Oblikovanje kulturne krajine Krasa v bronasti dobi

The formation of the cultural landscape of the Karst in the Bronze Age

Tomaž FABEC, Dimitrij MLEKUŽ VRHOVNIK

Izvleček

Članek obravnava oblikovanje bronastodobne kulturne krajine na Krasu. V razpravo uvajava nove podatke o dolgoročni zgodovini kraške krajine z združevanjem dveh dopolnjujočih se virov. Najprej preučujeva podatke iz sedimentnih zapolnitev vrtač, ki nudijo diahroni pogled na razvoj preteklih krajin, in te podatke soočiva s podatki zračnega laserskega skeniranja. Osredotočava se na epizodo transformacije v 3. in 2. tisočletju pr. n. št., ko je prišlo do obsežnega krčenja gozdov in oblikovanja kulturne krajine, fokusirane na živinorejo.

Ključne besede: Kras; bronasta doba; kulturna krajina; pašništvo; vrtače; zračno lasersko skeniranje; sedimentacija

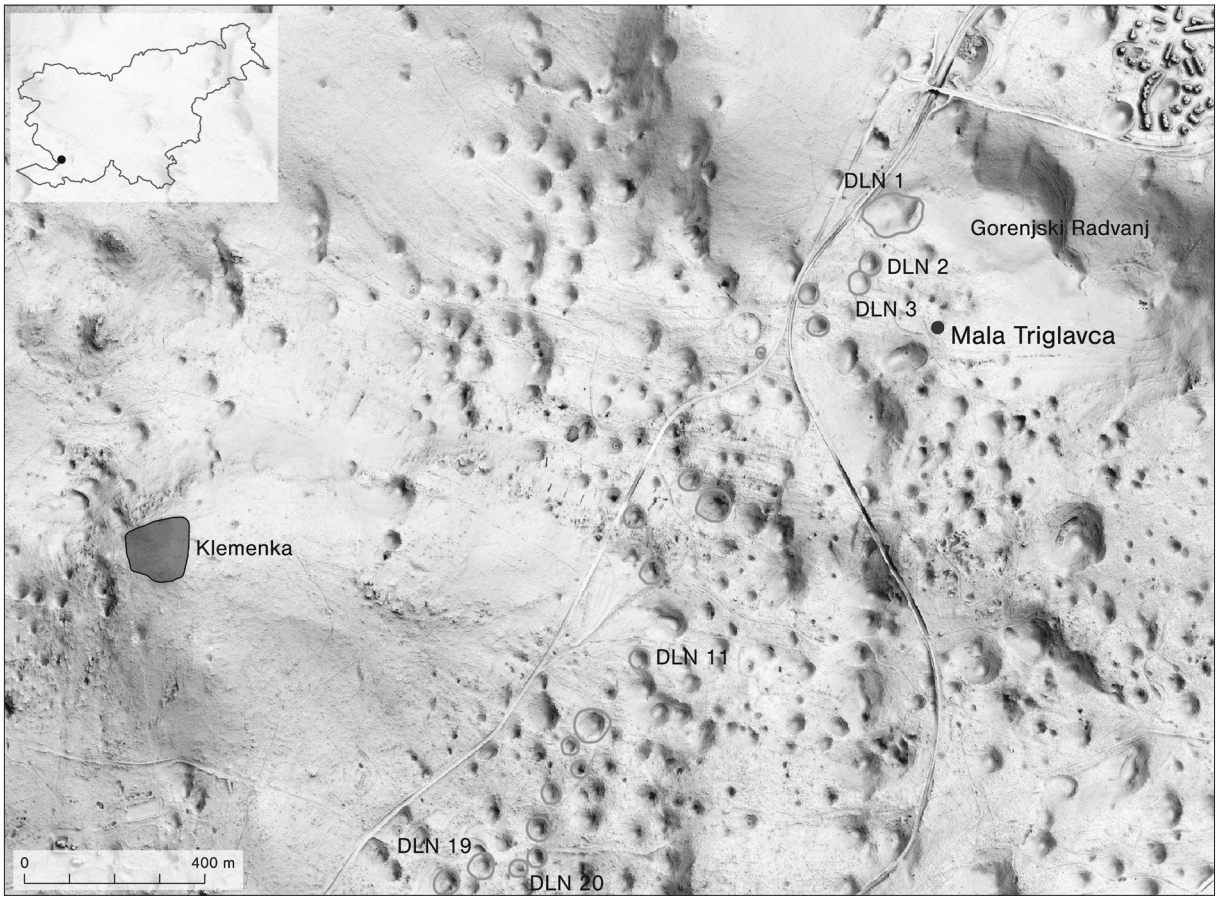
Abstract

The paper examines the formation of the Bronze Age cultural landscape in the Karst region. We introduce new data on the long-term history of the Karst landscape by combining two complementary sources. First, we analyse data from sediment infills in dolines, which provide a diachronic view of past landscape development, and confront these with data from airborne laser scanning. The focus is on the transformation episode in the second and third millennia BCE, when extensive clearing and the formation of a cultural landscape centred on livestock herding took place. The next major transformation occurred only in the last millennium, particularly after 1500 CE.

Keywords: Karst; Bronze Age; cultural landscape; pastoralism; dolines; airborne laser scanning; sedimentation

V prispevku predstavljava potek oblikovanja bronastodobne kulturne krajine, ki smo ga v izhodišču prepoznali na seriji arheoloških najdišč na Divaškem Krasu in mu sledili tudi na preostalih delih planote. Z njeno vzpostavitvijo je bil Kras preoblikovan v pašniško krajino, ki se je kot taka obdržala vse do srednjega veka (Mlekuž Vrhovnik, Fabec 2024).

Skoraj vse, kar danes vemo o poselitvi Krasa pred bronasto dobo, izhaja iz jam. Nekatere jame imajo dolgo zgodovino poselitve, ki pogosto sega že v zgodnji mezolitik. V mezolitiku lahko jame razumemo kot zbirališča ljudi, kot lovske tabore ali morda kraje za obrede in praznovanja. V 6. tisočletju pr. n. št. začnejo skupnosti na Krasu rediti drobnico in postanejo nomadski oziroma transhumantni pastirji. Tradicija uporabe jam se večinoma ohrani, spremeni pa se njihova funkcija, saj so jih od takrat uporabljali predvsem kot staje za drobnico in pastirska zavetišča (glej npr. Boschian, Montagnari Kokelj 2000; Fabec 2003, 88–90; Mlekuž 2012, 205–208).



Sl 1: Mala Triglavca in raziskane vrtače DLN 1 (Gorenjski Radvanj) do DLN 20 med Divačo in Lokvijo. Oštevilčenje vrtač ustreza oštevilčenju kontekstov v katalogu drobnih najdb (podlaga: Senčen relief, izdelan na podlagi podatkov državnega zračnega laserskega snemanja ©ARSO)
Fig. 1: Mala Triglavca and the investigated dolines: DLN 1 (Gorenjski Radvanj) to DLN 20 between Divača and Lokev. The numbering of the dolines corresponds to the numbering of contexts used in the catalogue of small finds (basemap: Hillshade derived from airborne laser scaning data provided by the Slovenian Environment Agency ©ARSO).

S koncem eneolitika in še posebno v bronasti dobi pride do sprememb v sestavu čred. Večjo vlogo dobi govedo, pomemben produkt postanejo mleko in mlečni izdelki. Ta sprememba se prepleta z družbenimi premenami, ki jih lahko prepoznamo v večji kohezivnosti in povečani teritorialnosti skupnosti, ki se kažeta v bolj omejeni mobilnosti in oblikovanju poselitvenega sistema, ki temelji na vzpostavitvi prvih stalnih naselij, gradišč in pašniške kulturne krajine (Fabec 2018, 107–115).

MALA TRIGLAVCA

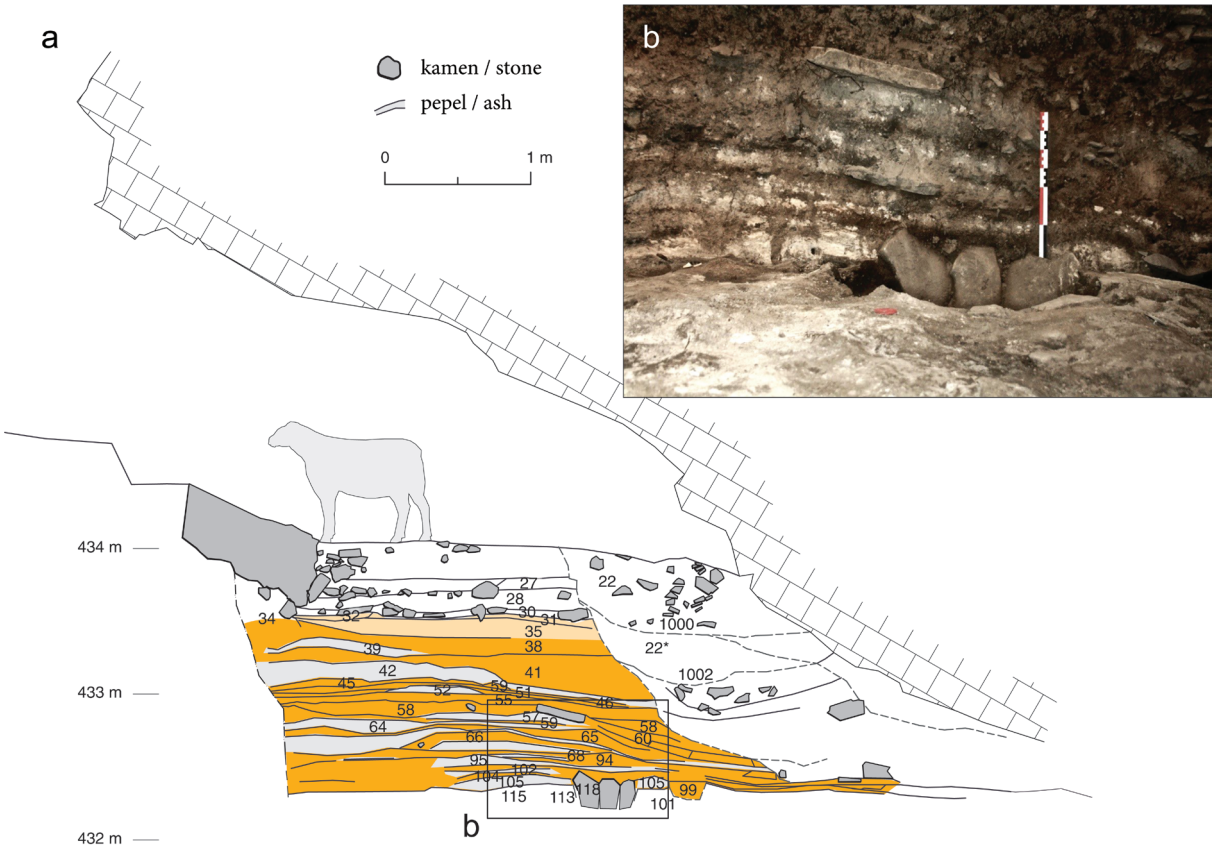
Mala Triglavca je spodmol na Divaškem Krasu. Vhod vanj je usmerjen proti severu in se odpira na robu manjše vrtače jugozahodno od Divače na nadmorski višini 345 m (*sl. 1*). Spodmol je globok okoli 6 m, površina spodmola je približno 54 m^2. Arheološka izkopavanja so razkrila kontinuirano stratigrafsko sekvenco, ki sega v zgodnji mezolitik (Mlekuž et al. 2008; Mlekuž, Pergar 2014). Pokazala so na zelo zapleteno sliko depozicijskih praks v mezolitiku in neolitiku. Sedimente v osrednjem delu spodmola sestavlja dobro definirano zaporedje horizontalno odloženih antropogenih plasti. V tem delu so glavni podepozicijski procesi pedogenetski. Drugače je bilo ob jamski steni, kjer so bili sedimenti močno preoblikovani. Preoblikovanje je bilo predvsem posledica lateralnega drsenja sedimentov globlje v jamo. Tu smo uspeli identificirati drsno površino oz. serijo erozijskih površin, ki je relocirane sedimente na robovih spodmola ločila od sekvence v njegovem osrednjem delu.

Stratigrafska sekvenca v osrednjem delu jame je bila dobro ohranjena, drobne najdbe in druge ostaline so ležale *in situ*. Plasti so tvorila predvsem trda ali zbita ilovnato meljasta tla z različnim

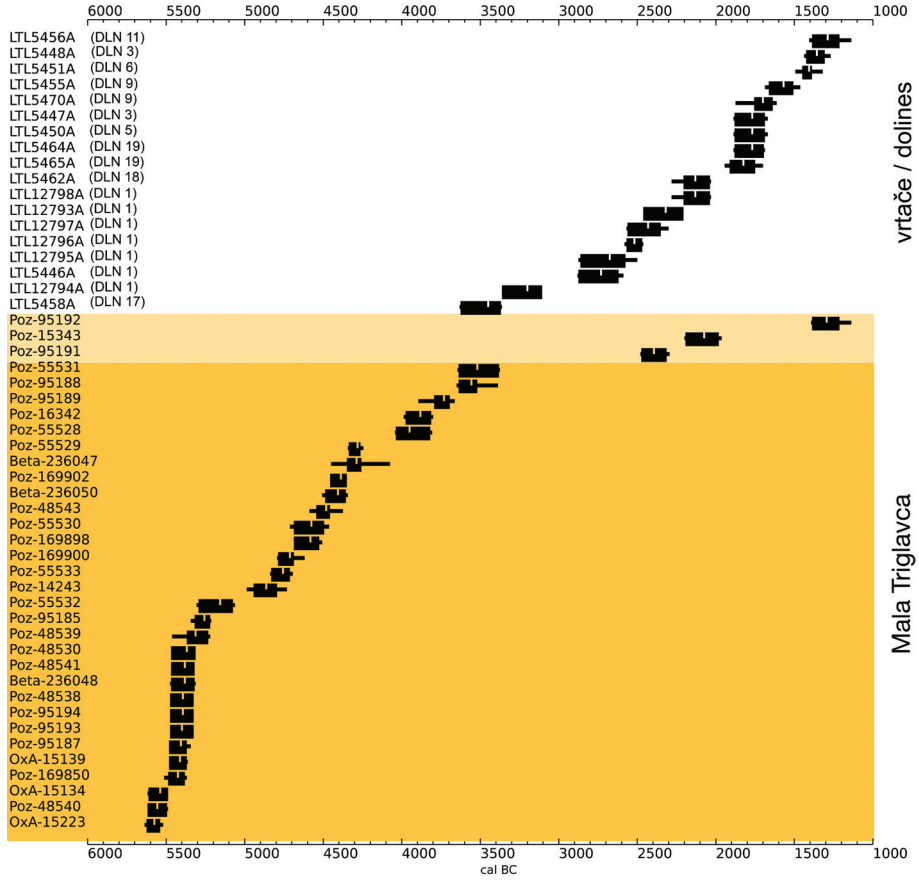
deležem grušča in večjih apnencev, ki so rezultat krušenja jamske stene.

Za sekvenco neolitskih in eneolitskih plasti je bilo značilno ritmično izmenjevanje plasti temno obarvanih tal s plastmi pepela (*sl. 2*). Takih izmenjav smo našteli vsaj 24; menimo, da par temne plasti in plasti pepela predstavlja horizont, časovno zamejeno fazo uporabe jame. Vsak horizont se začne s temno plastjo, ki predstavlja ostanek bivanja v jami. Začetek njene odložitve je običajno povezan z ureditvijo prostora, navadno z izravnavo tal z nasutjem grušča in prekrivanjem pepela prejšnjega horizonta s kamnitimi ploščami. V nekaterih primerih je ureditev prostora povezana tudi z vertikalnimi elementi, predvsem vkopi, ki so bili obloženi ali utrjeni z večjimi apnenci. Temne plasti so rezultat vsakdanjih človekovih aktivnosti v jami, v njih so ležali kosi keramičnega posodja, kamena orodja in odbitki, razlomljene kosti in drugi odpad. Ob koncu poselitvene faze horizonta so organski material na površju temne plasti (predvsem steljo in živalski gnoj) zbrali in sežgali. Horizont tako zaključujejo proge belkastih meljastih tal, ki vsebujejo veliko pepela.

Na podlagi številnih radiokarbonskih datumov (*sl. 3*), ki smo jih pridobili z vzorčenjem kosti iz horizontov na različnih globinah, lahko prepoznamo dokaj enakomerno hitrost sedimentacije v spodmolu vse od konca mezolitika dalje, s hitrostjo okoli milimeter na leto. Po letu 3000 pr. n. št. se sedimentacija spremeni; predvsem se bistveno upočasni. Zaporedje menjav temnih in svetlih plasti se konča, očitno se raba spodmola spremeni. Od tu naprej sledimo zgolj plastem meljastih tal z velikim deležem grušča, v katerih je drobnih arheoloških najdb opazno manj. Meniva, da gre to spremembo v sedimentaciji v Mali Triglavci vezati na dogajanje v neposredni okolici, ki smo ga prepoznali v sedimentnih zapolnitvah serije vrtač med Divačo in Lokvijo.



Sl 2: Mala Triglavca: **a** – stratigrafski prerez zapolnitve spodmola; spodnji del označenega odseka predstavlja neolitski del sekvence, zgornji pa bronastodobni del, **b** – fotografija izmenjav temnih plasti in plasti pepela v zapolnitvi.
Fig. 2: Mala Triglavca: **a** – stratigraphic section of the rock shelter infill; the lower part of the marked segment represents the Neolithic sequence, the upper part the Bronze Age sequence, **b** – photograph showing alternating dark layers and ash layers within the infill.



