most impressions are in the shape of a rounded V (*Fig. 2: 3 – right*). The decoration is composed of irregularly spaced short impressions with rounded ends positioned roughly perpendicularly to shallower straight and regularly broken lines. The vessel (on *Fig. 1: 1*) bears somewhat different impressions, with the short transverse impressions more densely spaced and much thinner (*Fig. 2: 1*).

The group of analysed finds includes a fragment and a complete vessel that bear a decoration different from that on other finds (*Fig. 1: 9,10*), but also of a different cultural attribution; a number of authors attributed them to the Litzen pottery group.²⁰ The decoration on the pottery of this group consists of short oblique impressions with rounded ends succeeding one another at an angle of roughly 45° (*Fig. 2: 9,10*). The vessel (on *Figure 1: 10*) bears single lines of such impressions and the fragment (on *Fig. 1: 9*) bears two bands of several parallel lines.²¹ On the basis of ceramic vessels from eastern Austria, Johannes-Wolfgang Neugebauer was able to prove already in 1994 that Litzen decoration is made by impressing bands of twisted cords.²² A few years ago, Matija Črešnar conducted experiments to verify the decoration of twisted (double) cord typical of Litzen pottery and was able to differentiate it from the whipped cord impressions characteristic of the Kisapostag culture.²³

In connection with this it should be mentioned that the finds excavated by Dežman also include rare remains of yarn or thread (*Fig. 3: 1*) predominantly made from leaf-fibres of lesser bulrush (*Typha angustifolia*) or from marsh grass and flax.²⁴ Also preserved are twisted double cords of plant origin (*Fig. 3: 2*), such as were used in the production of the characteristic Litzen decoration. This led me to examine how to make a wavy band of impressions with a twisted double cord and how prehistoric potters made more complex decoration such as that on the vessel on *Figure 1: 10*.

¹⁸ Vital, Convertini, Lemerrier 2012, 91 ff.

¹⁹ Vital, Convertini, Lemerrier 2012, 96 ff, 109. Experimental analyses performed at Aix-en-Provence, France, were also aimed at determining the possible natural materials used to make such decoration (e.g. wood, grass stems, twigs, metal sticks, stone plates, plant or animal fibres, natural combs such as *Cerastoderma edule*, *Chlamys varia*, *Cardium echinatum* and other shells). The analysis of the prehistoric pottery considered the decoration in plan and cross section, as well as the direction of impression. They also noted similarities with the pottery decorated in the *Wickelschnur* technique from the Ljubljana area and from the Triestine karst.

²⁰ See e.g. Korošec 1957; Parzinger 1984.

²¹ Apart from this, the finds from Dežman's pile-dwelling sites also include two fragments with this decoration: fragments kept in the Narodni muzej Slovenije under Inv. Nos. B 1799 and B 1800 (Korošec, Korošec 1969, Pls. 54: 14; 56: 6; 118: 7).

²² Neugebauer 1994, Fig. 77.

²³ Črešnar 2010, 112, Fig. 2; on the decoration technique of the Litzen pottery see also: Marković 2003, 123 ff

²⁴ Kept in the Narodni muzej Slovenije, Inv. Nos.: B 1088, B 1089, B 1090, B 1091 and B 1092; Greif 1997, 41.

I conducted the experiments at the department for conservation and restoration of the Narodni muzej Slovenije.²⁵ The decoration tools were either chosen or made so as to correspond with the above-discussed characteristics of the cord impressed decoration. Suitable objects already existing in nature include certain species of shells and shark teeth.²⁶ The shell used in the experiments is Noah's ark shell (*Arca noae*), which is found in the Mediterranean and is particularly abundant in the coastal waters of the Adriatic Sea.²⁷ The hinge of this shell has a very thin and finely denticulate edge (Fig. 4). Shark teeth can be found on the continent as fossils. In Slovenia, fossilized shark teeth can mainly be found in the central part, for example at Moravče, Trbovlje, Zagorje and so forth.²⁸ In my experiments, I used a fossilized *Carcharocles megalodon* shark tooth (Fig. 5) found at the prehistoric site at Vače, in the sediment above Graves 12–24.²⁹ Originally, however, the tooth had probably been picked up somewhere in the vicinity of Moravče.³⁰

We made other tools ourselves. The first step was to make a rigid support around which cords could be wrapped. Attempting to make impressions as similar to the prehistoric ones as possible, we made thin plates with one sharp edge of a V-shaped cross section and different widths; several plates were roughly 5cm and two roughly 2cm wide. Two plates were made of bone (Fig. 6: a,c) and the others of wood (Fig. 6: b,d–f).³¹ We wrapped various cords and fibres around the wooden plates,

²⁵ The experiments were aided by Igor Ravbar, from the conservation and restoration department, who helped me make clay plates, but also wooden and bone supports, and Boštjan Laharnar, from the archaeological department. I sincerely thank them both.

