

# Doneski k raziskovanju metalurške dejavnosti na Ljubljanskem barju

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# Doneski k raziskovanju metalurške dejavnosti na Ljubljanskem barju

## Contributions to research on metalworking in Ljubljansko barje

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*Ljubljansko barje je vlažna ravnica, ki leži jugozahodno od Ljubljane, v Sloveniji. V arheologiji je poznano predvsem po ostankih prazgodovinskih koliščarjev, ki območje prvokrat poselijo v 5. tisočletju (46. stoletje), nato sledijo poselitveni ciklusi v 4. (med 37. in 32. stoletjem), 3. (med 28. in 24. stoletjem), ob koncu 3. in v prvi polovici 2. tisočletja pr. Kr.*

*Razmeroma številne najdbe, tudi novoodkrite in prvič predstavljene, kalupov, talilnih posod in drugih metalurških pripomočkov, kažejo, da je bila koliščarska poselitev Ljubljanskega barja tesno povezana z metalurško dejavnostjo. Najstarejša najdba te vrste je sicer datirana v 36. stoletje in izvira z najdišča Hočevarica pri Verdu.*

*Metalurška dejavnost je zahtevala veliko znanja. Po značaju je bila magijska. Ob tem pa je predstavljala stalno grožnjo naselbini in ljudem. Zdi se, da so kovači imeli zelo pomemben položaj v družbi, kar se odraža tudi v izpostavljenosti livarskih delavnic. Na Ljubljanskem barju je njih lega ožje locirana na območju treh koliščarskih naselbin iz 4. in 3. tisočletja pr. Kr.: Maharski prekop, Stare gmajne in Založnica. Gre za čas, ko na podlagi arheoloških virov na Ljubljanskem barju prvokrat lahko govorimo o delitvi dela in o pojavu družbenih elit.*

*Ključne besede: Ljubljansko barje, kolišča, eneolitik, metalurški pripomočki, livarske delavnice*

*Ljubljansko barje is a wet plain which lies to the south-west of Ljubljana, Slovenia. In archaeology, it is primarily known for the remains of prehistoric pile-dwellings, which appeared in this region for the first time in the 5th millennium (46th century). The later settling cycles took place in the 4th millennium (between the 37th and 32nd century), 3rd millennium (between the 28th and 24th century), in the late 3rd millennium and in the first half of the 2nd millennium B.C.*

*The relatively numerous finds of moulds, melting pots and other metalworking utensils – both those recently discovered and those that have already been presented – indicate that the pile-dwelling settlements of Ljubljansko barje were closely connected to the metalworking activity. The oldest find of this kind has been dated to the 36th century B.C. and it was discovered on the site of Hočevarica near Verd.*

*The metal processing demanded a great deal of knowledge and skill. It had magical implications. For this reason it presented a constant threat for settlements and people. It seems that metal workers held a very special position in the society, which was also reflected in the exposed location of their workshops. In Ljubljansko barje, their position is narrowly located in the area of three pile-dwelling settlements from the 4th and 3rd millennium B.C.: Maharski prekop, Stare gmajne and Založnica. Now for the first time, on the basis of the archaeological sources, in Ljubljansko barje we can talk about the division of labour and appearance of a social elite.*

*Key words: Ljubljansko barje, pile-dwellings, Eneolithic, metalworking utensils, casting workshops*