Sl 3: Sekvenca ^{14}C datumov iz Male Triglavce in raziskanih vrtač DLN 1 (Gorenjski Radvanj) do DLN 20. Z oranžno so označeni konteksti vzorcev kot na sliki 2. Sosledje datumov jasno kaže na premik težišča človeških aktivnosti iz jame v krajino.

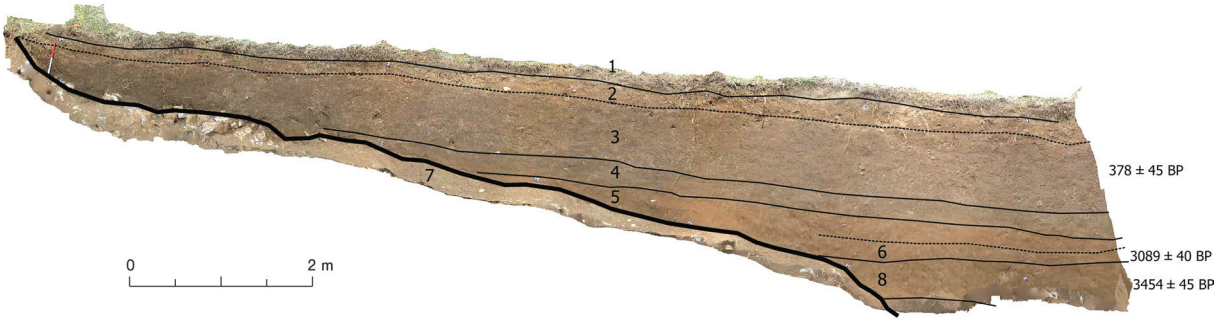
Fig. 3: Sequence of ^{14}C dates from Mala Triglavca and the investigated dolines (DLN 1–20, Gorenjski Radvanj. Contexts corresponding to the samples shown in Fig. 2 are marked in orange. The sequence of dates clearly indicates a shift in the focus of human activities from the cave into the surrounding landscape.

VRTAČE

Vrtače so ena izmed najbolj tipičnih kraških površinskih oblik; gre za lijakaste depresije, ki se zaradi kraških procesov – bodisi kemičnega raztapljanja kamnin bodisi kolapsa ali sufozijskih procesov – razvijajo v karbonatni podlagi. Kras je poln vrtač; pogosto jih najdemo nekaj deset na kvadratni kilometer. Vrtače so ena redkih površinskih kraških oblik, v katerih je akumulacija sedimentov večja od erozije in jih lahko štejemo za sedimentacijske bazene, kjer se nalagajo sedimenti. Dinamika sedimentacije v vrtačah izhaja iz interakcije naravnih in antropogenih dejavnikov na lokalni ravni, v neposredni okolici vrtače in v vrtači sami, ali na širši, krajinski ravni. Učinek antropogenih dejavnikov v zapolnjevanju vrtač se odraža ne le v odloženih arheoloških ostankih, kot so najdbe, strukture, plasti itd., temveč tudi v sestavi sedimentnih zapolnitev, njihovi magnetni susceptibilnosti in geokemičnih lastnostih.

V naši študiji smo preučili 20 vrtač na Divaškem Krasu (*sl. 1*: DLN 1–20), kjer smo strojno izkopali 30 testnih jarkov vzdolž celotne daljše osi spodnjega dela (dna) vrtače (Fabec 2018). V večjih vrtačah smo testne jarke izkopali na več mestih. Izkope smo praviloma poglabljali, vse dokler nismo dosegli dna drobnozrnate sedimentne zapolnitve, ki je prekrivala kompaktno apnenčasto podlago ali debelozrnate sedimente, predvsem grušče in blokovne grušče. Debelina drobnozrnatih sedimentnih zapolnitev je zelo poredko presegala 3 m.

Prva ugotovitev je bila, da so stratigrafska zaporedja v vseh raziskanih vrtačah podobna in sledijo enakemu vzorcu. Plasti s podobnimi lastnostmi so se namreč pojavljale v skoraj vseh vrtačah v podobnih stratigrafskih položajih, tako da smo lahko posplošili stratigrafsko zaporedje in procese,



Sl 4: Vrtača DLN 3. Presek skozi sedimentno zapolnitev z nakazanimi talnimi horizonti. Številke označujejo posamezne horizonte, prekinjena črta označuje neostre meje.
Fig. 4: Doline DLN3. Cross-section through the sediment fill with indicated soil horizons. Numbers denote individual horizons, and the dashed line marks diffuse boundaries.



Sl 5: Ostanki prežganih tal: **a** – grudice prežganih tal in drobci oglja v bronastodobnem horizontu SE 02, DLN 6; **b** – grudice prežganih tal, dokumentirane na pogorišču velikega požara na Krasu leta 2022.
Fig. 5: Remains of burnt soil: **a** – lumps of burnt soil and charcoal fragments in the Bronze Age horizon SE 02, DLN 6; **b** – lumps of burnt soil documented at the site of the large wildfire on the Karst in 2022.

ki so zaporedje oblikovali. Ta vzorec so dodatno podprla radiokarbonska datiranja posameznih plasti iz različnih vrtač (skupno je bilo datiranih 23 vzorcev oglja iz različnih plasti, ki datirajo od konca pleistocena do poznega novega veka; glej *sl. 3* z izborom datacij iz časovnega intervala od 6000 do 1000 cal BC), saj so pokazala, da so se podobni talni horizonti oblikovali v istih obdobjih. Lahko zaključimo, da so vsaj nekateri dejavniki, ki so pogojevali odlaganje sedimentnih zapolnitev v vrtačah, rezultat procesov, ki so hkrati delovali na regionalni ravni.

Na podlagi radiokarbonskih datacij in odkritega arheološkega gradiva smo v sedimentarnih zapolnitvah vrtač prepoznali dva horizonta, ki sta nastala pod močnim vplivom človeka (*sl. 4*). Prvi sega v bronasto dobo, drugi v novi vek, oba pa odražata intenzivno človekovo preoblikovanje vrtač samih in njihovega zaledja. V primerjavi z njima je človekov vpliv na prostor v preostalih obdobjih bistveno slabše viden in ponekod skorajda neopazen.

V zgodnjem novem veku so vrtače obdelovali; gre za tako imenovane delane vrtače, pri katerih sta bila površje in lastnosti tal spremenjeni in izboljšani za kmetijsko obdelavo. Novoveške zapolnitve so se od preostalih razlikovale po zelo očitni prisotnosti apnenčastega grušča, kosov opek in lončenine, kovinskih predmetov in, redkeje, živalskih kosti. To gradivo razumemo kot rezultat kmetijskih praks za izboljšanje obdelovalne zemlje (Gams 1974; Radinja 1987; Gams, Gabrovec 1999; Panjek 2015).

Bronastodobni horizonti so tanjši od novoveških, zanje je značilna povečana količina drobcev oglja, posameznih keramičnih črepinj in kamnitih artefaktov. Drobnih najdb je bilo razmeroma malo; prevladujejo kosi keramičnih posod, najbrž loncev in skled, ob njih nastopajo redka kamnita orodja (*t. 1:* 1–8). Živalskih ostankov, tipične sestavine naselbinskih odpadkov, skoraj ni bilo. Redke kostne najdbe pa zagotovo kažejo, da njihova odsotnost ni rezultat zgolj tafonomskih dejavnikov, npr. kisle reakcije tal. Pomembna komponenta bronastodobnih plasti so bile živo oranžne ali



Sl 6: Vrtača Gorenjski Radvanj. Groblji kamenja (**a**, **b**) na nivoju bronastodobnih plasti.
Fig. 6: Buried cairins (**a**, **b**) in the doline of Gorenjski Radvanj.

rumene grudice meljastih tal, ki kažejo tudi zelo visoke vrednosti magnetne susceptibilnosti in so najverjetneje ostanek prežganih tal (*sl. 5*). Dolgotrajna izpostavljenost tal požarom namreč vodi do pretvorbe šibko magnetnih železovih oksidov in hidroksidov (npr. hematit) v bolj magnetne oblike (magnetit in maghemit). Da so visoke vrednosti magnetne susceptibilnosti tal predvsem rezultat človeške uporabe ognja, so pokazale tudi druge študije na Krasu (Mušič 1997). Bronastodobne plasti se v geokemijski sestavi ne razlikujejo od ostalih plasti, kar je verjetno posledica dejstva, da so učinki požarov na geokemijske lastnosti tal zelo kratkotrajni (Ollesch, Vacca 1999; Pagliai 2022). Sledovi antropogenizacije sedimentov govorijo o človekovih aktivnostih, ki so posledica požiganja vegetacije in premetavanja tal, vendar ne do te mere, da bi lahko sklepali na poljedelsko obdelavo.

Radiokarbonsko datiranje vzorcev oglja iz plasti z grudicami prežganih tal kaže razmeroma enotno sliko. Iz teh plasti je bilo skupno datiranih 18 vzorcev, od katerih tretjina radiokarbonskih datumov sodi v prvo polovico 2. tisočletja pr. n. št. (glej *sl. 3*), polovica razpoložljivih datumov pa kaže na čas od konca tretjega do sredine druge polovice 2. tisočletja pr. n. št. (Fabec 2018, slika 95; Plestenjak et al. 2012, 133–137). Radiokarbonski datumi tako kažejo začetek človekovega poseganja v krajino v zgodnji bronasti dobi in na povečanje človeških vplivov v srednji bronasti dobi.

Povečan človeški vpliv na krajino v bronasti dobi kot tudi zgodnjem novem veku je jasno zaznaven tudi v sedimentaciji. V zadnjem tisočletju, od konca srednjega veka do danes, je bilo v preučevanih vrtačah povprečno nanesenih do 0,9 m tal, od tega je bilo 0,6 m nanesenih v treh stoletjih zgodnjega novega veka, kar kaže, da je bila hitrost sedimentacije v tem obdobju največja. Plasti iz bronaste dobe so za polovico tanjše, saj meri njihova povprečna debelina približno 0,45 m. Preseneča ugotovitev, da je bila sedimentacija med omenjenima obdobjema močno upočasnjena. V šestih vrtačah ležijo prazgodovinske plasti neposredno pod poznoantičnimi in srednjenovoveškimi, medtem ko jih v drugih šestih primerih od novoveških ločuje manj kot 0,4 m debela plast zapolnitve. Na splošno se je v železni in rimski dobi v raziskanih vrtačah odložilo povprečno do največ 20 cm tal, več kot polovico manj kot v bronasti dobi in več kot štirikrat manj kot v času od pozne antike do danes. Ocena hitrosti sedimentacije pred bronasto dobo je problematična, ker v večini primerov nismo dosegli geološke skalne osnove. Vendar pa debelina najglobljega dela sedimentnih zapolnitev preučenih vrtač kaže, da je bila sedimentacija znatno počasnejša. Ocenjujemo, da se je v holocenu pred bronasto dobo odložilo toliko sedimenta kot v času od pozne antike do danes (Fabec 2018, 87–88).

V nekaterih sondiranih vrtačah so bila naknadno opravljena arheološka izkopavanja večjih površin. Med izkopavanji v vrtači Gorenjski Radvanj (DLN 1; glej *sl. 1*; Plestenjak et al. 2012) je bilo prepoznano zaporedje plasti, za katere je bila značilna prisotnost grudic prežganih tal, fragmentov keramičnih posod, drobcev oglja in sileksov. Radiokarbonske datacije kažejo, da so se odložile tekom konca 3. in prve polovice 2. tisočletja pr. n. št. (*sl. 3*). Na tem nivoju sta ležali tudi dve kamniti groblji. Prva (*sl. 6:* a) je bila v tlorisu pravilne krožne oblike s premerom okoli 4 m. Sestavljali so jo večji apnenci, nametani na kup brez pravega reda; le na severni in zahodni strani je kamenje nakazovalo obod. V preseku je bila polkrožne oblike, v osrednjem delu je dosegala višino 0,7 m, na robovih pa zgolj 0,2 m. Drobnega gradiva je bilo v groblji malo, v njej so ležale redke keramične črepinje, ki so se pojavljale tudi v plasti, ki je prekrila grobljo.

Druga kamnita struktura (*sl.* 6: b) je ležala 4 m vzhodneje od prve. V tem primeru je bila vsaj deloma postavljena neposredno na apnenčasto podlago. V preseku je bila po obliki podobna prvi, na osrednjem delu je bila visoka okoli 0,75 m, na robovih pa dobre 0,3 m. V tlorisu je bila ovalna, dolga 5 in široka 2,8 m. Za razliko od prve so bili v njej vgrajeni tudi kamniti bloki, ki so v nekaterih primerih dosegali velikost 1 × 0,8 m. Najdb je bilo tudi v tem primeru malo. V obeh grobljah so bili zgornji apnenci izrazito korodirani.

V Gorenjskem Radvanju odkrita lončenina je bila izredno fragmentirana in večinoma tipološko nedoločljiva ter je v plasteh ležala razpršeno. Redke določljive črepinje (*t. 1:* 9–15) so večinoma pripadale večjim posodam, verjetno skledam, ter v manjši meri loncem in skodelam, v enem primeru pa tudi trinožniku (*t. 1:* 10). Razmeroma veliko je bilo kamenih artefaktov (*t. 1:* 16–22), med katerimi so nastopali različni tipi klin in praskal, svedri in retuširani odbitki. Drobne najdbe ne govorijo o intenzivni uporabi vrtače, razmeroma majhna količina odkrite lončenine pa kaže na to, da v vrtači niso živeli, kar potrjuje tudi odsotnost živilskih odpadkov, npr. živalskih kosti. Drobno gradivo kaže na nenaselbinsko izrabo vrtač, odkritje dveh pokopanih grobelj pa na agrarno rabo prostora.

GROBLJE, OGRADE, ZIDOVI

Groblje, ograde in zidovi so ena najpogostejših oblik, ki jih lahko prepoznamo na površju Krasa s pomočjo zračnega laserskega skeniranja. Zračno lasersko skeniranje (ZLS, lidar) površja Krasa je razkrilo množico zanimivih anomalij ali oblik, večinoma pozitivnih form, ki se kažejo kot kupi in nasipi. Vsi ti sledovi se praviloma pojavljajo v skupinah in sestavljajo kompleksne arheološke krajine.

Te ostaline so najbolj vidne na območjih z zelo plitko plastjo površinskih tal, izven obdelovalnih površin, npr. delanih vrtač in travnikov, njiv in vinogradov, saj so bili na njih poznejši antropogeni posegi močno omejeni. Na obdelovalnih površinah so površinske značilnosti precej slabše ohranjene, saj so pogosto predelane ali zabrisane zaradi oranja ali čiščenja površja, v vrtačah in dolinah pa jih je prekrila debela plast sedimentnih zapolnitev. Stratigrafska razmerja med vsemi strukturami kažejo na njihovo "plastovitost", pri čemer je jasvvvvno razvidna plast urejene krajine, ki je starejša od novoveške *agro-kraške krajine* (Nicod 1987).

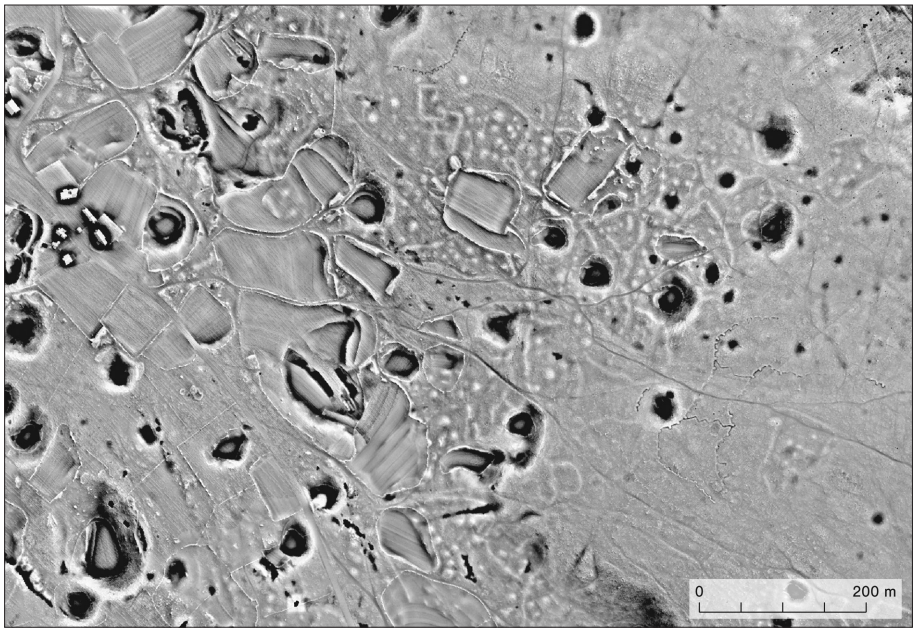
Kras je zelo specifična krajina. Tu so naravni procesi preoblikovanja površja zelo počasni; razen v vrtačah, kjer deluje akumulacija, površje Krasa zaznamuje počasna erozija in denudacija. Zato se sledovi človekovih posegov na površju zelo dobro ohranjajo in jih je mogoče enostavno razbrati na digitalnih modelih reliefa visoke ločljivosti, narejenih iz podatkov ZLS.