²⁶ I would like to thank Matija Križnar from the Prirodoslovni muzej Slovenije, Ljubljana, who recommended that I use the shark tooth in my experiments and also helped in finding the literature on the topic.

²⁷ This shell was used in the experiments solely on the basis of its physical characteristics; both these shells and the shark teeth were used as examples of tools readily available in nature and bearing a denticulate edge. Dežman's pile-dwelling sites yielded neither these shells nor shark teeth.

²⁸ Mikuž 2000, Fig. 4; Križnar 2012, 367 ff; Mikuž, Šoster 2013, 113 ff.

²⁹ Stare 1955, 61, Pl. XCV: 1; the find under Inv. No. P 8257 is kept in the Narodni muzej Slovenije.

³⁰ I thank Matija Križnar for identifying the origin of the fossilized tooth from Vače.

³¹ Considering the absence of such finds in bone at Dežman's pile-dwelling sites, I presume that the plates must have been made of wood and have not survived.

variously densely spaced. The cords were either of animal gut (Fig. 6: a),³² cattle-tail hair (Fig. 6: b)³³ and of plant origin (Fig. 6: e,f), even a modern perlon cord³⁴ (Fig. 6: c,d).

The cord was attached to the plates in two different ways. In two cases, we pulled it through small holes we had drilled (Fig. 6: a,c) and then tied the ends. In other cases, we tied the ends using a separate cord and wax (Fig. 6: b,e).³⁵ We also used horn to make a small comb (Fig. 6: g).³⁶

The last two tools were a twisted double hemp cord and a twisted double hemp cord, wrapped around rigid and flat plates of various widths (Fig. 6: h).

The prepared tools were then impressed into leather-hard clay plates with a slightly convex upper surface (Fig. 7) in an attempt to recreate the decoration on the archaeological finds, more precisely the above-mentioned pottery from Dežman's pile-dwelling sites (cf. *List of finds*).

EXPERIMENT RESULTS

Impressions of plant and animal cords wrapped around a plate

The experiments have shown that the decoration most similar to that on the archaeological finds was produced by impressions made with a flat plate, either of wood or of bone, around which cords or fibers were wrapped. The impressions most similar to the fragments and vessels on Figs. 1: 1–8 were produced by gut cords wrapped around a plate (Figs. 6: a; 8: a). Alongside similarities, there are also differences. The main difference is in that individual

³² I thank Lucija Lavrenčič for provided me with used gut strings for a harp. The strings were originally too thick and had to be thinned by removing some of the gut ribbons.

³³ Cattle hair was wrapped around the plate both as individual hairs (Fig. 6: b – top and bottom left) and in locks (Fig. 6: b – bottom right).

³⁴ The latter was used for the sole purpose of observing impressions made with a stiffer cord.

³⁵ The tool (on Fig. 6: a) was made by inserting the gut cord through the two holes and fixing it to the plate with wax.

³⁶ Comb impressions represent, according to Nicolis (1998, 57), one of the main decorative techniques of the Bell Beaker culture. Combs for decorating pottery are generally considered as extremely rare finds; one was found at the Praelle di Novaglio site (Verona) (Nicolis 1998, Fig. 6), while Dežman's pile-dwelling sites revealed none. The comb we made at the Narodni muzej Slovenije is similarly shaped as the wooden and bone plates so as to facilitate impressing.

transverse lines were too elongated and unevenly impressed, which is a consequence of the gut string used being too dry. Ribbons of animal guts have to be twisted while still 'fresh' and then dried, so that they retain the rounded cross section and elasticity.³⁷ Cords made in this way would probably produce impressions very similar to those made by a plate wrapped in perlon cord (Figs. 6: c,d; 8: b,c). The latter impressions are, in fact, very similar to those on the prehistoric fragments shown on Figs. 1: 3 and 1: 5 (see also Fig. 2: 3,5).