### Uvod

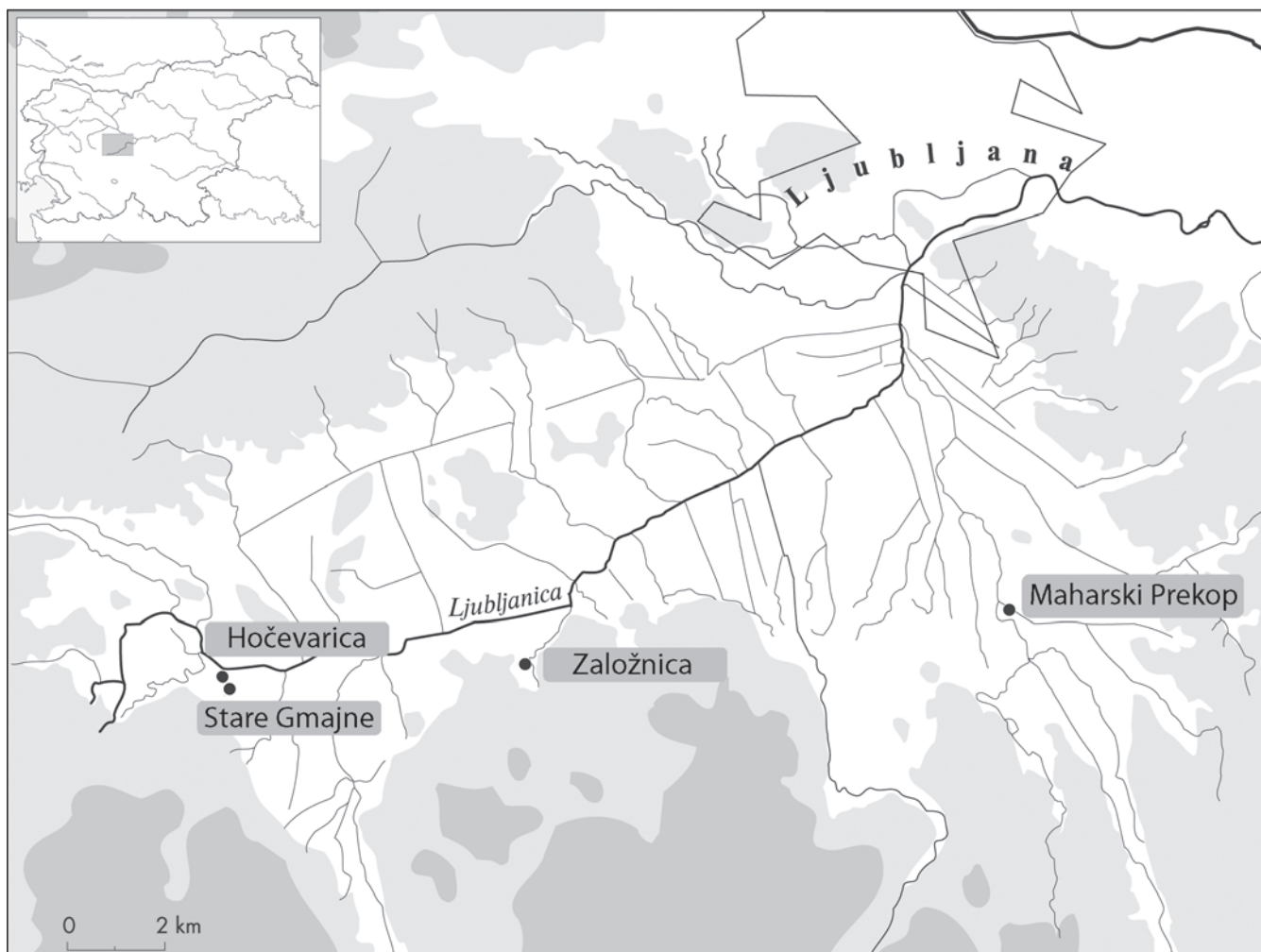
Ljubljansko barje je vlažna ravnica, ki leži jugozahodno od Ljubljane, glavnega mesta Slovenije, in meri 163 km<sup>2</sup> (karta 1). Po zadnji ledeni dobi je območje prekrivalo jezero, ki ga v pozni prazgodovini preraste močvirje in nato barje (Melik 1946, 99-102; Mencej 1992, 264). V arheologiji ga poznamo predvsem po ostankih prazgodovinskih kolišč.

Prvi koliščarji so prišli na Ljubljansko barje v približno dru-

### Introduction

Ljubljansko barje is a wet plain which lies to the south-west of Ljubljana, capital of Slovenia. It stretches over 163 km<sup>2</sup> (Map 1). After the last glacial period the area was covered by a lake, which turned into a swamp in the late prehistoric period, and later into marshland (Melik 1946, pp. 99-102; Mencej 1992, p. 264). In archaeology, it is best known for the remains of prehistoric pile-dwellings.