V starejši krajini so ena najpogostejših antropogenih oblik groblje (*sl. 7*). Pojavljajo se kot okrogli kupi, premera med 5 in 25 m in višine med 0,3 in 1 m. V preseku so groblje zvončaste ali polkrožne, s precej položnimi stranicami in gladkimi robovi. Na travnikih in pašnikih jih danes pogosto prekriva travna ruša. V teh primerih so na aerofotografijah videti kot okrogle lise svetlejše vegetacije, kar kaže, da so jedra kamnita. V gozdovih so še vedno vidne kot kamnite strukture, kot kupi grušča in kamenja.

Groblje so rezultat čiščenja in trebljenja krajine. Na podlagi njihove prostornine, ki meri med 30 in 80 m^3, in njihove gostote, ki na poljih grobelj dosega nekaj deset grobelj na hektar, je bilo izračunano, da so otrebili okoli 200 do 250 kg kamenja in grušča na kvadratni meter očiščenega površja. Groblje običajno nastopajo v skupinah od nekaj do več deset grobelj in lahko prekrivajo precej velike površine. V skupinah ali poljih grobelj (ang. *cairinfields*) se groblje pretežno pojavljajo v podobnih oblikah in dimenzijah ter so lahko med seboj približno enako oddaljene. Ponekod so polja grobelj zamejena ali predeljena z nizkimi pozitivnimi oblikami nepravilnih oblik, najverjetneje kamnitimi zidovi ali nasipi (Mlekuž 2015, 679–680).

Arheološka izkopavanja grobelj v okolici Kazelj (glej *sl. 12:* B) so pokazala, da gre za kupe različno velikih apnencev, ki so v nekaterih primerih veliki tudi do 80 cm (*sl. 8*), torej za strukture, ki so zelo podobne pokopanima grobljama iz Gorenjskega Radvanja. V raziskanih grobljah je bilo med kamni presenetljivo veliko drobnozrnatega sedimenta oziroma prsti, ki lahko dosega 40 % volumna groblje, kar je v nasprotju z interpretacijo grobelj kot kupov otrebljenega kamenja. Prisotnost tal razumemo kot skupek ujetega eolskega sedimenta in humusa, ki je nastajal na lokaciji sami. Takšno razlago potrjuje sestava drobnozrnate zapolnitve, saj se na vrhu groblje pojavlja le humus, ki postopoma prehaja v rahlo grudičasto prst in proti dnu v meljasta rdečerjava tla. Menimo, da takšno stanje kaže na pedogenetske procese znotraj groblje in odraža dolgotrajnost akumulacije prsti.

Raziskane groblje so bile postavljene neposredno na skalno podlago, ki je bila pogosto zelo

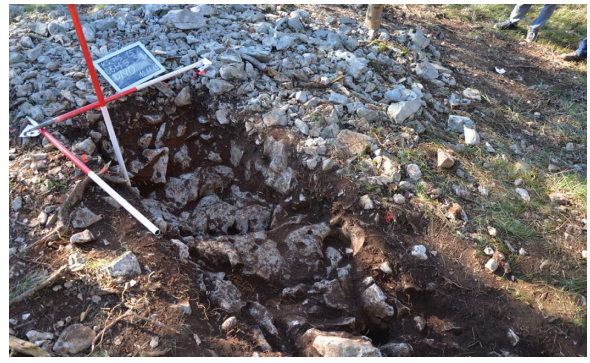


Sl 7: Kazlje. Polje grobelj (območje B na *sliki 12*) na vizualizaciji digitalnega modela terena, izdelanega iz podatkov zračnega laserskega skeniranja (podlaga: Senčen relief, izdelan na podlagi podatkov državnega zračnega laserskega snemanja ©ARSO).
Fig. 7: Cairnfield near Kazlje (area B in *Figure 12*) on a visualization of the digital terrain model derived from airborne laser scanning data (basemap: Hillshade derived from airborne laser scaning data provided by the Slovenian Environment Agency ©ARSO).

razpokana, z globokimi žepi in škrapljami. V nekaj primerih je bilo kamenje zloženo okoli skalnih čokov. Prisotnost žlebičev na površju skalne podlage pod grobljami kaže, da je bila podlaga direktno izpostavljena vremenskim vplivom in je torej ruša ni prekrivala. Glede na to sklepamo, da je bila v času gradnje grobelj krajina zelo skalnata, z le tanko plastjo prsti. Tudi ena izmed grobelj v Gorenjskem Radvanju (*sl. 6:* b) je bila deloma postavljena neposredno na skalno podlago (Plestenjak et al. 2012, 27).

Izkopane groblje so bile večinoma brez arheoloških najdb, kar je v skladu z njihovo razlago kot deponijami kamenja, odstranjenega s površine obdelovalnih površin. Pri izkopu pa smo opazili, da je med kamni pogosto prisotna tudi znatna količina drobnozrnatega sedimenta oziroma prsti, ki lahko dosega do približno 40 % volumna groblje. Ta sestava kaže, da groblje niso zgolj preprosti kupi otrebljenega kamenja, temveč kompleksnejše sedimentno-kamnite akumulacije, nastale skozi daljši proces odlaganja in preoblikovanja. Zaradi odsotnosti arheološkega gradiva je njihov nastanek težko časovno opredeliti.

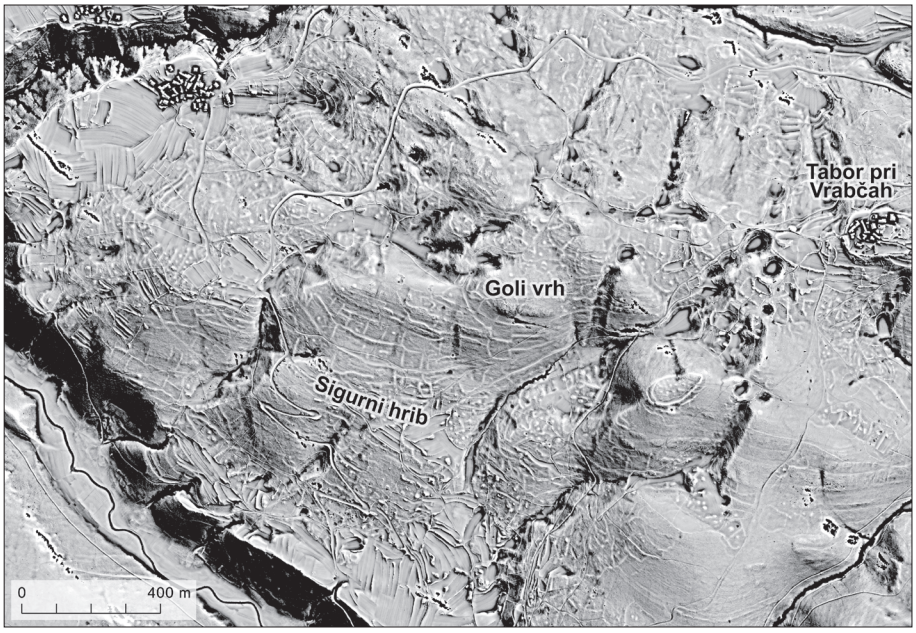
Le v manjši groblji na ledini na Drenju (*sl. 7*), ki je skupaj z drugimi grobljami ležala znotraj ograde, smo odkrili šest fragmentov (zgodnje-srednje)



Sl 8: Kazlje. Struktura ene izmed raziskanih grobelj.
Fig. 8: The structure of one of the cairns near Kazlje.



Sl 9: Kazlje. Suhi zid ograde na robu polja grobelj.
Fig. 9: Dry wal, part of an enclosure at the edge of the cairnfield near Kazlje.



Sl 10: Tabor pri Vrabčah. Terase in mejni zidovi na pobočjih Sigurnega hriba (območje C na sliki 12) na vizualizaciji digitalnega modela terena, izdelanega iz podatkov zračnega laserskega skeniranja (podlaga: Senčen relief, izdelan na podlagi podatkov državnega zračnega laserskega snemanja ©ARSO).
Fig. 10: Terraces and boundary walls on the slopes of Sigurni Hill near Tabor by Vrabče (area C in figure 12) on a visualization of the digital terrain model derived from airborne laser scanning data (basemap: Hillshade derived from airborne laser scaning data provided by the Slovenian Environment Agency ©ARSO).

bronastodobne lončenine. Najdbe prazgodovinske (eneolitske in bronastodobne) keramike s polij grobelj so sicer že dolgo znane tudi z ledine V Snožetih pri Goričah pri Famljah (Osmuk 1988) ter z Grižc pri Dolenji vasi blizu Senožeč (Osmuk 1992) (*sl. 12:* D, E). Pri čiščenju ali trebljenju površja ljudje odstranjenega kamenja ne odlagajo le v groblje, temveč tudi na robove krčevine. Krčevina oziroma čistina organsko rase skozi odpiranje in čiščenje novih površin, pri čemer nastanejo zamejitve, ki jih tvorijo grobljasti zidovi. V starejši krajini, ki smo jo prepoznali s pomočjo ZLS, nizki grobljasti zidovi tvorijo linearne oblike, ki zamejujejo prostore, ki so bili namenjeni intenzivni paši, upravljanju in reji živali. Obstaja precejšnja variabilnost med ogradami, tako v obliki kot tudi količini vloženega dela za njihovo izgradnjo. Velike so tudi razlike v njihovem obsegu, najmanjše merijo zgolj nekaj stotin m^2, največje pa presegajo površino enega ali več hektarjev. Večje so navadno nepravilne oblike in se prilagajajo reliefu ter v nekaterih primerih zapirajo območja med vrtačami. V ogradah zelo pogosto nastopajo tudi groblje (Mlekuž 2015, 680–682).

Vzhodno od Kazelj smo raziskali večje polje grobelj, ki ga sestavlja več kot 80 grobelj. Te se delijo po skupinah, ki jih med seboj ločujejo nizki grobljasti zidovi. Polje grobelj je presekano s sodobnimi vinogradi. Na zahodnem robu območja smo identificirali nasipe, ki ograjujejo manjša polja pravokotne oblike. Izkazalo se je, da gre v tem primeru za ruševino skrbno grajenega masivnega suhega zidu (*sl. 9*), ki je bil, na podlagi volumna ruševine, originalno višji od 1,5 m. V tem primeru torej ne gre za grobljast zid okoli čistine, temveč za načrtno grajeno strukturo, ograde. Prisotnost kosov keramičnih posod, med katerimi ni bilo tipološko opredeljivih črepinj[1] in živalskih kosti, kaže, da gre v tem primeru za drugačno rabo prostora; v ogradi so očitno potekale aktivnosti, ki so puščale več odpada. Radiokarbonska datacija skočnice goveda, najdene v pokopanih tleh pod ruševino, je pokazala na čas med 1210 in 1030 pr. n. št. (2940 ± 35 BP, Poz-92794). Ograda je torej starejša od 11. st. pr. n. št.

Sondiranja so razkrila, da so linearne značilnosti, ki smo jih na posnetkih ZLS interpretirali kot nasipe, zelo različne. V nekaterih primerih je šlo zgolj za linearne groblje, kupe kamenja podolgovate oblike, ki jih interpretiramo kot rezultat odlaganja kamenja na robovih otrebljenih površin (ang.

[1] Po mnenju Mance Vinazza gre za značilno bronastodobne izdelke.

dumping walls). V tem primeru je videti, da je bilo kamenje zgolj nametano, čeprav dopuščamo tudi možnost, da gre za razvaline enostavno grajenih suhih zidov.

Druge na ZLS prepoznane linearne strukture interpretiramo kot ostanke zemljiške razdelitve. Primer takšnih struktur predstavlja sistem nizkih linearnih nasipov in grobelj na pobočjih Sigurnega hriba in Golega vrha zahodno od gradišča Tabor pri Vrabčah (Mlekuž 2018). Kažejo se kot zaporedje nizkih škarp, ki tečejo prečno na pobočje (*sl. 10*). Pasovi, ki jih zamejujejo škarpe, so predeljeni z zidovi. Rezultat so nizi dolgih prog, razdeljenih na pravokotna polja, ki potekajo vzporedno po pobočju. Na robovih se relativno pravilen vzorec ortogonalne razdelitve podre in postane veliko bolj naključen ter organski. Na takšen način predelana krajina ima škatlast, pravilen pravokoten videz, podoben pravokotno urejenim krajinam v Dalmaciji (kjer pa so večinoma novoveške in namenjene predvsem drevesnim kulturam in vinogradom). Škatlasto poljsko razdelitev lahko uvrstimo med koaksialne poljske razdelitve. Koaksialni, kohezivni, grajeni ali škatlasti sistemi poljske razdelitve (ang. *coaxial, cohesive, aggregate brickwork field systems*) so značilni za pozno prazgodovino in jih najdemo od Anglije do Severne Nemčije. Zaznamujejo jih majhne, pravokotne, podobno velike in povezane parcele oz. polja, ki so organizirana simetrično glede na glavno os (Yates 2007, 16–17).

Diagnostičnega materiala, ki bi omogočil datiranje ostankov zemljiške razdelitve na pobočjih Sigurnega hriba in Golega vrha, nismo odkrili. Predvidevamo, da gre za del kulturne krajine gradišča Tabor pri Vrabčah (Mlekuž 2018), ki je živelo v pozni bronasti in starejši železni dobi (Vinazza 2025).

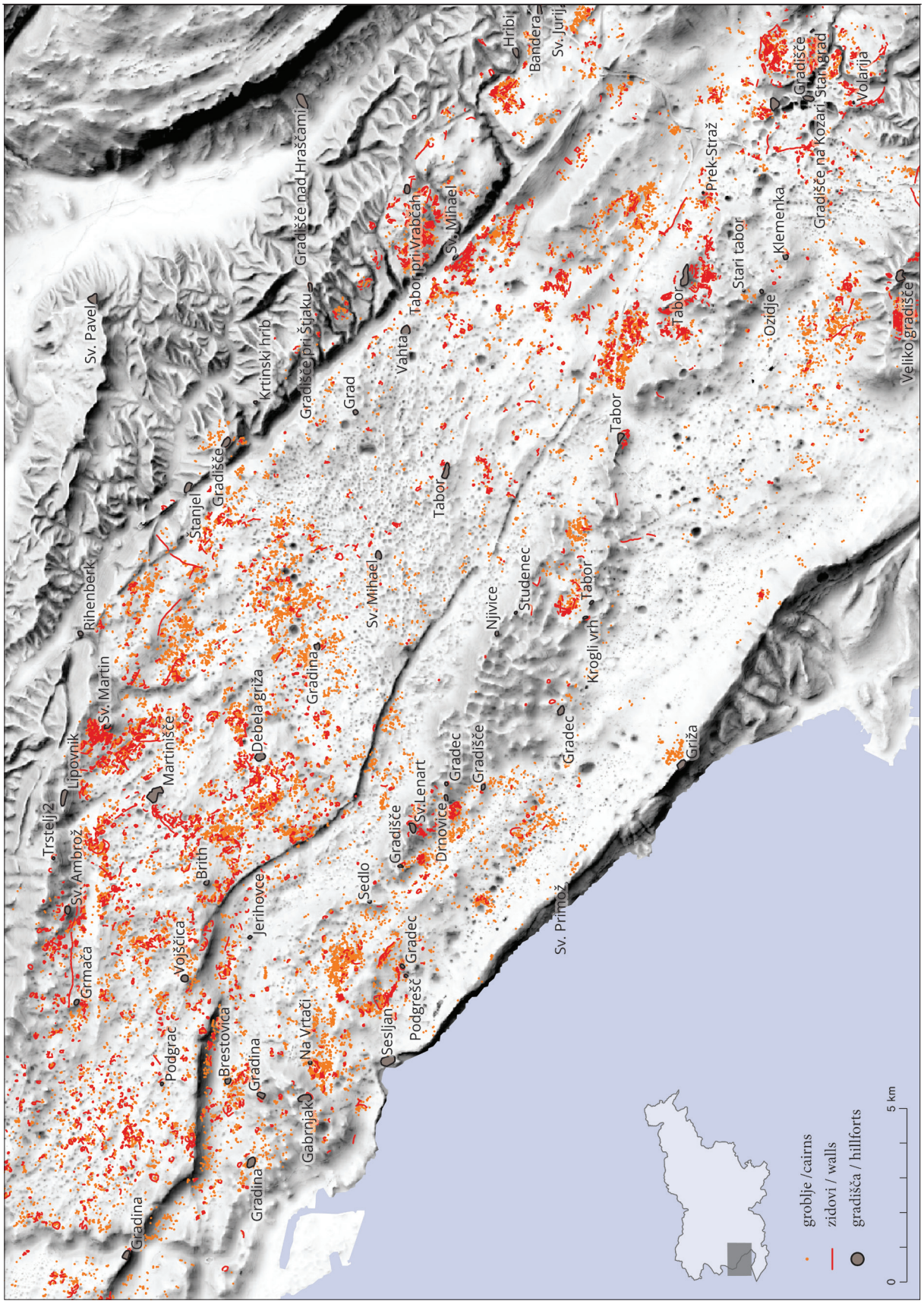
Analiza posnetkov ZLS za celoten Kras je pokazala na obseg prazgodovinskega, verjetno bronastodobnega vpliva na krajino (*sl. 11*). Večina krajine kaže sledi prazgodovinske rabe prostora. Na raziskovalnem območju je bilo prepoznanih in digitaliziranih več kot 25 tisoč grobelj, kar znaša približno 30 grobelj na kvadratni kilometer. Prepoznamo lahko območja z visoko gostoto, zlasti v osrednjem delu raziskovanega območja, pa tudi območja z nizko gostoto, na primer na območju Sežanskega krasa, vendar brez jasnega vzorca. Po celotnem Krasu so razpršena manjša, izolirana polja grobelj, ki jih lahko razlagamo kot manjše čistine, pa tudi velike neprekinjene površine kamnitih grobelj, ki bi lahko nakazovale obsežne pašnike. Podobno velja za linearne strukture oziroma zidove, ki kažejo podoben, a ne povsem enak razpored. Prepoznali smo več kot 500 km teh struktur, kar pomeni več kot 600 metrov zidov na kvadratni kilometer.