Comparable impressions were also obtained with the use of a plate wrapped in a very thin flax thread (Fig. 8: d).

The impressions made with a plate wrapped with dry grass stems appear similar to the impressions of gut strings (Figs. 6: f; 8: e). Individual segments of impressions are unevenly long and wide, as well as slightly more elongated in comparison to the impressions on the prehistoric finds.

The impressions with a plate wrapped with cattle hair are the finest and densest of all (Figs. 6: b; 8: f). They are most similar to the impressions decorating the vessel on Figure 1: 1 (see also Fig. 2: 1). Plates of various widths can thus be used to make the impressions such as those on the said vessel (Figs. 2: 1; 8: f).

Impressions of a twisted double cord

The decoration such as that on the vessel and fragment on Figs. 1: 9 and 10, respectively, were made by impressing a twisted double cord onto the clay so as to form either long or short lines, as well as horizontal, vertical and oblique lines.

The twisted double cord wrapped around variously wide flat plates can be used to make wide or narrow impressions, also to make the motif of hatched triangles (cf. Figs. 2: 10; 9: a). Impressing at least two twisted double cords side by side into the clay produces decoration similar to that on the prehistoric fragment on Figure 1: 9 (cf. Figs. 2: 9; 9: b).³⁸

³⁷ In the process of string making, two long guts or gut ribbons are twisted with the twist added regularly, left to dry and finally polished with natural materials so as to become smooth and shiny.

³⁸ The decoration can also be made with a single cord, but this makes the process of creating wavy lines more difficult. When working with two cords, one is pressed into the clay, the other is placed alongside the first one,

Shell, shark tooth and comb impressions

A comparison of the impressions made either with the hinge of a shell (Fig. 4) or a comb (Fig. 6: g) with those on the select pieces of prehistoric pottery reveals no similarities. The impression of the seashell is composed of individual rhombic impressions with rounded edges (Fig. 10: I), while the impressions left by a comb are square and less dense (Fig. 10: III). The latter are similar to the decoration found on the pottery of the Bell Beaker culture from, for example, northern Italy.³⁹

Impressions left by a shark tooth (Figs. 5; 10: II) are also not comparable; the impressions of individual teeth are too round and of varying sizes.

CONCLUSION

In 2010, Črešnar convincingly demonstrated the importance of exactly determining the decoration on the prehistoric pottery, which consequently allows archaeologists to distinguish between the Kisapostag and the Litzen cultures.⁴⁰ An erroneous identification of the decoration, or even an erroneous term for the decoration or the decorative technique may lead to an erroneous attribution of a find both in terms of time and culture. The analysis of the decorative technique employed for the pottery from Dežman's pile-dwelling sites has shown that the decoration was not made with the aid of a roulette or by stamping with a comb or a denticulate object readily available in nature, but rather by impressing twisted cord of either plant or animal origin. The cord was not wrapped around a stick, but around a plate, most probably a short one, as suggested already in the 1960s by Paola Korošec.⁴¹ Similarly as the cord wrapped around a stick, producing a whipped cord decoration characteristic of the Kisapostag culture,⁴² the cord wrapped around a plate also enables the creation of decoration where individual impressions are separated by variously wide interspaces, because of the way the cord was wrapped around a plate. The decoration where individual impressions are finer might have been

the first one is then removed and placed on the other side of the second one and so forth.

³⁹ Mottes, Nicolis 1998, Fig. 4; Nicolis, Mottes 1998, Cat. Nos. 13, 35, 52, 59, 69, 61 and so forth.

⁴⁰ Črešnar 2010.

⁴¹ Korošec 1967, 301.

⁴² Črešnar 2010, 112.

made by impressing wrapped hairs (*Figs. 2: 1; 8: f*). The use of the term *odtis ovite niti* ('impression of a twisted cord') in Slovenian thus seems erroneous, while the term *žigosanje z omotano nitjo* ('stamping with a wrapped cord') seems incomplete.⁴³ Apart from explaining the decorative technique employed on the Ljubljana culture pottery, my analysis and experiments have also revealed similarities with the barbed wire or *barbelé* decoration, typical of the Bell Beaker culture, mainly of its late or final phase, in the area of northern Italy and south-eastern France.⁴⁴ Whether the similarities in the decorative technique also suggest other typological and cultural connections between northern Italy and south-eastern France, on the one hand, and Dežman's pile-dwellings and wider in Slovenia, on the other, are topics left for future research.