The first pile-dwellers arrived in Ljubljansko Barje in ap-



Karta 1 Ljubljansko barje s Hočevarico, Maharskim prekopom, Starimi gmajnami in Založnico. Pripravile: M. Belak in T. Korošec.  
 Map 1 Ljubljansko barje with Hočevarica, Maharski prekop, Stare gmajne and Založnica. Prepared by M. Belak and T. Korošec.

gi četrtni 5. tisočletja pr. Kr. Kot kažejo rezultati najnovejših interdisciplinarnih raziskav, ki jih vodi Inštitut za arheologijo ZRC SAZU v sodelovanju z Oddelkom za lesarstvo Biotehniške fakultete Ljubljanske Univerze, so se na Barju zadržali le za krajše obdobje (Čufar, Korenčič 2006, 125; Toškan, Dirjec 2006, 148; Velušček 2006a, 26).

Naslednji poselitveni val, glede na število najdišč izgleda izrazitejši, se zgodi v 4. tisočletju pr. Kr. V obdobju med 37. in 32. stoletjem na Barju najdemo niz naselbin, kot so: Hočevarica, Črešnja pri Bistri, Maharski prekop, Stare gmajne, Blatna Brezovica itd. (Velušček 2004a, 76-77; 2005c, 199-203). V približno 28. stoletju pr. Kr., po ponovni večstoletni prekinitvi v poselitvi, se na Ljubljanskem barju pojavijo ljudje, ki jih lahko povežemo z nosilci vučedolske kulture. Njih nasledijo nosilci zgodnje Somogyvár-Vinkovci kulture, ki prostor obvladujejo vse do 24. stoletja pr. Kr. (Velušček, Čufar 2003, 123-158, prim. s Parzinger 1984, Tab. 4).

Nadaljevanje poselitve Ljubljanskega barja je veliko slabše raziskano. Na jugozahodu sicer leži naselbina, ki jo na podlagi keramike moremo postaviti v zgodnjo bronasto dobo. Datacijo potrjuje tudi radiokarbonska analiza vzetega vzorca kola, ki kaže starost  $3785 \pm 100$  BP (Z-1934) oziroma 2150 cal BC (Dirjec 1991, 193-206, T. 1-T. 5). Podobno velja tudi za obdobje t. i. litzenke keramike v okvirno prvi polo-

proximately the second quarter of the 5<sup>th</sup> millennium B.C. According to the results of the latest interdisciplinary explorations, led by the Institute of Archaeology of the Scientific Research Centre of the Slovenian Academy of Sciences and Arts, in cooperation with the Department of Wood Technology of the Biotechnical Faculty of the University of Ljubljana, they only stayed in Barje for a short period of time (Čufar, Korenčič 2006, p. 125; Toškan, Dirjec 2006, p. 148; Velušček 2006a, p. 26).

The next wave of settlement, which – judging by the number of finds – seems to have been larger, took place in the 4<sup>th</sup> millennium B.C. In the period between the 37<sup>th</sup> and the 32<sup>nd</sup> centuries B.C., in the region of Barje there were a number of settlements, such as Hočevarica, Črešnja pri Bistri, Maharski prekop, Stare gmajne, Blatna Brezovica etc. (Velušček 2004a, pp. 76-77; 2005c, pp. 199-203). In approximately the 28<sup>th</sup> century, after yet another centuries-long interruption in settlement, people appeared in the area of Ljubljansko barje that can be easily linked to members of the Vučedol Culture. After them came representatives of the Early Somogyvár-Vinkovci Culture, who dominated this territory until the 24<sup>th</sup> century B.C. (Velušček, Čufar 2003, pp. 123-158, cf. Parzinger 1984, Pl. 4).