NAJDBE V KRAJINI

Pregledi odprtih izkopov, ki so v vrtačah po celotnem divaško-komenskem Krasu nastali zaradi odkopa zemljine za izdelavo novih njiv in vinogradov, so ponudili zanimiv vpogled v časovni in prostorski razpon smetenja, ki ga razumemo kot odraz nihanj intenzivnosti človekovih aktivnosti v prostoru. Skupno je bilo pregledanih 54 vrtač, v katerih smo dokumentirali odprte izkope zemljine (Fabec 2018). V skoraj vseh primerih (v 47 vrtačah, kar znaša 87 %) smo odkrili prazgodovinske najdbe, predvsem črepinje lončenine. Najdbe so pretežno ležale na površju. Običajno so ležale na koluviju, ki ga je po odvozu zemlje v bolj ali manj debelih nanosih odložila meteorna voda. Delovanje vodne erozije je bilo v večini izkopanih vrtač izrazito predvsem zaradi strmih sten izkopov, globine ter odsotnosti vegetacije, ki bi zadrževala erozijo tal. Le v petih primerih smo prazgodovinske ostanke odkrili tudi v profilih izkopov in jim tako lahko določili stratigrafsko lego. V teh primerih najdbe niso ležale znotraj domnevnih pokopanih tal oziroma plasti, ki bi kazale makroskopske sledove poljedelske obdelave, temveč v razmeroma debelih drobnozrnatih sedimentih nad ali pod njimi. Odkrite črepinje običajno ne presegajo 3–4 cm velikosti, kar odraža razmeroma visoko stopnjo fragmentarnosti. V nekaj izjemah so črepinje ležale na omejeni površini in so pripadale istim posodam (*t. 2:* 1–3). Črepinje so bile najbrž ohranjene *in situ*, saj bi jih morebitne človekove dejavnosti (npr. obdelava zemlje) ali naravni procesi (npr. vodna erozija) verjetno razpršili po veliko večjem prostoru.

V pregledanih izkopih je bilo drobnih najdb običajno malo, kar kljub dejstvu, da gre za pretežno uničena najdišča, ne govori v prid intenzivni izrabi. V dobri tretjini vrtač (21) smo odkrili le do tri najdbe, pri polovici teh pa samo eno najdbo. Le v slabi desetini vrtač (5) smo odkril več kot 20 najdb, pri čemer sta le dve močno izstopali po svoji številčnosti: vrtača južno od Tomaja (*sl. 12:* 10), kjer je bilo najdb 123, in Križmanov dol vzhodno od Kazelj (*sl. 12:* 11), kjer smo jih odkrili 79.

Med najdbami izrazito prevladujejo odlomki lončenine. Gre pretežno za črepinje večjih posod,



Sl 11: Razprostranjenost evidentiranih elementov bronastodobne kulturne krajine na Krasu (podlaga: Senčen relief, izdelan iz podatkov EU-DEM v1.1, 25 m ©Copernicus Land Monitoring Service, EEA).
Fig. 11: Distribution of cairnfields and linear structures across the entire Kras region (basemap: Hillshade derived from EU-DEM v1.1 (25 m) ©Copernicus Land Monitoring Service, EEA).

predvsem skled, loncev in v manjši meri tudi skodel. Fragmentov manjšega in finega posodja je bilo razmeroma malo. Časovno in tipološko ožje opredeljiva lončenina sodi v bronasto dobo (*t. 2, 3*). Po fakturi je dokaj homogena in značilna za bronastodobne lončarske mase[2]. Izjema je morda le fragment dna posode iz vrtače pri Ivanjem gradu, ki je najbrž mlajši, železnodobni. Drugih vrst najdb je bilo malo. Posamezni kameni artefakti predstavljajo le 2,5 % celotnega odkritega gradiva. Gre za klinaste odbitke iz lokalnega ali alohtonega roženca, ki jih tipološko ne moremo točneje opredeliti (Fabec 2018, 20–27).

Na Krasu je bilo odkritih tudi nekaj kovinskih najdb, ki jih lahko povežemo z začetki preoblikovanja krajine v bronasti dobi. Okoliščine njihovih odkritij večinoma niso najbolj jasne, a zdi se, da jih lahko vežemo s kamnitimi strukturami. Morda gre za predmete, ki so bili izgubljeni pri rabi v krajini, morda pa celo za votive. Med posameznimi najdbami gre še najbolj izpostaviti bronasto sekiro z robniki (*t. 4:* 2) s konca zgodnje bronaste dobe (Carancini, Peroni 1999, 10–16). Najdena je bila južno od Brestovice pri Povirju (*sl. 12:* 12), sredi več hektarjev velikega območja s številnimi polji grobelj, ogradami, grobljastimi zidovi in linearnimi nasipi. Morda sta posledica aktivnosti, vezanih na urejanje kulturne krajine, tudi drugi dve bronasti posamezni najdbi, igla tipa Wetzleinsdorf (varianta Grosshöflein ali St. Margarethe, Rihovsky 1983; *t. 4:* 1) in sulična ost (*t. 4:* 3), ki je bila glede na spodnji rob tula, ki je razširjen in razčesnjen zaradi tolčenja, najbrž preuporabljena kot orodje. Prva je bila najdena na območju Železnih vrat pod Trsteljem (*sl. 12:* 1), v bližini dolgega grobljastega zidu, druga pa vzhodno od vasi Lokev (*sl. 12:* 13). Ost je bila odkrita med strojno odstranitvijo mejnega suhega zidu, ki je bil zgrajen v času novoveške predelave tamkajšnjih parcel za kmetijsko uporabo, pri čemer je bila prvotna gmajna preoblikovana v travnik. Glede na njeno odlično ohranjenost lahko predvidevamo, da je vseskozi ležala v razmeroma suhem okolju, najbrž med kamenjem, ne pa v tleh (Fabec et al. 2025, 958–961).

[2] Tudi v tem primeru je lončenino opredelila Manca Vinazza, FF UL.

ZAKLJUČEK

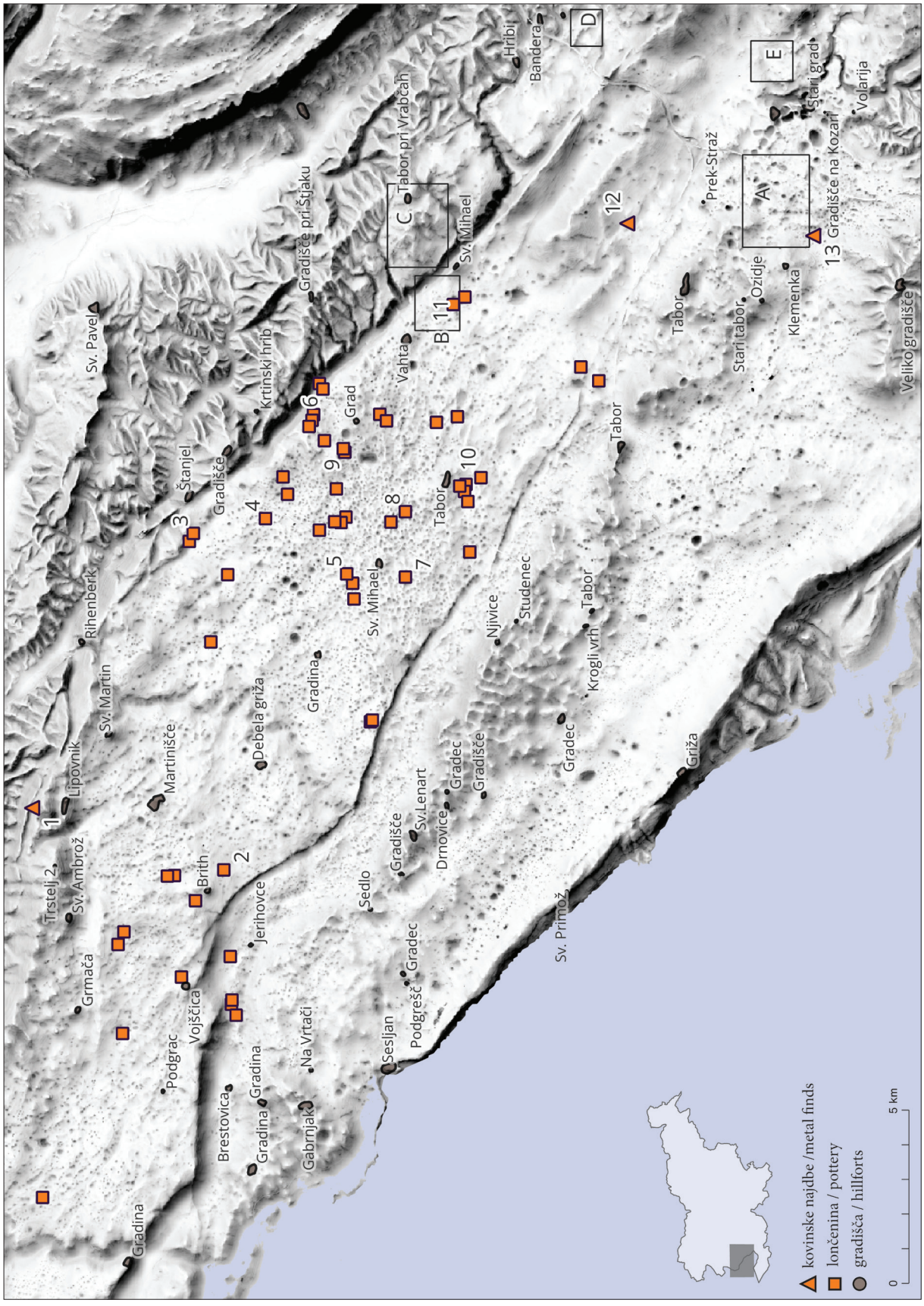
Predstavljeni rezultati arheoloških raziskav, ki so bile na Krasu izvedene v krajini izven naselbin, v vrtačah, jamah in na planem, jasno kažejo na dve obdobji preoblikovanj pokrajine, ki sta pustili dve plasti pokrajinskega palimpsesta.

Prvo preoblikovanje krajine lahko datiramo v bronasto dobo, po letu 2500 pr. n. št. Antropogeni horizonti s sledovi ožgane zemlje in oglja, ki se pojavljajo v zapolnitvah vrtač, kažejo na obsežno požiganje vegetacije in poseganje v tla, kar je posledica krčenja gozdov in odstranjevanja drevesnih panjev. Ta proces spremlja oblikovanje kulturne krajine, ki vključuje predvsem pašnike, živinske ograde in v veliko manjši meri tudi obdelovalne površine in je najstarejša plast kraškega krajinskega palimpsesta. Obdobje prvega (bronastodobnega) obsežnega preoblikovanja krajine je trajalo več stoletij in mu je sledila stabilna, odprta kulturna krajina. Gledano širše lahko to dogajanje umestimo v sklepni del dolgoročnega procesa, ki se je začel okoli 5500 pr. n. št. z oblikovanjem neolitskega pašništva (Boschian, Montagnari Kokelj 2000; Mlekuž 2005). V neolitiku in eneolitiku je bila živinoreja na Krasu izrazito usmerjena v rejo drobnice, predvsem koz, v manjši meri ovc in še manj goveda ter prašičev (Mlekuž 2005; Mlekuž 2007). Analize živalskih ostankov iz jam kažejo raznoliko, a pogosto specializirano sestavo čred z visoko prevlado drobnice, ki v nekaterih primerih dosega tudi do 80 %. Prisotnost sledi živalskih iztrebkov in drugih ostankov v plasteh kaže na uporabo jam kot sezonskih pastirskih postaj (t. i. *grottes bergeries*), povezanih s transhumanco (Brochier 1983; Boschian, Montagnari Kokelj 2000). Ostanki mlečnih lipidov kažejo na izkoriščanje

→

Sl. 12: **1**–**13** lokacije najdb, ki jih predstavljamo v katalogu; **A**–**E** območja, ki jih omenjamo v tekstu (A – območje med Divačo in Lokvijo; B – Kazlje; C – Sigurni hrib in Goli vrh pri Taboru pri Vrabčah; D – Grižce pri Dolenji vasi; E – V Snožetih pri Goričah) (podlaga: Senčen relief, izdelan iz podatkov EU-DEM v1.1, 25 m ©Copernicus Land Monitoring Service, EEA).

Fig. 12: Distribution of finds in the landscape. Only the locations of finds presented in the catalog are numbered. Areasmentioned in the text are marked with labels A–E: A – the area between Divača and Lokev; B – Kazlje; C – Sigurni Hill and Goli Vrh near Tabor by Vrabče; D – Grižce near Dolenja Vas; E – V Snožetih near Goriče (basemap: Hillshade derived from EU-DEM v1.1 (25 m) ©Copernicus Land Monitoring Service, EEA).



Sl 12: Distribucija najdb v krajini.
Fig. 12: Distribution of finds in the landscape.

živali tudi za sekundarne produkte. Prehrana je temeljila predvsem na živalskih beljakovinah (Cenni, Bartoli 1999, 100–101).

Z bronasto dobo pride do izrazite spremembe v načinih odlaganja materiala v jamah; sežiganje gnoja se prekine in sedimentacija se močno upočasni, kar nakazuje, da se jame niso več uporabljale kot hlevi za drobnico. Ta sprememba je na Tržaškem Krasu dokumentirana v več jamah, npr. Čotarjevi pečini (it. *Grotta Cotariova*), Katrni pejci (it. *Grotta Caterina*), Pečini na Leskovcu (it. *Grotta Azzurra*), jami Lonza (it. *Grotta Benedetto Lonza*) in Pečini Podkičer (it. *Cavernetta a est di Trebiciano*), najbrž pa tudi Orehovi pejci (it. *Grotta dei Ciclami*) in jami Mitrej (it. *Grotta del Mitreo*) (Fabec 2018, 108). V Mali Triglavci se je odlaganje značilnih hlevskih tal končalo okoli 2100 pr. n. št. (Mlekuž et al. 2008), to je v času, ko na tem prostoru pride do obsežnih antropogenih posegov v krajino, ki vključujejo krčenje vegetacije s požiganjem in preoblikovanje površja. Zgodnja bronasta doba je tudi čas prvih stalnih naselij, gradišč. Na Krasu jih je evidentiranih več kot 100 (Marchesetti 1903); med njimi so velike razlike v času nastanka, velikosti, legi, notranji strukturi in količini dela, vloženega v gradnjo njihovih obzidij (Slapšak 1995, 24, 26–27). Vendar niso vse s kamnitimi strukturami obdane ograde dejanska gradišča, njihove oblike, velikosti in funkcije se namreč med seboj zelo razlikujejo. Nekatera so morda služila kot velika osrednja naselja, druga kot manjša satelitska gradišča, tretja pa zgolj kot živinske ograde in živinorejski tabori (Slapšak 1995, 26–27).

Živalski ostanki z gradišč in drugih sočasnih najdišč kažejo na splošen trend proti bolj specializirani živinoreji. Delež ovac in koz se je močno zmanjšal (na 25–50 %), medtem ko se je delež goveda občutno povečal. Govedo postane pomembnejše – polovica vseh vzorcev vsebuje 35–60 % goveda, v nekaterih tudi do 90 %. Prašiči pridobijo na pomenu kot vir mesa. Povečana prisotnost goveda (in prašičev) nakazuje večjo diverzifikacijo strategij upravljanja živine, pri katerih je imela vsaka živalska vrsta svojo specifično vlogo v pastirskem sistemu. Hkrati pa to kaže na večji poudarek na sekundarnih živalskih proizvodih, predvsem mleku (Fabec 2018, 107–115).

Poseganje v krajino in nastali vzorci rabe prostora pričajo o krajini, ki je bila prilagojena paši. Na podlagi oblike in gostote sledov lahko sklepamo, da je bila krajina organizirana glede na osnovne potrebe živine, kar poudarja ključni pomen živali in živinoreje v prazgodovini Krasa. Živali so bile osnova bogastva skupnosti in gospodinjstev ter središče vsakodnevnih dejavnosti in praks, vključno z gibanjem in skrbjo. Tako so bile tesno vtkane v identiteto skupnosti. Sledi kažejo, da so se ljudje in živali premikali v predvidljivih dnevnih in sezonskih ritmih, od naselij do skupnih pašnikov, kjer so bile živali nastanjene v velikih ogradah in živinorejskih taborih, se pasle na očiščenih travnikih in se s pastirji vračale v naselja.