LIST OF FINDS USED IN THE EXPERIMENT (*Figs. 1; 2*)

The archaeological finds below are described with respect to the experiment results.

1. Miniature ceramic vessel of a slightly flattened globular form with missing neck and rim. Impressed decoration on the neck, geometric motif: impressions of a very thin cord wrapped around a plate. Inv. No. B 1183 (*Figs. 1: 1; 2: 1*).

Lit.: Korošec, Korošec 1969, Pl. 11: 3.

2. Miniature ceramic vessel with a curved rim, a short cylindrical neck, a globular body, a spherical base and a strap handle, now broken off, that was attached at the rim and at the shoulder. Impressed decoration on the neck and shoulder, linear motif: densely spaced horizontal lines of impressions of a cord wrapped around a plate. Inv. No. B 1286 (*Fig. 1: 2; 2: 3*).

Lit.: Korošec, Korošec 1969, Pl. 35: 1.

3. Fragment of a ceramic vessel with a curved rim and a cylindrical neck. Impressed decoration on the neck, linear motif: densely spaced horizontal lines of impressions of a cord wrapped around a plate. Inv. No. B 1787 (*Figs. 1: 3; 2: 3*).

Lit.: Korošec, Korošec 1969, Pls. 55: 4; 118: 8.

4. Fragment of a ceramic vessel with a curved rim and a cylindrical neck. Impressed decoration on the neck, linear motif: densely spaced and broken lines of impressed cord wrapped around a plate and two horizontal lines of circular stabs. Inv. No. B 1795 (*Figs. 1: 4; 2: 4*).

Lit.: Korošec, Korošec 1969, Pl. 54: 13.

5. Fragment of a ceramic vessel with a curved rim and a cylindrical neck. Impressed decoration on the neck, linear

motif: densely spaced and broken lines of impressed cord wrapped around a plate. Inv. No. B 1781 (*Figs. 1: 5; 2: 5*).

Lit.: Korošec, Korošec 1969, Pl. 56: 3.

6. Fragment of a ceramic vessel with semi-everted curved rim and a curved neck. Impressed decoration on the neck, linear motif: densely spaced and broken lines of impressed cord wrapped around a plate. Inv. No. B 1798 (*Fig. 1: 6; 2: 6*).

Lit.: Korošec, Korošec 1969, Pl. 55: 6.

7. Fragment of a ceramic vessel with a straight rim, a cylindrical neck with a sharp transition into the shoulder. Impressed decoration on the neck and shoulder, linear motif: horizontal and vertical lines of impressions of a cord wrapped around a plate. Inv. No. B 1804 (*Fig. 1: 7; 2: 7*).

Lit.: Korošec, Korošec 1969, Pl. 55: 2.

8. Fragment of a vessel with a cylindrical neck and globular body; the shoulder bears an elongated applique with a finger impression. Impressed decoration on the shoulder, geometric motif: bands of horizontal and vertical lines of impressions of a cord wrapped around a plate. Inv. No. B 1802 (*Fig. 1: 8; 2: 8*).

Lit.: Korošec, Korošec 1969, Pl. 61: 1.

9. Fragment of a ceramic vessel with everted curved rim. Impressed decoration on the exterior surface of the neck, linear motif: two wavy bands consisting of several lines of impressions of a twisted double cord. Inv. No. B 1801 (*Figs. 1: 9; 2: 9*).

Lit.: Korošec, Korošec 1969, Pls. 55: 11; 119: 3.

10. Ceramic jar with a slightly everted and thickened rim, a low curved neck and a globular body, two tunnel-shaped lugs on the shoulder, flat base with a rounded transition into the body. Impressed decoration on the shoulder, geometric motif: impressions of a twisted double cord. Inv. No. B 1321 (*Figs. 1: 10; 2: 10*).

Lit.: Korošec, Korošec 1969, Pls. 7: 10 a,b; 108: 4.

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⁴³ Velušček, Čufar, Levanič 2000, 85, Pl. 6: 3; Velušček, Čufar 2003, 126, 129, Pls. 3: 2; 14: 4; 15: 9.

⁴⁴ Strahm 1998, 40; Vital, Convertini, Lemerrier 2012, 1 ff.