Later settling in Ljubljansko barje has been much less researched. In the south-west of the area there is a settlement which can be dated to the Early Bronze Age on the basis of pottery finds. Such a dating is further confirmed by the radiocarbon analysis of a sample taken from a wheel, which

vici 2. tisočletja pr. Kr., ko so na morebitne poselitvene točke sprva kazali le par fragmentov litzenske keramike, litzenska skleda in ornamentirano bodalo (npr. Gabrovec 1983, T. 1,1, T. 1,2, T. 1,3, T. 1,6; Parzinger 1984, Taf. 4,9, Taf. 8,19).

V katalogu o depojskih in posameznih kovinskih najdbah bakrene in bronaste dobe Slovenije (Šinkovec 1995), na str. 99 piše, da je bilo bodalo (št. 193. IG) najdeno leta 1876 pri izkopavanjih koliščarske naselbine na Igu in, da ga prvi omenja W. Schmid (Šmid 1909, 118, Abb. 22, T. 4,6). Našel naj bi ga K. Dežman, ležalo pa naj bi približno 1 m nad naselbinskimi najdbami, kar kasneje povzame tudi A. Gaspari (Gaspari 2002, 39; 2004, 41).

Najdbo dejansko prvi omenja in opiše D. Dežman oziroma K. Deschmann (Deschmann 1877, 474-475). Iz poročila izvemo, da je bila odkrita leta 1876, v drugi sezoni raziskovanja kolišč na Ižanskem. O podrobnejših okoliščinah odkritja v literaturi ni podatkov, kar skoraj stoletje pozneje navede tudi S. Gabrovec (Gabrovec 1971, 88). Slednje lahko trdimo tudi za litzensko keramiko z Iga in litzensko skledo z Notranjih Goric (glej Schmid 1910, 96a, Fig. 7), saj postaja vedno bolj jasno, da v zvezi z odkritjem omenjenih najdb bolj natančni horizontalnostratigrafski podatki niso bili zabeleženi. Še več, danes ugotavljamo, tako za območje ižanskih kolišč, kot tudi za Notranje Gorice, da gre za točki, ki sta bili v prazgodovini večkrat poseljeni (npr. Gabrovec 1983, 24, 26, 31; Parzinger 1984, 40, 44, Abb. 7).

Po S. Gabrovcu, naj bi litzenska keramika dokazovala zadnjo fazo kolišč na Ljubljanskem barju (Gabrovec 1983, 24; enako tudi Velušček 2004a, 79). Nasprotna ji je teza, z ornamentiranim bodalom v glavni vlogi, v kateri je predlagano, da naj bi bilo namerno (ritualno) odloženo na območju, kjer so nekoč bila kolišča (Gaspari 2002, 39; 2004, 41, prim. z Vuga 1982, 20). Slednje je po našem mnenju malo verjetno, saj se zdi, da so lahko litzenska, zelo verjetno naselbinska,<sup>1</sup> keramika, in bodalo sočasni.<sup>2</sup> In končno, tezo o obstoju kolišč v obdobju litzenske keramike so potrdila tudi nova odkritja. Nedavno so namreč potapljači v strugi Bistre dejansko odkrili kolišče s tako ornamentirano keramiko (Gaspari, Erič 2007, 10-19, T. 2,1, T. 2,3, T. 2,4, T. 13,1), kar je zagotovo dokaz, da so v tem času na Ljubljanskem barju še vedno gradili kolišča. Upravičeno lahko domnevamo, da so bila nekatera izmed njih postavljena tudi v Notranjih Goricah ter na območju kolišč pri Igu. Novejše raziskave tudi kažejo, da je prišlo na Ljubljanskem barju v obdobju po litzenski keramiki do korenite spremembe v poselitvi. Vzrok naj bi bil v dokončnem izginitju jezera in zamočvirjanju celotnega območja (Vuga 1982, 20; Toškan 2005, 95; Velušček 2005a, 77-78). Pomenljivo je tudi dejstvo, da proti koncu srednje oziroma v mlajši bronasti dobi in tudi še pozneje človek na Ljubljanskem barju več ne postavlja kolišč, temveč gradi naselbine na trdnih tleh, na obrobju (Vuga 1980, 199-210; Velušček 2005a, 73-89).