Ekstenzivna reja drobnice velja za eno najbolj učinkovitih oblik izkoriščanja obrobnih zemljišč tudi v modernem obdobju (Bertaglia Jost, Joosen 2007, 657). Ovce in koze se lahko pasejo tudi na kamnitem in marginalnem svetu, medtem ko govedo potrebuje kakovostno travo. Ena krava obenem potrebuje približno 15-krat več krme kot ena ovca in zahteva veliko večje dnevne količine vode. Za zimsko krmo krava potrebuje približno 1000 kg sena. Ocene iz leta 1851 kažejo, da so bili za pridelavo zadostne količine sena za eno kravo potrebni približno 3 akri (1,2 ha) zemlje (Curtler 1938; Fussell 1950). Reja goveda zahteva torej večji vložek energije v urejanje krajine, vključno z oblikovanjem pašnikov in travnikov. Površinske skale in panji lahko ovirajo košnjo, zato je bilo treba za izboljšanje pašnikov in travnikov s površja odstraniti čim več ovir. Zgodovinsko gledano so bili neotrebljeni pašniki vredni dvakrat manj od očiščenih in delanih pašnikov (Gams 1991, 20).

Sledi požiganja vegetacije in erozije tal v vrtačah v bronasti dobi lahko razumemo kot rezultat čiščenja zemljišč, povezanega z ekspanzijo in izboljšanjem kakovosti pašnikov za rastoče črede goveda. To je bil ob sedentarizaciji glavni dejavnik družbenih sprememb, ki se odražajo v večji družbeni koheziji in teritorialnosti skupnosti. Posledično so nastale materialne označbe teritorialnosti in zemljiškega lastništva, od monumentalnih gradiščnih obzidij in gomil do zgoraj predstavljenih mejnih kamnitih struktur, grobelj in ograd. Te strukture so rezultat kolektivnega dela, kar kaže na skupinsko povezanost in velike vložke v preoblikovanje krajine za pašniško izrabo.

Kulturna krajina Krasa je postala stabilna osnova za reprodukcijo družbenega življenja. Ta krajina in način življenja sta se nadaljevala tudi v železni dobi. Pokrajina se je skozi čas razvijala, spreminjala in prilagajala, njene značilnosti so se plastile, vendar so bili temeljni obrisi tega razvoja postavljeni že v bronasti dobi. Kras, kot ga vidimo danes, je zato dolgoročen artefakt, katerega osnovna podoba se je začela oblikovati prav v tem obdobju.

Zahvale

Zahvaljujemo se Manci Vinazza za pomoč pri opredelitvi keramičnega gradiva, Nives Zupančič za izdelavo tabel, Petru Turku in Smiljanu Brešanu, ki sta nama dovolila objavo bronastih najdb, Mini Mrkun, ki je te najdbe izrisala, ter Ani Plestenjak in podjetju Arhej d. o. o. za vpogled v dokumentacijo izkopavanj v vrtači Gorenjski Radvanj. Raziskava temelji na rezultatih predhodnih arheoloških raziskav za ugotavljanje arheološkega potenciala, ki jih je za projekt drugega železniškega tira Divača–Koper izvedel Center za preventivno arheologijo ZVKDS, deloma pa tudi raziskavah, ki so bile delno financirane iz sredstev programa "Arheologija", P6-0247 pri ARIS.

KATALOG

Najdbe, odkrite med predhodnimi raziskavami na območju II. tira (*t. 1:* 1–8; *4:* 3) začasno hrani ZVKDS, CPA. Gradivo iz Gorenjskega Radvanja (*t. 1:* 9–22) in ostalih vrtač (*t. 2–3*) hrani Goriški muzej Kromberk. Sekira z robniki (*t. 4:* 2) je shranjena v Narodnem muzeju Slovenije, iglo (*t. 4:* 1) pa hrani najditelj.
Vsa keramika je izdelana prostoročno.
Pri opisu oblikovnih in tehnoloških značilnostih smo se oprli na smernice Milene Horvat (1999). Pri keramičnih najdbah so po vrsti podani podatki o okrasu, lončarski glini (zelo fino zrnata – zrna velikosti do 0,25 mm; fino zrnata – zrna velikosti od 0,26 do 0,5 mm; drobno zrnata – zrna velikosti od 0,51 do 2,0 mm; grobo zrnata – zrna velikosti od 2,01 do 3,0 mm; zelo grobo zrnata – zrna velikosti nad 3,01 mm), načinu obdelave površine (groba oz. hrapava površina – brisanje; gladka površina – glajenje; spolirana površina – poliranje), načinu žganja (oksidacijsko, nepopolno oksidacijsko, redukcijsko, nepopolno redukcijsko, itd.) ter o barvi površine (zgolj opisno, v primeru različne barve sta posamezno podani tudi barva notranje in zunanje površine) in trdoti (mehka – 1. in 2. stopnja po Mohsu; trda – 3. in 4. stopnja po Mohsu; zelo trda – 5. in 6. stopnja po Mohsu; izredno trda – 7., 8. in 9. stopnja po Mohsu).

Okrajšave / Abbreviations: odl. = odlomek / fragment; DLN = vrtača / doline

Tabla 1

1. Odl. ustja lonca; zelo grobozrnata; glajena; redukcijsko; temno rdečkasto rjava; izredno trda. Najdišče: DLN 2.
2. Odl. ustja in ostenja sklede; drobnozrnata; hrapava; redukcijsko, v končni fazi oksidacijsko; zunanja površina rjavo rdeča, notranja temno rjava; trda. Najdišče: DLN 11.
3. Odl. ustja lonca; drobnozrnata; glajena; redukcijsko; temno rjava; izredno trda. Najdišče: DLN 20.
4. Odl. ročaja; fino zrnata; glajena; redukcijsko; sivo črna; trda. Najdišče: DLN 2.
5. Odl. ostenja z ročajem ovalnega preseka; finozrnata; glajena; nepopolno oksidacijsko; močno rjava; luknjičava in izredno trda. Najdišče: DLN 19.
6. Odl. okrašenega ostenja; okrogli odtisi z orodjem; grobozrnata; glajena; redukcijsko; zunanja površina rjava, notranja temno sivkasto rjava; izredno trda. Najdišče: DLN 19.
7. Klinica iz sivkasto rumenega roženca. Najdišče: DLN 1.
8. Dvojno praskalo na retuširani klini iz sivkastega roženca z belimi vključki. Najdišče: DLN 3.
9. Odl. ustja in ostenja skodele; fino zrnata; hrapava; redukcijsko, v končni fazi oksidacijsko; rdeče rjava; trda. Najdišče: Gorenjski Radvanj.
10. Odl. noge trinožnika; grobozrnata; hrapava; oksidacijsko, sekundarno prežgana; oranžno rdeča; mehka. Najdišče: Gorenjski Radvanj.
11. Odl. ustja in ostenja lonca; drobno zrnata; hrapava; redukcijsko, v končni fazi oksidacijsko; barva zunanje površine: rjava , notranja sivo črna; trda. Najdišče: Gorenjski Radvanj.
12. Odl. ustja in ostenja sklede; drobnozrnata; hrapava; redukcijsko; sivo črna; trda. Najdišče: Gorenjski Radvanj.
13. Odl. ustja in ostenja sklede; finozrnata; glajena; redukcijsko, v končni fazi oksidacijsko; rjava; trda. Najdišče: Gorenjski Radvanj.
14. Odl. ustja z ročajem skodele; finozrnata; glajena; redukcijsko; sivo črna; trda. Najdišče: Gorenjski Radvanj.
15. Odl. držaja; drobno zrnata; glajena; redukcijsko, v končni fazi oksidacijsko; rdeče rjava; trda. Najdišče: Gorenjski Radvanj.
16. Kamnito jedro. Tuf. Najdišče: Gorenjski Radvanj.
17. Odbitek z izjedo. Roženec. Najdišče: Gorenjski Radvanj.
18. Jedrni odbitek uporabljen kot sveder. Roženec. Najdišče: Gorenjski Radvanj.
19. Klina z retušami. Roženec. Najdišče: Gorenjski Radvanj.
20. Klina z retušami. Roženec. Najdišče: Gorenjski Radvanj.
21. Klina z retušo. Roženec. Najdišče: Gorenjski Radvanj.
22. Klina s polstrmo retušo. Roženec. Najdišče: Gorenjski Radvanj.

Tabla 2

1. Odl. skodele; finozrnata; glajena; redukcijsko; zunanja površina rumenkasto rdeča, notranja rjava; luknjičava in izredno trda. Najdišče: Tomaj, lokacija 10.
2. Okrašena skodela; aplicirano rebro in plitve bradavice; zelo finozrnata; brisanje; redukcijsko; zunanja površina temno rjava, notranja zelo temno siva; precej luknjičava in izredno trda. Najdišče: Avber, lokacija 9.
3. Odl. sklede z razčlenjenim držajem; odtisi prstov; drobnozrnata; brisanje; redukcijsko; zunanja površina močno rjava, notranja temno rumenkasto rjava; precej luknjičava in izredno trda. Najdišče: Tomaj, lokacija 10.

Tabla 3

1. Odl. ustja sklede; finozrnata; glajena; oksidacijsko; močno rjava; luknjičava in izredno trda. Najdišče: Krajna vas, lokacija 5.
2. Odl. ustja sklede; drobnozrnata; glajena; redukcijsko, v končni fazi oksidacijsko; rjava; luknjičava in izredno trda. Najdišče: Krajna vas, lokacija 5.

3. Odl. ustja sklede; drobnozrnata; brisanje; oksidacijsko; močno rjava; luknjičava in zelo trda. Najdišče: Tomaj, lokacija 10.
4. Odl. ustja lonca; finozrnata; brisanje; redukcijsko; zunanja površina temno rjava, notranja zelo temno siva; luknjičava in zelo trda. Najdišče: Štanjel, lokacija 3.
5. Odl. ustja lonca; finozrnata; glajena; redukcijsko; rumenkasto rjava; izredno trda. Najdišče: Kazlje, lokacija 11.
6. Odl. ustja lonca; grobozrnata; glajena; redukcijsko; temno rjava; luknjičava in mehka. Najdišče: Kazlje, lokacija 11.
7. Odl. ustja lonca; finozrnata; glajena; redukcijsko; črna; luknjičava in izredno trda. Najdišče: Tomaj, lokacija 10.
8. Odl. okrašenega ročaja posode; odtis orodja; finozrnata; glajena; redukcijsko; temno rjava; izredno trda. Najdišče: Kazlje, lokacija 11.
9. Odl. ostenja okrašene posode; barbotin; finozrnata; brisanje; oksidacijsko; zunanja površina rjava, notranja zelo temno siva; luknjičava in izredno trda. Najdišče: Dutovlje, lokacija 7.
10. Odl. ostenja posode z držajem z odtisom prstov; odtisi prstov; zelo grobozrnata; brisanje;; oksidacijsko; zunanja površina rjava, notranja zelo temno siva; precej luknjičava in izredno trda. Najdišče: Avber, lokacija 6.
11. Odl. ostenja z držajem; drobnozrnata; brisanje; oksidacijsko; močno rjava; luknjičava in izredno trda. Najdišče: Ivanji Grad., lokacija 2.
12. Odl. ustja posode; drobnozrnata; glajena; oksidacijsko; rjava; luknjičava in mehka. Najdišče: Kazlje, lokacija 11.
13. Odl. ostenja z okrašenim držajem; odtisi prsta; drobnozrnata; brisanje; oksidacijsko; močno rjava; luknjičava in zelo trda. Najdišče: Štanjel, lokacija 4.
14. Odl. ostenja z držajem; zelo grobozrnata; brisanje; oksidacijsko; močno rjava; luknjičava in zelo trda. Najdišče: Tomaj, lokacija 10.
15. Odl. ostenja lonca z apliciranim rebrom; aplicirano ravno rebro; drobnozrnata; brisanje: oksidacijsko; rjava; luknjičava in trda. Najdišče: Dutovlje, lokacija 8.
16. Odl. ostenja okrašene posode; barbotin; finozrnata; izdelava: prostoročno; brisanje; oksidacijsko; zunanja površina rjava, notranja zelo temno siva; luknjičava in izredno trda. Najdišče: Dutovlje, lokacija 7.
17. Odl. okrašenega ostenja z apliciranim rebrom; odtis prstov; finozrnata; glajena; redukcijsko; zunanja površina rumenkasto rdeča, notranja močno rjava; izredno trda. Najdišče: Kazlje, lokacija 11.

Tabla 4

1. Bronasta valovita igla z lečasto glavico in predrtim odebeljenim vratom. Ima oglat presek ter nazaj uvito konico. Najdišče: Potok pri Dornberku, lokacija 1.
2. Bronasta sekira z robniki. Teme je skoraj ravno. Proti rezilu se močno razširi. Robniki potekajo od vrha sekire do razširitve v rezilo. Rezilo je zaobljeno. Najdišče: Brestovica pri Povirju, lokacija 12.
3. Bronasta lovorolistna sulična ost z odlomljeno konico. Spodnji rob tula je razširjen in razčesnjen zaradi naknadnega tolčenja. Najdišče: Lokev, lokacija 13.

BERTAGLIA JOST, S., J. JOOSEN 2007, Identifying European marginal areas in the context of local sheep and goat breeds conservation: A geographic information system approach. – *Agricultural Systems* 94 (3), 657–670.

BOSCHIAN, G., E. MONTAGNARI KOKELJ 2000, Prehistoric Shepherds and Caves in the Trieste Karst (Northeastern Italy). – *Geoarchaeology* 15/4, 331–371.

BROCHIER, E. J. 1983, Bergeries et feux de bois néolithiques dans le Midi de la France. – *Quartär* 33/34, 181–194.

CARANCINI, G.L., R. PERONI 1999, L'età del bronzo in Italia: per una cronologia della produzione matallurgica. – *Quaderni di protostoria* 2.

CENNI, S., F. BARTOLI 1999, Analisi paleobiogica dei resti ossei rinvenuti nel pozzo iniziale dell'Abisso Cesca (Gabrovizza – Carso triestino). – *Atti della Società per la Preistoria e Protostoria della Regione Friuli-Venezia 11*, 91–103.

CURTLER, W. H. R. 1938, *A Short History of English Agriculture*. – London.

FABEC, T. 2003, Neolitizacija Krasa. – *Arheološki vestnik* 54, 73–122.

FABEC, T. 2018, *Arheologija vrtač na Krasu*. – Monografije CPA 5. https://www.zvkds.si/wp-content/uploads/2024/03/arheologija_0.pdf

FABEC et al. 2025 = T. Fabec, M. Murko, B. Orehek, T. Nanut, M. Arh, M. Janežič, M. Fazarinc, G. Rutar, T. Mulh, H. Rismondo, N. Verđnik, M. Šajn, T. Žerjal, M. Vinazza, M. Čuček, N. Bizjak, M. Česnik, J. Gregorčič 2025, *Poročilo o izvedenih arheoloških izkopavanjih na območju gradnji II. tira železniške proge Divača-Koper* (hrani ZVKDS OE Nova Gorica).

FUSSELL, G. E. 1950, *The Old English Farming Books. 1523–1793* 1. – London.

GAMS, I. 1974, *Kras*. – Ljubljana.

GAMS, I. 1991, Sistemi prilagoditve primorskega dinarskega krasa na kmetijsko rabo tal. – *Geografski zbornik* 31, 5–106.

GAMS, I., M. GABROVEC 1999, Land use and human impact in the Dinaric karst. – *International Journal of Speleology* 28, 55–70.

HORVAT, M. 1999, *Keramika. Tehnologija keramike, tipologija lončenine, keramični arhiv*. – Razprave Filozofske fakultete, Ljubljana.

MARCHESETTI, C. 1903, *I castellieri preistorici di Trieste e della Regione Giulia*. – Atti del Museo civico di storia naturale 4.

MLEKUŽ, D. 2005, The Ethnography of the Cyclops: Neolithic pastoralists in the eastern Adriatic. – *Documenta Praehistorica* 32, 15–51.

MLEKUŽ, D. 2007, Who Were the Cyclopes? Odyssey and Neolithic, Eneolithic and Bronze Age Pastoralists from the East Adriatic Coast and Dinarides. – V: M. Blečić (ur.), *Scripta Praehistorica in Honorem Biba Teržan*, 69–89, Ljubljana.

MLEKUŽ, D. 2012, Notes from underground: caves and people in the Mesolithic and Neolithic Karst. – V: K. A. Bergsvik, R. Skeates (ur.), *Caves in context: the cultural significance of caves and rockshelters in Europe*. Oxford, 199–211.

MLEKUvŽ, D. 2015, Oblike prazgodovinske poljske razdelitve na Krasu. – *Kronika* 63/3, 675–690.

MLEKUŽ, D. 2018, Cultural landscape of a prehistoric hillfort: Tabor pri Vrabčah. – V: E. Borgna, P. Cassola Guida, S. Corazza (ur.), *Preistoria e protostoria del Caput Adriae*, 573–580, Firenze.

MLEKUŽ D., M. PERGAR 2014, 37. Mala Triglavca pri Divači. – V: B. Teržan, M. Črešnar (ur.), *Absolutno datiranje bronaste in železne dobe na Slovenskem / Absolute dating of the bronze and iron ages in Slovenia*, Katalogi in monografije 40, 581–585.

MLEKUŽ et al. 2008 = D. Mlekuž, M. Budja, R. Payton, C. Bonsall 2008, 'Mind the Gap': Caves, Radiocarbon Sequences, and the Mesolithic–Neolithic Transition in Europe – Lessons from the Mala Triglavca Rockshelter Site. – *Geoarchaeology* 23, 398–416.

MLEKUŽ VRHOVNIK, D., T. FABEC 2025, The Formation of the Kras Landscape from Prehistory to the Early Modern Period. – V: B. Fuerst-Bjeliš, J. Mrgić, H. Petrić, M. Zorn, Ž. Zwitter (ur.), *Environmental Histories of the Dinaric Karst*, Environmental History 17, 81–107.

MUŠIČ, B. 1997, Magnetic susceptibility measurements in dolinas. – *Annales* 10, 37–42.

NICOD, J. 1987, Amenagements agraires dans de petites depressions karstiques en Provence et dans les Causes, et dans quelques regions de comparaison en Italie et Yugostavie. – V: J. Kunaver (ur.), *Karst and Man. Proceedings of the International Symposium on Human Influence in Karst*, 97–110, Ljubljana.

OLLESCH, G., A. VACCA 1999, Turnover dei fosfati e dei processi di degradazione in un ecosistema a pascolo in Sardegna. – *Bollettino della società italiana della scienza del suolo* 48, 329–348.

OSMUK, N. 1988, Goriče pri Famljah. – *Varstvo spomenikov* 30, 196–197.

OSMUK, N. 1992, Grižce. – *Varstvo spomenikov* 34, 208.

PAGLIAI, L. 2022, L'impatto sul suolo degli incendi boschivi. – *Incendi boschivi: nuovi paradigmi tra prevenzione, gestione e ricostituzione. Giornata di studio online su Incendi boschivi (31 gennaio 2022)*, 114–125, Firenze.

PANJEK, A. 2015, *Kulturna krajina in okolje Krasa: o rabi naravnih virov v novem veku*. – Koper.

PLESTENJAK et al. 2012 = A. Plestenjak, T. Verbič, A. Grilc, P. Vojakovič, I. Bekljanov Zidanšek, S. Hvalec, L. Rozman, S. Porenta 2012, *Poročilo o opravljenih arheoloških raziskavah na trasi 2. tira železniške proge Divača - Ljubljana* (hrani ZVKDS OE Nova Gorica).

RADINJA, D. 1987, Modern agricultural land improvement in Slovene Dinaric karst. – V: J. Kunaver (ur.), *Karst and Man. Proceedings of the International Symposium on Human Influence in Karst*, 123–135, Ljubljana.

RIHOVSKY, J. 1983, *Die Nadeln in Westungarn I.* – Prähistorische Bronzefunde 13/10.

SLAPŠAK, B. 1995, *Možnosti študija poselitve v arheologiji*. – Arheo 17.

VINAZZA, M. 2025, O življenju na prazgodovinskem gradišču Tabor pri Vrabčah. – V: N. Peresin Meden (ur.), *Dolenčev zbornik 2025: o Muzeju prevozništva in tovorništva ter (pra)zgodovini kraške kulturne krajine*, 39–50, Divača.

YATES, T. D. 2007, *Land Power and Prestige: Bronze Age Field Systems in Southern England*. – Oxford.

The formation of the cultural landscape of the Karst in the Bronze Age

Translation

We present here the process through which the Bronze Age cultural landscape was formed, a process first identified at a series of archaeological sites on the Divača Karst and subsequently traced across other parts of the plateau. This transformed the process of the Karst into a pastoral landscape that, in broad terms, persisted until the Middle Ages (Mlekuž Vrhovnik, Fabec 2024).

Almost all evidence for human presence in the Karst before the Bronze Age comes from caves. Some caves have long occupation histories extending back to the Early Mesolithic. In the Mesolithic, caves may be understood as places where people gathered; as hunting camps, or perhaps as locations for ritual and celebration. In the sixth millennium BCE, communities in the Karst began to herd sheep and goats and became mobile or transhumant pastoralists. The tradition of using caves was largely maintained, but their function changed, as they were thereafter used primarily as sheepfolds and pastoral shelters (see, for example, Boschian, Montagnari Kokelj 2000; Fabec 2003, 88–90; Mlekuž 2012, 205–208).

At the end of the Eneolithic and especially in the Bronze Age, herd composition changed. Cattle assumed a greater role, while milk and dairy products became increasingly important. This shift was intertwined with broader social transforma-

tions, visible in greater community cohesion and increased territoriality, expressed through reduced mobility and the emergence of a settlement system based on the establishment of first permanent settlements, hillforts, and a pastoral cultural landscape (Fabec 2018, 107–115).

MALA TRIGLAVCA

Mala Triglavca is a rockshelter on the Divača Karst. Its entrance faces north and opens onto the edge of a small doline southwest of Divača at an elevation of 345 m asl (*Fig. 1*). The rockshelter is approximately 6 m deep and covers an area of about 54 m². Archaeological excavations revealed a continuous stratigraphic sequence reaching back to the Early Mesolithic (Mlekuž et al. 2008; Mlekuž, Pergar 2014). They also revealed a highly complex picture of depositional practices in the Mesolithic and Neolithic. In the central part of the shelter, the sediments consist of a well-defined sequence of horizontally deposited anthropogenic layers with some pedogenic post-depositional processes. Along the cave wall, the sediments had been heavily reworked. This reworking was primarily the result of the lateral downslope movement of sediment further into the cave. Here, we were able to identify a series of erosional surfaces, which separated relocated sediments along the edge of the shelter from the sequence preserved in its centre.

The stratigraphic sequence in the central part of the cave was well preserved, and small finds and other remains were found in situ. The layers consisted mainly of hard or compact clayey silts with varying proportions of scree and larger limestone fragments produced by the disintegration of the cave wall.

The sequence of Neolithic and Eneolithic layers was characterised by the rhythmic alternation of dark-coloured soil layers and ash layers (*Fig. 2*). At least 24 such alternations were identified. We interpret each pair of a dark layer and an ash layer as a horizon, that is, as a temporally bounded phase in the use of the cave. Each horizon begins with a dark layer representing the residue of occupation within the cave. Its deposition usually begins with the preparation of the floor, typically through levelling the floor with scree and covering the ash of the previous horizon with stone slabs. In some cases, the organisation of space also involved vertical elements, especially pits lined or reinforced with larger limestones. The dark layers are the result of everyday human activities in the cave; they contained pottery sherds, stone tools and flakes, broken bones, and other refuse. At the end of each occupation phase, the organic material on the surface of the dark layer, mainly bedding and animal dung, was gathered and burnt. The horizon is therefore capped by streaks of whitish silty soil containing abundant ash.

On the basis of numerous radiocarbon dates (*Fig. 3*), obtained by sampling bones from horizons at different depths, we can identify a fairly steady rate of sedimentation in the rockshelter from the end of the Mesolithic onwards, at around 1 mm per year. After 3000 BCE, however, sedimentation changed and slowed notably. The sequence of alternating dark and light layers came to an end, indicating a change in the use of the shelter. From this point onward, only silty soils with a high proportion of scree were deposited, and these contain noticeably fewer small archaeological finds. We suggest that this change in sedimentation at Mala Triglavca is related to processes in the immediate surroundings, which we identified in the sediment fills of a series of dolines between Divača and Lokev.

DOLINES

Dolines are among the most characteristic karst surface landforms. They are funnel-shaped depressions developing in carbonate bedrock as a result of karst processes, whether chemical dissolution, collapse, or suffosion. The Karst is full of dolines, often occurring in densities of several tens per square kilometre. Dolines are one of the few karst surface forms in which sediment accumulation exceeds erosion, and they may therefore be treated as sedimentary basins in which sediments accumulate. The dynamics of sedimentation in dolines arise from the interaction of natural and anthropogenic factors operating at the local scale, in the immediate surroundings of the doline and within the doline itself, as well as at the broader landscape scale. The effects of anthropogenic factors in the infilling of dolines are reflected not only in deposited archaeological remains such as finds, structures, layers, and so on, but also in the composition of the sediment fills, their magnetic susceptibility, and their geochemical properties.

In this study, we investigated 20 dolines on the Divača Karst (*Fig. 1:* DLN 1–20), where 30 machine-cut test trenches were excavated along the entire long axis of the lower part, that is, the

floor of the doline (Fabec 2018). In larger dolines, test trenches were excavated at several locations. As a rule, the trenches were deepened until we reached the base of the fine-grained sediment fill overlying compact limestone bedrock or coarse-grained sediments, mainly scree and block scree. The thickness of the fine-grained sediment fills only rarely exceeded 3 m.

The first important observation was that the stratigraphic sequences in all investigated dolines were similar and followed the same pattern. Layers with similar characteristics occurred in nearly all dolines in comparable stratigraphic positions, allowing us to generalise both the stratigraphic sequence and the processes that formed it. This pattern was further supported by radiocarbon dating of individual layers from different dolines. In total, 23 charcoal samples from different layers were dated, ranging from the end of the Pleistocene to the Late Modern period; see *Fig. 3* for a selection of dates from the interval 6000–1000 cal BC. These dates showed that similar soil horizons formed during the same periods. We may therefore conclude that at least some of the factors conditioning sediment deposition in dolines were the result of processes operating simultaneously at the regional scale.

On the basis of radiocarbon dates and the recovered archaeological material, we identified two horizons in the sediment fills of the dolines that were formed under strong human influence (*Fig. 4*). The first belongs to the Bronze Age, the second to the Modern period. Both reflect intensive human modification of the dolines themselves and of their catchments. Compared to these two episodes, human impact on the landscape in other periods is much less visible, and in some places almost imperceptible.

In the early Modern period, dolines were cultivated, where surfaces and soil properties were modified and improved for agricultural use. Modern fills differ from the others in the conspicuous presence of limestone gravel, brick fragments, pottery, metal objects, and more rarely animal bones. We interpret this material as the result of agricultural practices aimed at improving arable soil (Gams 1974; Radinja 1987; Gams, Gabrovec 1999; Panjek 2015).

The Bronze Age horizons are thinner than the Early Modern ones. They are characterised by increased quantities of charcoal fragments, isolated pottery sherds, and stone artefacts. Small finds were relatively scarce; pottery fragments, probably from jars and bowls, predominate, accompanied by rare stone tools (*Pl. 1:* 1–8). Animal remains, which are a typical component of settlement refuse, were almost absent. The few bone finds recovered show that this absence cannot be explained solely by taphonomic factors such as acidic soils. An important component of the Bronze Age layers consisted of vivid orange or yellow lumps of silty soil, which also show very high magnetic susceptibility values and are most likely the remains of burnt soil (*Fig. 5*). Prolonged exposure of soils to fire leads to the transformation of weakly magnetic iron oxides and hydroxides, such as hematite, into more strongly magnetic forms, such as magnetite and maghemite. Other studies in the Karst have likewise shown that high soil magnetic susceptibility values are primarily the result of human use of fire (Mušič 1997). In their geochemical composition, however, Bronze Age layers do not differ from other layers, probably because the effects of fire on the geochemical properties of soils are short-lived (Ollesch, Vacca 1999; Pagliai 2022). These traces of anthropogenic alteration point to activities involving the burning of vegetation and the disturbance of soil, though not to the degree that would suggest arable cultivation.

Radiocarbon dating of charcoal samples from layers containing lumps of burnt soil presents a relatively coherent picture. In total, 18 samples from these layers were dated, and almost half of the radiocarbon dates fall in the first half of the second millennium BCE (see *Fig. 3*). Ten available dates indicate a timespan from the end of the third millennium to the middle of the second half of the second millennium BCE (Fabec 2018, Fig. 95). The radiocarbon dates therefore suggest that human intervention in the landscape began in the Early Bronze Age and intensified in the Middle Bronze Age.

The increase in human impact on the landscape during the Bronze Age, and again in the early Modern period, is also clearly reflected in sedimentation. In the last millennium, from the end of the Middle Ages to the present, up to 0.9 m of soil accumulated on average in the studied dolines, of which 0.6 m accumulated during the three centuries of the early Modern period, indicating that sedimentation rates were highest at that time. Bronze Age layers are about half as thick, averaging approximately 0.45 m. A striking finding is that sedimentation slowed dramatically between these two periods. In six dolines, prehistoric layers lie directly beneath Late Antiquity and medieval to

Early Modern layers, while in another six they are separated from the Early Modern fills by a layer less than 0.4 m thick. In general, in the Iron Age and Roman period, at most c. 20 cm of sediment accumulated in the investigated dolines, more than half less than in the Bronze Age and more than four times less than between Late Antiquity and the present. Estimating sedimentation rates before the Bronze Age is more difficult, because in most cases the geological bedrock was not reached. Nevertheless, the thickness of the deepest parts of the sediment fills in the investigated dolines suggests that sedimentation was substantially slower. We estimate that during the Holocene before the Bronze Age, as much sediment accumulated as in the last 1500 years (Fabec 2018, 87–88).

In some of the tested dolines, larger-scale archaeological excavations were subsequently carried out. During excavations in the doline at Gorenjski Radvanj (DLN 1; see *Fig. 1*; Plestenjak et al. 2012), a sequence of layers was identified that was characterised by the presence of lumps of burnt soil, pottery fragments, charcoal, and flint. Radiocarbon dates indicate that these accumulated between the end of the third millennium and the first half of the second millennium BCE (*Fig. 3*). At this level, two stone clearance cairns were also found. The first (*Fig. 6a*) was circular in plan, with a diameter of around 4 m. It consisted of larger unsorted limestone stones; we can recognize built perimeter in the north and east side of the structure. In section, it was semicircular in shape, reaching a height of 0.7 m in the centre and only 0.2 m at the edges. Small finds were scarce, with a few pottery sherds occurring both within the cairn and in the layer covering it. The second stone structure (*Fig. 6b*) lay 4 m east of the first. In this case, it was at least partly built directly on limestone bedrock. In section, it was similar in form to the first, reaching a height of around 0.75 m in the centre and just over 0.3 m at the edges. In plan, it was oval, 5 m long and 2.8 m wide. Unlike the first structure, it also incorporated stone blocks, in some cases measuring up to 1 × 0.8 m. Finds were scarce here as well. In both cairns, the stones in the upper part of the structure were strongly corroded.

The pottery discovered at Gorenjski Radvanj was highly fragmented and in most cases typologically indeterminate; it was dispersed through the layers. The few identifiable sherds (*Pl. 1:* 9–15) mostly belonged to larger vessels, probably bowls, and to a lesser extent jars and cups, and in one case also to a tripod vessel (*Pl. 1:* 10). Stone artefacts were relatively numerous (*Pl. 1:* 16–22), including various types of blades and scrapers, borers, and retouched flakes. The small finds do not indicate intensive use of the doline, while the relatively small quantity of pottery suggests that people did not live there, a conclusion further supported by the absence of food refuse such as animal bones. The small finds point to a non-settlement use of the dolines, while the discovery of two buried stone clearance cairns indicates an agrarian use of the area.

CLEARANCE CAIRNS, ENCLOSURES, WALLS

Clearance cairns, enclosures, and walls are among the most common forms that can be identified on the surface of the Karst with the help of airborne laser scanning (ALS). Airborne laser scanning of the Karst surface has revealed a multitude of intriguing anomalies or forms, mostly positive features appearing as mounds and embankments. These traces typically occur in groups and together form complex archaeological landscapes.

These remains are most visible in areas with very shallow surface soils, outside cultivated land such as cultivated dolines, meadows, fields, and vineyards, because later anthropogenic disturbance in such places was limited. On cultivated surfaces, the surface features are much less well-preserved, often reworked or blurred by ploughing or stone clearance, while in dolines and valleys they have been buried beneath thick sediment fills. Stratigraphic relationships between these structures point to their layered character, making visible an older layer of organised landscape predating the Modern agro-karst landscape (Nicod 1987).

The Karst is a landscape where natural processes of surface transformation are very slow. Apart from dolines, where accumulation occurs, the Karst surface is marked by slow erosion and denudation. As a result, traces of human intervention on the surface are very well-preserved and can be read relatively easily on high-resolution digital terrain models derived from airborne laser scanning data.

Within this older landscape, one of the most common anthropogenic forms is the clearance cairn (*Fig. 7*). These appear as circular mounds, between 5 and 25 m in diameter and 0.3 to 1 m high. In section, they are bell-shaped or semicircular, with rather gentle sides and smooth edges. Today, on meadows and pastures, they are often

covered by turf. In such cases, they appear in aerial photographs as round patches of lighter vegetation, indicating stone cores. In woodland, they are still visible as stone structures, as mounds stones.

Clearance cairns are the result of clearing and stone removal from the landscape. Based on their volume, which ranges between 30 and 80 m^3, and their density, which in cairnfields reaches several tens of cairns per hectare, it has been estimated that around 200 to 250 kg of stone and scree was removed per square metre of cleared ground. Clearance cairns usually occur in groups of a few to several dozen and may cover quite extensive areas. In such groups, or cairnfields, the cairns generally occur in similar forms and dimensions and may be spaced at roughly regular intervals. In some places, cairnfields are bounded or subdivided by low positive features of irregular form, most likely stone walls or embankments (Mlekuž 2015, 679–680).

Archaeological excavations of cairns near Kazlje (see *Fig. 12:* B) showed that they consist of heaps of limestones of varying sizes, in some cases up to 80 cm across (*Fig. 8*), that is, structures very similar to the buried cairns from Gorenjski Radvanj. Within the investigated cairns, a surprisingly large quantity of fine-grained sediment or soil was present among the stones, reaching up to 40% of the cairn's volume. This runs counter to a simple interpretation of cairns as heaps of cleared stone. We interpret the presence of soil as a combination of trapped aeolian sediment and humus formed in situ. This interpretation is supported by the composition of the fine-grained fill: only humus occurs at the top of the cairn, gradually passing into slightly aggregated soil and, toward the base, into silty reddish-brown earth. We suggest that this reflects pedogenic processes within the cairn and indicates the long duration of soil accumulation.