1 Naj omenimo najdbe litzenske keramike iz naselbin, ki so bile odkrite v okviru izgradnje slovenskega avtocestnega križa (npr. Strmčnik Gulič 2001, 120, sl. 5, sl. 6; Horvat 2003, 177-178; Kerman 2003, 160-162; Kruh 2003, 179-180; Strmčnik Gulič 2003, 237-238; Šavel 2003, 211-212).

2 O tem, da je mogoče govoriti o litzenski keramiki in ižanskem bodalu kot o sočasnih najdbah, glej in prim. pri Gabrovcu 1983, 31-32; Vinski-Gasparini 1983, 484-491; Neugebauer 1994, 141, Abb. 78; Turk 2007, 211-215.

resulted in an age of 3785 ± 100 BP (Z-1934), that is 2150 cal B.C. (Dirjec 1991, pp. 193-206, Pl. 1 – Pl. 5). This is similar to the period of so-called Litzen Pottery, generally dated to the first half of the 2<sup>nd</sup> millennium B.C., since the possible settlement venues were first suggested by several fragments of Litzen Pottery, a Litzen bowl and a decorated dagger (e.g. Gabrovec 1983, Pl. 1,1, Pl. 1,2, Pl. 1,3, Pl. 1,6; Parzinger 1984, Pl. 4, 9, Pl. 8, 19).

In the Catalogue of the Hoards and Individual Metal Finds from the Copper and Bronze Ages in Slovenia (Šinkovec 1995), on page 99 it is stated that the dagger (No. 193 Ig) was found in 1876 during the excavation of the pile-dwelling at Ig, and that it was first mentioned by W. Schmid (Šmid 1909, p. 118, Abb. 22, Pl. 4, 6). It was allegedly discovered by K. Dežman, lying approximately 1 m above other settlement finds, which was later repeated also by A. Gaspari (Gaspari 2002, p. 39; 2004, p. 41).

In reality, the find was first mentioned and described by D. Dežman, that is, K. Deschmann (Deschmann 1877, pp. 474-475). From his report we can conclude that it was discovered in 1876, during the second season of the explorations of the pile-dwellings at Ig. The literature does not contain any more detailed information about the circumstances of the discovery – a fact stated almost a century later by S. Gabrovec (Gabrovec 1971, p. 88). The same can be said of the Litzen Pottery from Ig and of the Litzen bowl from Notranje Gorice (see Schmid 1910, p. 96a, Fig. 7), so it becomes much clearer that in relation to the discovery of these finds any more detailed horizontal stratigraphic data were not recorded. However, nowadays we consider that the area of the pile-dwellings both at Ig and at Notranje Gorice are places that were settled multiple times during prehistory (e.g. Gabrovec 1983, pp. 24, 26, 31; Parzinger 1984, pp. 40, 44, Abb. 7).

According to S. Gabrovec, the Litzen pottery is evidence of the last phase of the pile-dwellings in Ljubljansko barje (Gabrovec 1983, p. 24; the same in Velušček 2004a, p. 79). A counter-theory focuses on the decorated dagger and suggests that it was deliberately (ritually) left in this area where pile-dwellings used to stand (Gaspari 2002, p. 39; 2004, p. 41, cf. Vuga 1982, p. 20). In our opinion, the latter is rather unlikely, if we know that the Litzen pottery – most probably produced in the settlement<sup>1</sup> – and the dagger were contemporary.<sup>2</sup> Finally, the hypothesis on the existence of pile-dwellings in the Litzen Pottery period has also been confirmed by the latest discoveries. Namely, recently the divers found a pile-dwelling and pottery with the same type of decoration in the river-bed of the Bistra (Gaspari, Erič 2007, pp. 10-19, Pl. 2, 1, Pl. 2, 3, Pl. 2, 4, Pl. 13, 1), which certainly proves that at that time pile-dwellings were still built in Ljubljansko Barje. We could rightfully assume that some of them were also erected at Notranje Gorice, and in the area of pile-dwellings at Ig. The recent research also indicates that in Ljubljansko Barje, in the Litzen Pottery period, a radical change in the settlement pattern took place. It was probably caused by the final disappearance of the lake and the transformation of the entire region into a swamp (Vuga 1982, p. 20; Toškan 2005, p. 95; Velušček 2005a, pp. 77-78). Another significant fact is that in the late Middle Bronze Age or in the Late Bronze Age and even later, people who lived in Ljubljansko Barje did not erect pile-dwellings, but rather built dwellings on mineral