The investigated cairns were built directly on bedrock, which was often heavily fissured, with deep pockets and grikes. In a few cases, stones were stacked around rock outcrops. The presence of solution grooves on the bedrock surface beneath the cairns indicates that the bedrock had been directly exposed to weathering and was therefore not covered by turf. We therefore infer that at the time the cairns were built, the landscape was highly rocky and carried only a thin soil cover. One of the cairns at Gorenjski Radvanj (*Fig. 6b*) was likewise built partly directly on bedrock (Plestenjak et al. 2012, 27).

The excavated cairns were generally devoid of archaeological finds, which is in keeping with their interpretation as dumps of stone removed from cultivated surfaces. During excavation, however, we observed that a substantial quantity of fine-grained sediment or soil was often present among the stones, amounting to as much as c. 40% of the cairn's volume. This composition suggests that cairns are not merely simple heaps of cleared stone, but more complex stone-sediment accumulations formed through a longer process of deposition and transformation. In the absence of archaeological material, their chronology is difficult to establish.

Only in a smaller cairn on the Drenje area (*Fig. 7*), lying together with other cairns inside an enclosure, we recovered six fragments of Early to Middle Bronze Age pottery. Prehistoric, Eneolithic and Bronze Age pottery from cairnfields has, however, long been known from the V Snožetih area near Goriče pri Famljah (Osmuk 1988), as well as from Grižce near Dolenja vas near Senožeče (Osmuk 1992) (*Fig. 12:* D, E). When clearing the land, people did not deposit removed stone only in cairns, but also along the edges of cleared plots. A cleared plot or opening grows organically as new areas are opened and cleaned, producing boundaries formed by cairn-like walls. In the older landscape identified through airborne laser scanning, low cairn-like walls form linear features enclosing spaces intended for intensive grazing, livestock management, and animal husbandry. There is considerable variability among enclosures, both in form and in the labour invested in their construction. Their size also varies greatly, from only a few hundred square metres to more than one or several hectares. The larger examples are usually irregular in shape and adapted to the relief, in some cases enclosing areas between dolines. Clearance cairns are also very frequently found within such enclosures (Mlekuž 2015, 680–682).

East of Kazlje, we investigated a large cairnfield comprising more than 80 cairns. These are arranged in groups separated by low cairn-like walls. The cairnfield is cut by modern vineyards. Along the western edge of the area, we identified embankments enclosing small rectangular fields. Excavation showed that in this case these were the collapsed remains of a carefully constructed massive dry-stone wall (Fig. 9), which, judging by the volume of the collapse, originally stood over 1.5 m high. This is therefore not a cairn-like wall around a cleared plot, but a deliberately built structure, an enclosure. The presence of pottery

fragments, none of them typologically diagnostic, and animal bones indicates a different use of space here; activities were evidently taking place within the enclosure that generated more refuse. A radiocarbon date from a cattle astragalus found in buried soil beneath the collapsed wall gave a date between 1210 and 1030 BCE (2940 ± 35 BP, Poz-92794). The enclosure must therefore be older than the eleventh century BCE.

Test trenching showed that the linear features interpreted from airborne laser scanning imagery as embankments are quite varied. In some cases, they proved to be no more than linear clearance cairns, elongated heaps of stone interpreted as the result of dumping stone along the edges of cleared surfaces, that is, dumping walls. In such cases, the stone seems simply to have been thrown down, although we also allow the possibility that some represent the ruined remains of simply built dry-stone walls.

Other linear structures identified on airborne laser scanning imagery are interpreted as the remains of land division. One example is the system of low linear embankments and cairns on the slopes of Sigurni hrib and Goli vrh west of the hillfort of Tabor near Vrabče (Mlekuž 2018). These appear as a sequence of low terraces running across the slope (*Fig. 10*). The strips bounded by these terraces are further subdivided by walls. The result is a series of long bands divided into rectangular fields running parallel along the slope. At the edges, the relatively regular orthogonal pattern breaks down and becomes much more random and organic. A landscape reworked in this way has a box-like, orderly rectangular appearance, similar to rectilinear landscapes in Dalmatia, though there these are mostly of Modern date and primarily associated with arboriculture and vineyards. This box-like field division may be classified as a coaxial field system. Coaxial, cohesive, aggregated, or brickwork field systems are characteristic of later prehistory and are known from England to northern Germany. They are defined by small, rectangular, similarly sized, and interconnected plots or fields organised symmetrically around a principal axis (Yates 2007, 16–17).

We did not recover diagnostic material that would allow us to date the remains of the field system on the slopes of Sigurni hrib and Goli vrh. We assume that they form part of the cultural landscape of the hillfort of Tabor near Vrabče (Mlekuž 2018), which was occupied in the Late Bronze and Early Iron Age (Vinazza 2025).

The analysis of airborne laser scanning imagery for the Karst as a whole revealed the scale of prehistoric, probably Bronze Age, landscape impact (*Fig. 11*). Most of the landscape bears traces of prehistoric land use. Across the study area, more than 25,000 clearance cairns were identified and digitised, amounting to roughly 30 cairns per square kilometre. Areas of high density can be recognised, especially in the central part of the study area, as well as areas of lower density, for example in the Sežana Karst, but without any clear overall pattern. Across the Karst, there are scattered small, isolated cairnfields that may be interpreted as small clearings, as well as large continuous areas of stone cairns that may indicate extensive pastures. A similar, though not identical, pattern is visible in the distribution of linear structures or walls. We identified more than 500 km of these features, which amounts to more than 600 m of walls per square kilometre.

FINDS IN THE LANDSCAPE

Surveys of open cuts created in dolines across the Divača and Komen Karst by the removal of soil for the creation of new fields and vineyards have provided an interesting insight into the chronological and spatial range of discard, which we understand as reflecting fluctuations in the intensity of human activity in the landscape. In total, 54 dolines with open soil cuts were examined (Fabec 2018). In almost all cases, 47 dolines or 87%, we discovered prehistoric finds, mostly pottery sherds. These finds lay predominantly on the surface. They usually rested on colluvium deposited in varying thicknesses by runoff after the removal of soil. In most of the excavated dolines, water erosion had been particularly active because of the steep section faces, the depth of the cuts, and the absence of vegetation that might otherwise have reduced soil erosion. Only in five cases the prehistoric remains were also found in the exposed profiles, allowing us to establish their stratigraphic position. In these cases, the finds did not occur within the presumed buried soils or layers showing macroscopic traces of cultivation, but in relatively thick fine-grained sediments above or below them. The sherds recovered usually do not exceed 3 to 4 cm in size, reflecting a relatively high degree of fragmentation. In a few exceptional cases, sherds were found concentrated in a limited area and belonged to the same vessels (*Pl. 2:* 1–3). These

sherds were probably preserved in situ, since either human activity, such as cultivation, or natural processes, such as water erosion, would otherwise likely have dispersed them over a much larger area.

The quantity of small finds in the investigated cuts was usually low, which, even though these are mostly destroyed sites, does not suggest intensive use. In more than a third of the dolines examined, 21 in total, we recovered no more than three finds, and in half of these cases only a single find. In fewer than one-tenth of the dolines, five in total, more than twenty finds were recovered, and only two stood out by quantity: a doline south of Tomaj (*Fig. 12:* 10), where 123 finds were collected, and Križmanov dol east of Kazlje (*Fig. 12:* 11), where 79 were found.

Pottery fragments overwhelmingly predominate among the finds. These consist mainly of sherds from larger vessels, especially bowls and jars, and to a lesser degree cups. Fragments of smaller and finer ware were relatively rare. The more narrowly datable and typologically diagnostic pottery belongs to the Bronze Age (*Pls. 2, 3*). In terms of fabric, it is fairly homogeneous and characteristic of Bronze Age pottery fabrics. A possible exception is a base fragment from a doline near Ivanji grad, which is probably later, of Iron Age date. Other types of finds were scarce. Isolated stone artefacts account for only 2.5% of the total assemblage. These are blade-like flakes of local or allochthonous chert that cannot be dated more precisely on typological grounds.

A small number of metal finds have also been discovered in the Karst that may be connected with the beginnings of landscape transformation in the Bronze Age. The circumstances of their discovery are mostly unclear, but they seem to be associated with stone structures. These may be objects lost in the course of activities carried out in the landscape, or perhaps even votive deposits. Among the isolated finds, a flanged bronze axe (*Pl. 4:* 2) from the end of the Early Bronze Age is particularly noteworthy (Carancini and Peroni 1999, 10–16). It was found south of Brestovica pri Povirju (*Fig. 12:* 12), in the middle of an area spanning several hectares containing numerous cairnfields, enclosures, cairn-like walls, and linear embankments. Two other isolated bronze finds may also be related to activities associated with the organisation of the cultural landscape: a pin of the Wetzleinsdorf type, a variant Grosshöflein or St. Margarethe (Rihovsky 1983; Pl. 4: 1), and a spearhead (*Pl. 4:* 3) which, judging by the lower edge of the socket, widened and splayed through hammering, was probably re-used as a tool. The former was found in the area of Železna vrata below Trstelj (*Fig. 12:* 1), near a long cairn-like wall; the latter was discovered east of the village of Lokev. The spearhead was found during the mechanical removal of a boundary dry-stone wall built during the Early Modern reorganisation of local plots for agriculture, when the original common land was transformed into a meadow. Given its excellent preservation, we may assume that it had long lain in a relatively dry environment, probably among stones rather than in soil (Fabec et al. 2025, 958–961).

CONCLUSION

Taken together, the evidence from doline deposits, archaeological features preserved in the open landscape, and the distribution of off-site finds points to two major episodes of landscape transformation on the Karst, which produced two distinct layers of the landscape palimpsest.

The first major transformation of the landscape can be dated to the Bronze Age, after 2500 BCE. Anthropogenic horizons with traces of burnt soil and charcoal in the sediment fills of dolines indicate extensive burning of vegetation and disturbance of soils, the result of woodland clearance and the removal of tree stumps. This process was accompanied by the formation of a cultural landscape composed primarily of pastures, livestock enclosures, and to a much lesser extent cultivated plots. This is the oldest layer of the Karst landscape palimpsest. This first, Bronze Age phase of large-scale landscape transformation lasted for several centuries and was followed by a stable, open cultural landscape. In a broader perspective, this development may be placed at the end of a long-term process that began around 5500 BCE with the emergence of Neolithic pastoralism (Boschian, Montagnari Kokelj 2000; Mlekuž 2005). In the Neolithic and Eneolithic, herding in the Karst was strongly oriented toward sheep and goats, with fewer cattle and even fewer pigs (Mlekuž 2005; Mlekuž 2007). Analyses of faunal remains from caves indicate varied but often specialised herd compositions, with sheep and goats sometimes accounting for as much as 80%. The presence of dung traces and other residues in the layers points to the use of caves as seasonal pastoral stations, so-called grottes

bergeries, associated with transhumance (Brochier 1983; Boschian, Montagnari Kokelj 2000). Dairy lipid residues show that animals were also exploited for secondary products. Diet was based primarily on animal protein (Cenni, Bartoli 1999, 100–101).

In the Bronze Age, there is a marked change in depositional practices in caves. The burning of dung ceases and sedimentation slows dramatically, suggesting that caves were no longer used as sheepfolds for sheep and goats. This shift is documented in several caves on the Trieste Karst along with Mala Triglavca, such as Čotarjeva pečina (It. Grotta Cotariova), Katrna pejca (It. Grotta Caterina), Pečina na Leskovcu (It. Grotta Azzurra), Lonza Cave (It. Grotta Benedetto Lonza), and Pečina Podkičer (It. Cavernetta a est di Trebiciano), and probably also Orehova pejca (It. Grotta dei Ciclami) and Mitrej Cave (It. Grotta del Mitreo) (Fabec 2018, 108). At Mala Triglavca, the deposition of the characteristic stable-floor deposits ended around 2100 BCE (Mlekuž et al. 2008), that is, precisely when extensive anthropogenic interventions in the landscape were taking place, including vegetation clearance by burning and the reworking of the surface.

The Early Bronze Age is also the period of the first permanent settlements, the hillforts. More than 100 have been recorded in the Karst (Marchesetti 1903). There are major differences among them in date, size, location, internal organisation, and in the amount of labour invested in building their ramparts (Slapšak 1995, 24, 26–27). Yet not all enclosed spaces bounded by stone structures are true hillforts; their forms, scales, and functions differ greatly. Some may have served as large central settlements, others as smaller satellite hillforts, and others again merely as livestock enclosures and pastoral camps (Slapšak 1995, 26–27).

Animal remains from hillforts and other contemporary sites show a general trend toward more specialised livestock husbandry. The proportion of sheep and goats declines sharply, to 25 to 50%, while the proportion of cattle increases significantly. Cattle become more important: half of all samples contain 35 to 60% cattle, and in some cases as much as 90%. Pigs also gain in importance as a source of meat. The increased presence of cattle, and also pigs, suggests greater diversification in herd-management strategies, with each animal species playing a specific role within the pastoral system. At the same time, this points to a greater emphasis on secondary animal products, especially milk (Fabec 2018, 107–115).

Interventions in the landscape and the resulting patterns of land use point to a landscape adapted to grazing. On the basis of the form and density of the traces, we may infer that the landscape was organised around the basic needs of livestock, which underscores the central importance of animals and herding in the prehistory of the Karst. Animals formed the basis of household and community wealth and stood at the centre of everyday activities and practices, including movement and care. They were therefore deeply woven into community identity. The traces suggest that people and animals moved in predictable daily and seasonal rhythms, from settlements to common pastures, where animals were kept in large enclosures and pastoral camps, grazed on cleared grasslands, and then returned with their herders to the settlements.

Extensive sheep and goat husbandry is considered one of the most effective ways of exploiting marginal land even in the modern period (Bertaglia Jost, Joosen 2007, 657). Sheep and goats can graze on rocky and marginal terrain, whereas cattle require good-quality grass. A single cow also requires approximately fifteen times more fodder than one sheep, and substantially larger daily quantities of water. For winter fodder, one cow needs around 1000 kg of hay. Estimates from 1851 suggest that approximately 3 acres, or 1.2 ha, of land were required to produce enough hay for one cow (Curtler 1938; Fussell 1950). Cattle husbandry therefore demands a much greater investment of energy in organising the landscape, including the creation of pastures and hay meadows. Surface stones and stumps can obstruct mowing, so as many obstacles as possible had to be removed from the ground in order to improve pastures and meadows. Historically, the uncleared pastures were worth only half as much as the cleared and improved ones (Gams 1991, 20).

The traces of vegetation burning and soil erosion in dolines during the Bronze Age may be understood as the result of land clearance associated with the expansion and improvement of pastures for growing cattle herds. Alongside sedentarisation, this was a principal driver of social changes expressed in stronger social cohesion and increased community territoriality. As a result, material markers of territoriality and land ownership emerged, from monumental hillfort ramparts and barrows to the boundary stone structures, clearance cairns, and enclosures discussed above. These structures are the result of collective labour and point both to strong group cohesion and to substantial investment in remaking the landscape for pastoral use.

The cultural landscape of the Karst became a stable basis for the reproduction of social life. This landscape, and the way of life associated with it, continued into the Iron Age. Over time, the landscape developed, changed, and adapted, and its features accumulated in successive layers. Yet the fundamental outlines of that development were already established in the Bronze Age. The Karst as we know it today is therefore a long-term artefact whose basic form began to emerge precisely in this period.

Acknowledgements

We thank Manca Vinazza for her help in identifying the pottery assemblage, Nives Zupančič for preparing the tables, Peter Turk and Smiljan Brešan for allowing us to publish the bronze finds, Mina Mrkun for drawing these finds, and Ana Plestenjak and the company Arhej d.o.o. for access to the documentation from the excavations in the doline at Gorenjski Radvanj. The research is based on the results of preliminary archaeological investigations carried out to assess the archaeological potential for the Divača–Koper second railway track project by the Institute for the Protection of Cultural Heritage of Slovenia, Centre for Preventive Archaeology, and in part also on the research partly funded by the ARIS programme 'Archaeology', P6-0247.

Translation: Dimitrij Mlekuž Vrhovnik

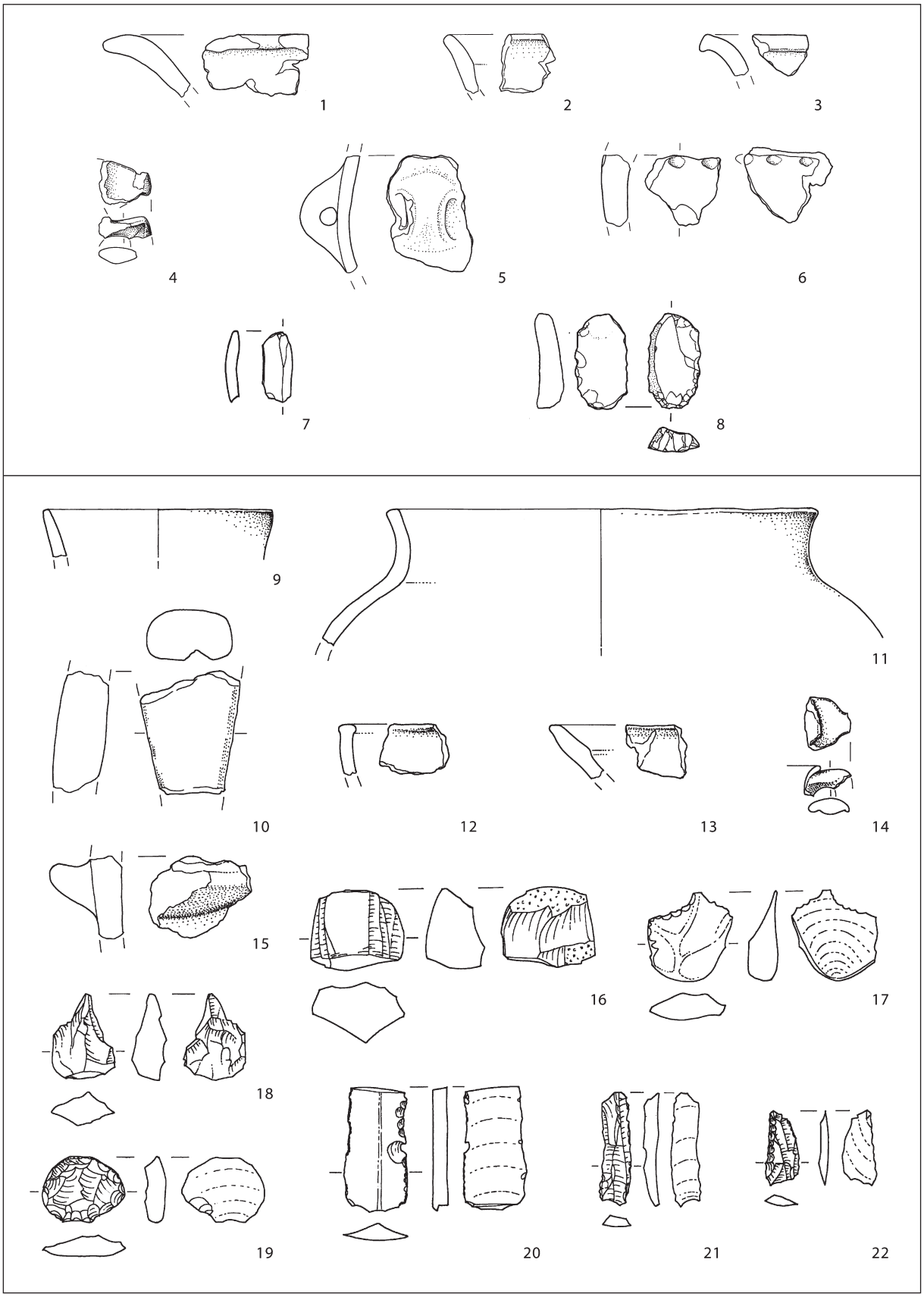
Tomaž Fabec
Zavod za varstvo kulturne dediščine Slovenije
Center za preventivno arheologijo
Poljanska 40
SI-1000 Ljubljana
tomaz.fabec@zvkds.si
https://orcid.org/0009-0007-8834-1633

Dimitrij Mlekuž Vrhovnik
Oddelek za arheologijo
Filozofska Fakulteta Univerze v Ljubljani
Aškerčeva cesta 2
SI-1000 Ljubljana
dimitrij.mlekuz@ff.uni-lj.si
https://orcid.org/0000-0002-6721-640X

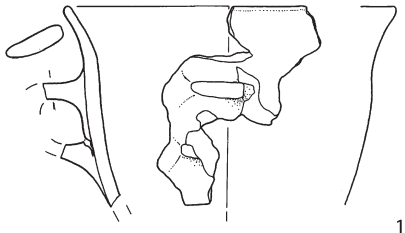
Slikovno gradivo: Sl. 1–3, 7, 10–12 (izdelava: Dimitrij Mlekuž Vrhovnik, FF UL). – *Sl. 4–5* (izdelava: Tomaž Fabec, ZVKDS). – *Sl. 6* (foto: arhiv Arhej d.o.o.). – *Sl. 8–9* (foto: Dimitrij Mlekuž Vrhovnik, FF UL). – *T. 1:* 1–8; *2:* 1–3; *3:* 1–17 (risba: Teja Gerbec). – *T. 1:* 9–22 (risba: Ida Murgelj). – *T. 4:* 1–2 (risba: Mina Mrkun). – *T. 4:* 3 (risba: Samo Ohman). – *T. 4:* 3 (foto: Davorin Ciglar Milosavljević).
Illustrations: Fig. 1–3, 7, 10–12 (elaborated by: Dimitrij Mlekuž Vrhovnik, FF UL). – *Fig. 4–5* (elaborated by: Tomaž Fabec, ZVKDS). – *Fig. 6* (photo: arhiv Arhej d.o.o.). – *Fig. 8–9* (photo: Dimitrij Mlekuž Vrhovnik, FF UL). – *Pl. 1:* 1–8; *2:* 1–3; *3:* 1–17 (drawing: Teja Gerbec). – *Pl. 1:* 9–22 (drawing: Ida Murgelj). – *Pl. 4:* 1–2 (risba: Mina Mrkun). – *Pl. 4:* 3 (drawing: Samo Ohman). – *Pl. 4:* 3 (photo: Davorin Ciglar Milosavljević).

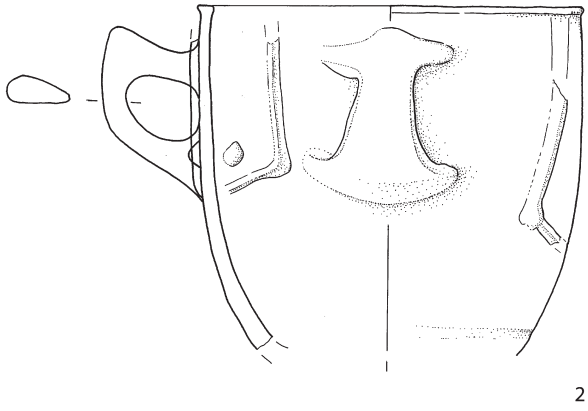
Podatki, na katerih temelji ta članek, bodo na razumno zahtevo posredovani interesentu. / The data underlying this article will be shared on reasonable request to the corresponding author.

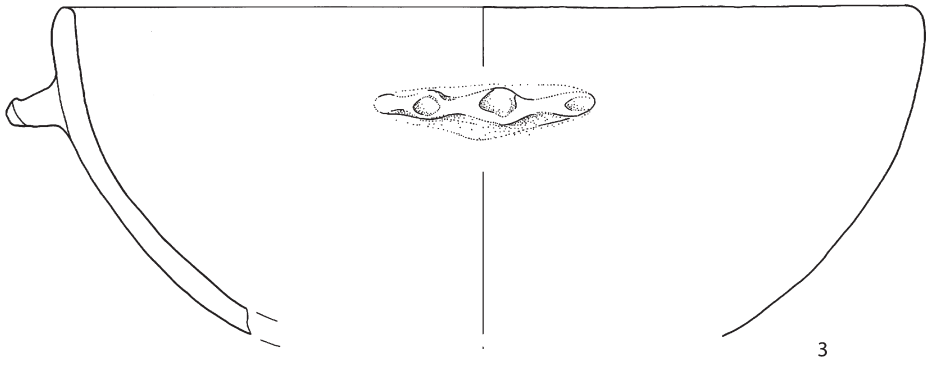
Članek je nastal v okviru programa (P6-0247), ki ga sofinancira Javna agencija za znanstvenoraziskovalno in inovacijsko dejavnost Republike Slovenije.
The authors acknowledge the financial support from the Slovenian Research and Innovation Agency (research core funding No. P6-0247).



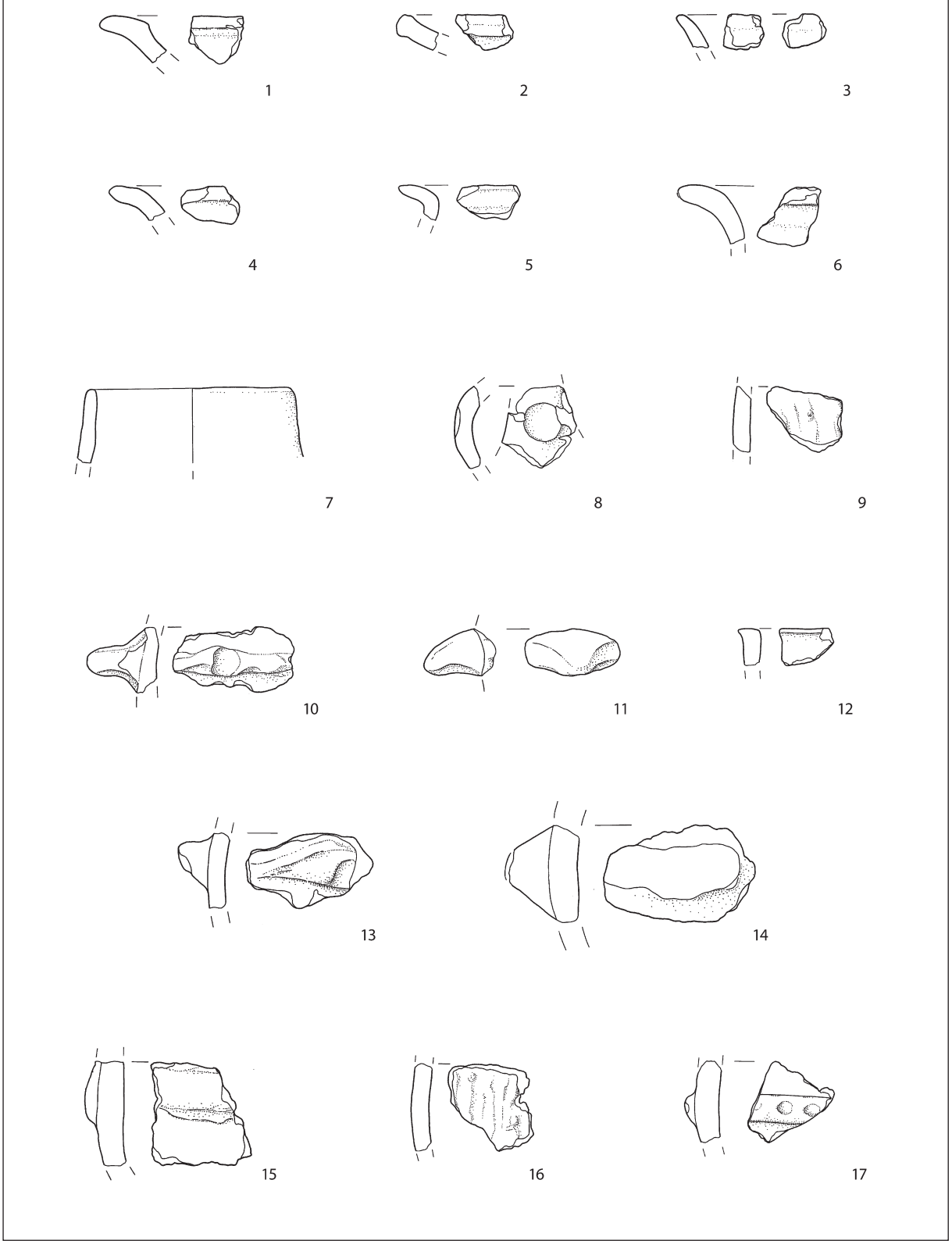
T. 1: Vrtače med Divačo in Lokvijo, izbor gradiva. **1** DLN 2; **2** DLN 11; **3** DLN 20; **4** DLN 2; **5**–**6** DLN 19; **7** DLN 1; **8** DLN 3; **9**–**22** Gorenjski Radvanj. 1–6,9–14 keramika, 7–8,15–22 roženec. M. 1–6,9–14 = 1 : 3; 7–8,15–22 = 1 : 2.
Pl. 1: Dolines between Divača and Lokev, a selection of finds. **1** DLN 2; **2** DLN 11; **3** DLN 20; **4** DLN 2; **5**–**6** DLN 19; 7 DLN 1; **8** DLN 3; **9**–**22** Gorenjski Radvanj. 1–6,9–14 pottery, 7–8,15–22 flintstone. Scale 1–6,9–15 = 1:3; 7–8,16–22 = 1:2.





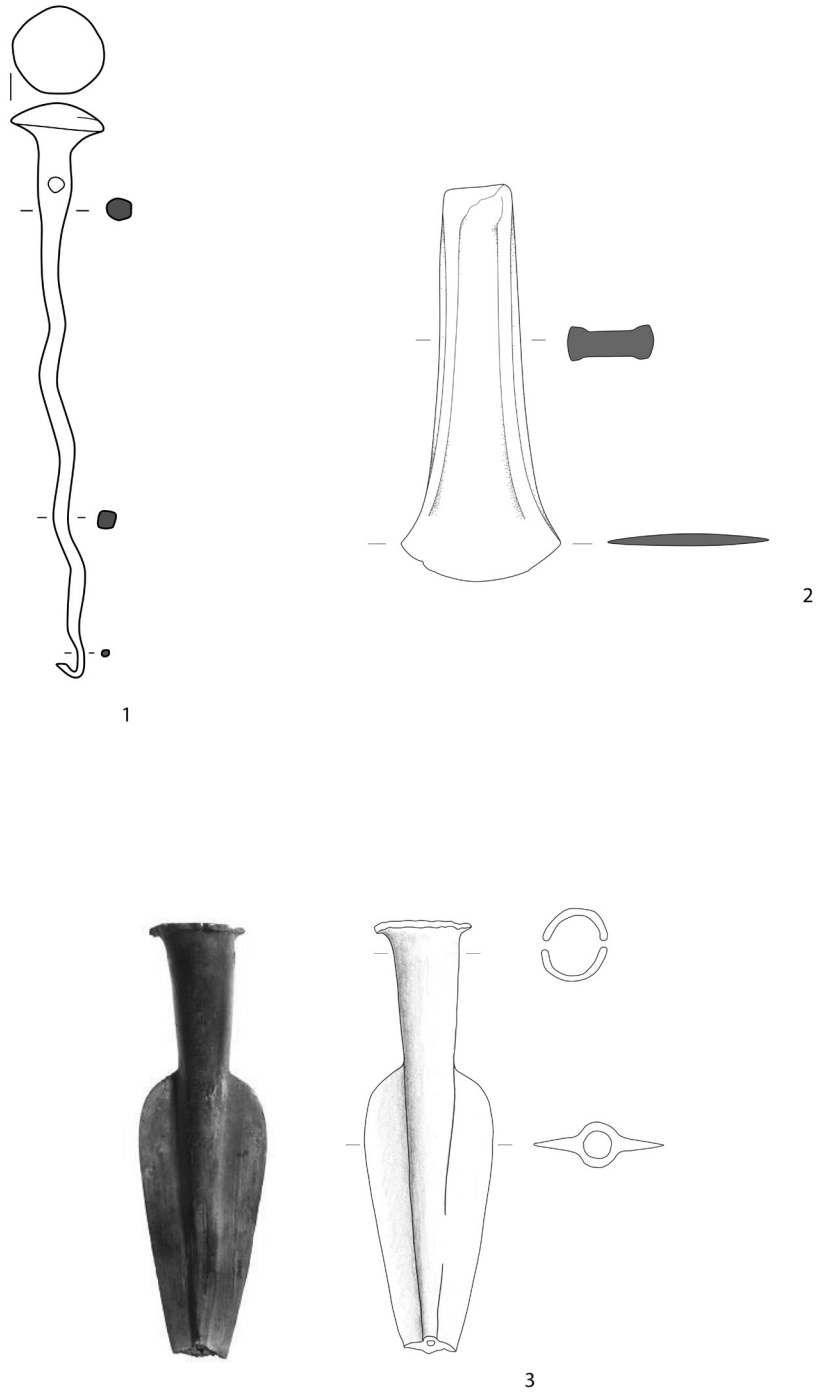


T. 2: Posamezne najdbe, izbor gradiva. **1**, **3** Tomaj, lokacija 10; **2** Avber, lokacija 9. Vse keramika. M. = 1 : 3.
Pl. 2: Selected isolated finds. **1**, **3** location 10; **2** location 9. All pottery. Scale = 1:3.



T. 3: Posamezne najdbe, izbor gradiva. **1**–**2** Krajna vas, lokacija 5; **3**, **7**, **14** Tomaj, lokacija 10; **4** Štanjel, lokacija 3; **5**–**6**, **8**, **12**, **17** Kazlje, lokacija 11; **10** Avber, lokacija 6; **11** Ivanji Grad, lokacija 2; **13** Štanjel, lokacija 4; **15** Dutovlje, lokacija 8; **9**, **16** Dutovlje, lokacija 7. Vse keramika. M. = 1 : 3.

Pl. 3: Selected isolated finds. **1**–**2** Krajna vas, location 5; **3**, **7**, **14** Tomaj, location 10; **4** Štanjel, location 3; **5**–**6**, **8**, **12**, **17** Kazlje, location 11; **10** Avber, location 6; **11** Ivanji Grad, location 2; **13** Štanjel, location 4; **15** Dutovlje, location 8; **9**, **16** Dutovlje, location 7. All pottery. Scale = 1:3.



T. 4: Posamezne najdbe, izbor gradiva. **1** Potok pri Dornberku, lokacija 1; **2** Brestovica pri Povirju, lokacija 12; **3** Lokev, lokacija 13. Vse bron. M. = 1 : 2.
Pl. 4: Selected isolated finds. **1** Potok near Dornberk, location 1; **2** Brestovica near Povir, location 12; **3** Lokev, location 13. All bronze. Scale = 1:2.