1 We can mention the finds of the Litzen Pottery in settlements that have been discovered during the construction of the Slovenian motor-way intersection (e.g. Strmčnik Gulič 2001, p. 120, Fig. 5, Fig. 6; Horvat 2003, pp. 177-178; Kerman 2003, pp. 160-162; Kruh 2003, pp. 179-180; Strmčnik Gulič 2003, pp. 237-238; Šavel 2003, p. 211-212).

2 For more on the Litzen pottery and the Ig dagger's contemporary finds see also examples in Gabrovec 1983, pp. 31-32; Vinski-Gasparini 1983, pp. 484-491; Neugebauer 1994, p. 141, Abb. 78; Turk 2007, pp. 211-215.



Sl. 1 Kalup; Stare gmajne, 2004. Foto: D. Valoh.  
Fig. 1 Mould; Stare gmajne, 2004. Photo by D. Valoh.

### Metallurški pripomočki s kolišč Ljubljanskega barja

Najstarejši dokazi o predelavi bakra v Starem svetu izvirajo iz 8. tisočletja pr. Kr., ko se v Anatoliji pojavijo prve kovane jagode in šila iz samorodnega bakra. Moralo pa je miniti skoraj tri tisoč let, da pride do dejanskega začetka metalurške dejavnosti, ki se kmalu zatem, v sredi 5. tisočletja, pod vplivom vzhoda, že intenzivno razvija tudi v jugovzhodni Evropi ter se nato vzdolž Karpatov in Alp širi proti severozahodu (Cevey et al. 2006, 25; Gleirscher 2007, 93-110). Gre za dogajanje, ki je pomagalo spreminjati svet (Lichardus 1991, 27), v prvi vrsti območja, kjer je bilo najti primerno surovino (Strahm 1994, 35; Velušček 2005b, 213-215; Gleirscher 2007, 93-110).

Že dalj časa je znano, da je tudi hribovita Slovenija razmeroma bogata z bakrovo rudo. V znatnih količinah jo je najti v pasu od Posavskega hribovja preko Škofje Loke do Cerknega, na Pohorju ter v Karavankah (glej Durman 1983, 9, 11; Velušček, Greif 1998, 33-36). Z bakrom je bogata tudi Koroška v Avstriji, nedaleč proč (Vahlkampf 1995, Abb. 12). Bogastvo nahajališč daje slutiti, da je prazgodovinski človek za izdelovanje bakrenih predmetov zelo verjetno izkoriščal tudi domačo surovino (glej Durman 1983, 67; Teržan 1983, 58; Velušček, Greif 1998, 31-53; Velušček 2004b, 297-306). Po hipotezi A. Veluščka (Velušček 2006a, 44-45), naj bi se prvi iskalci bakra na Ljubljanskem barju pojavili že v 5. tisočletju pr. Kr., za kar pa še ni materialnih dokazov. Kakor koli že, na Ljubljanskem barju najstarejši dokazi o avtohtoni metalurški dejavnosti izvirajo iz 4. tisočletja.

Na kolišču Hočevarica (karta 1), v naselbini, ki je datirana



Sl. 2 Detajl kalupa; Stare gmajne, 2004. Foto: D. Valoh.  
Fig. 2 Mould detail; Stare gmajne, 2004. Photo by D. Valoh.

soil, on the margins (Vuga 1980, pp. 199-210; Velušček 2005a, pp. 73-89).

### Metallurški pripomočki s kolišč Ljubljanskega barja

The oldest evidence of copper processing in the Old World originates from the 8<sup>th</sup> millennium B.C., when the first metal beads and awls appeared in Anatolia, made of native copper. It took almost another three thousand years for the real beginning of metalworking, but soon afterwards, in the middle of the 5<sup>th</sup> millennium, under the influence of the East, it was developing very intensively even in south-eastern Europe, and from there it spread towards the north-west along the Carpathians and the Alps (Cevey et al. 2006, p. 25; Gleirscher 2007, pp. 93-110). This is considered to be one of the developments that helped change the world (Lichardus 1991, p. 27) in the first regions mentioned, where the appropriate raw material could be found (Strahm 1994, p. 35; Velušček 2005b, pp. 213-215; Gleirscher 2007, pp. 93-110).

It has been known for some time already that hilly Slovenia is also rich in copper ore. Significant quantities of that ore can be found in the area stretching from the Posavina hills through Škofja Loka to Cerknjo, in the Pohorje and in the Karavanken (see Durman 1983, pp. 9, 11; Velušček, Greif 1998, pp. 33-36). The nearby Austrian region of Carinthia is also rich in copper (Vahlkampf 1995, Abb. 12). Numerous sites indicate that prehistoric man probably used the local raw material to produce copper objects (see Durman 1983, p. 67; Teržan 1983, p. 58; Velušček, Greif 1998, pp. 31-53; Velušček 2004b, pp. 297-306). According to A. Velušček, (Velušček 2006a, pp. 44-45), the first copper prospectors appeared in Ljubljansko Barje as early as the 5<sup>th</sup> millennium B.C., but there is still no material evidence that could corroborate this thesis. In any case, the oldest evidence of autochthonous metalworking activity in Ljubljansko Barje originates from the 4<sup>th</sup> millennium B.C.

At the pile-dwelling site of Hočevarica (Map 1), in the settlement dated to the first half of the 36<sup>th</sup> century, the remains of a mould<sup>3</sup> have been found with traces of copper on the inside, as well as a fragment of pure copper which resembles a drop (Velušček 2004c, pp. 51-52, Fig. 3.1.27, Fig. 3.1.28, Šmit 2004, pp. 69-71). Analysis has shown that the mould had

<sup>3</sup> The find was at first considered to be a casting or melting vessel (Velušček 2004c, pp. 51-52, and comp. with Durman 2000, p. 95).



Sl. 3 Kalup; Stare gmajne, 2007. Foto: D. Veranič.  
Fig. 3 Mould; Stare gmajne, 2007. Photo by D. Veranič.

v prvo polovico 36. stoletja, so bili najdeni ostanki kalupa<sup>3</sup> s sledovi bakra v notranjosti ter tudi kapljici podoben košček skoraj čistega bakra (Velušček 2004c, 51-52, sl. 3.1.27, sl. 3.1.28; Šmit 2004, 69-71). Analiza je pokazala, da je bil kalup v stiku z bakrom iz nesulfidne rude, čeprav tudi uporaba bakra iz sulfidne rude ni povsem izključena (Šmit 2004, 69-70).

Na podobno najdbo<sup>4</sup> smo naleteli tudi na Maharskem prekopu (karta 1), na kolišču, ki datira v sredo 4. tisočletja pr. Kr. (ustno K. Čufar). Sledovi bakra v delno ohranjeni posodi dokazujejo, da se je uporabljala v metalurškem procesu (Šmit, Nečemer 1998, 55-61). Analiza kaže, da je posoda prišla v stik z arzenovim bakrom iz sulfidne rude (Šmit, Nečemer 1998, 59).

Z Maharskega prekopa izvirajo tudi ostanki keramične posode, ki na kalup spominja po obliki (Velušček, Greif 1998, 32, sl. 1). V njej sledov metalurške dejavnosti namreč nismo odkrili (Šmit, Nečemer 1998, 59).

Iz približno srede druge polovice 4. tisočletja pr. Kr. izvirajo najdbe (Velušček 2002, 51-57; 2005b, 209-210) s kolišča Stare gmajne pri Verdu (karta 1). Leta 2004 je ekipa Inštituta za arheologijo ZRC SAZU v enem izmed drenažnih jarkov na zahodnem robu naselbine (sl. 6) odkrila več odlomkov najmanj dveh kalupov. Enega je mogoče sestaviti skoraj v celoti (sl. 1), preostali ostanki pa pripadajo najmanj še eni posodi

3 Sprva je bila najdba uvrščena med livarske oziroma talilne posode (Velušček 2004c, 51-52, in prim. z Durman 2000, 95).

4 Velja enako kot v op. 3 (glej Velušček, Greif 1998, 32-33, sl. 2, Šmit, Nečemer 1998, 59, in prim. z Durman 2000, 95).



Sl. 4 Južni profil sonde 3 z označenim mestom odkritja kalupa; Stare gmajne, 2007. Foto: D. Veranič.

Fig. 4 Southern profile of test-pit 3 with an indication of where the mould was discovered; Stare gmajne, 2007. Photo by D. Veranič.

contained copper smelted from sulphide ore, so that the processing of copper made from sulphide ore cannot be entirely excluded (Šmit 2004, pp. 69-70).

We came across a similar find<sup>4</sup> at Maharski Prekop (Map 1), in the pile-dwelling settlement dated to the middle of the 4<sup>th</sup> millennium B.C. (K. Čufar, personal communication). The copper traces in a partially preserved vessel testify that the vessel was used in the metalworking process (Šmit, Nečemer 1998, pp. 55-61). Analysis has indicated that the vessel had been in contact with arsenic copper smelted from sulphide ore (Šmit, Nečemer 1998, p. 59).

Fragments of a pottery receptacle were also found at Maharski Prekop. By its shape, it resembles a mould (Velušček, Greif 1998, p. 32, Fig. 1), but no traces of metal processing have been discovered on it (Šmit, Nečemer 1998, p. 59).

The finds (Velušček 2002, pp. 51-57; 2005b, pp. 209-210) from the pile-dwelling site of Stare Gmajne near Verd (Map 1) originate from approximately the middle of the second half of the 4<sup>th</sup> millennium B.C. In 2004, in one of the drainage canals on the western side of the settlement (Fig. 6), a team from the Institute of Archaeology of the SRC of the SASA discovered several fragments of at least two moulds. One of them could be reconstructed almost entirely (Fig. 1), while the remaining fragments belong to at least one vessel intended for a similar purpose. The laboratory analyses, carried out by Z. Milič of the National Museum of Slovenia, showed that traces of copper could be found on the inside of the almost-entirely preserved mould (Fig. 2). Considering the results of the previous explorations (cf. Velušček 2004b, pp. 297-306), the find is not a surprising one. An appropriate analogy can be found in the melting pot (Ecsedy 1977, p. 163, Pl. 11, 4, Pl. 12, 1; 1990, Fig. 6) or mould (Durman 2000, p. 95) from the site of Lánycsók of the Boleráz Group in Hungary.

In 2007, while exploring some test-pits at Stare Gmajne,

4 The comment from the footnote 3 also applies here (see Velušček, Greif 1998, pp. 32-33, Fig. 2, Šmit, Nečemer 1998, p. 59, and comp. with Durman 2000, p. 95).

podobne namembnosti. Laboratorijske raziskave, ki jih je opravil Z. Milič iz Narodnega muzeja Slovenije, so pokazale, da je v notranjosti skoraj v celoti ohranjenega kalupa najti baker (sl. 2). Glede na rezultate dosedanjih raziskav (prim. z Velušček 2004b, 297-306), najdba ne preseneča. Dobro analogijo zanjo pa najdemo v talilni posodi (Ecsedy 1977, 163, T. 11,4, T. 12,1; 1990, Fig. 6) oziroma kalupu (Durman 2000, 95) z najdišča boilerške skupine Lánycsók na Madžarskem.

Leta 2007 smo s sondiranjem na Starih gmajnah v neposredni bližini jarka blizu mesta (sl. 6) odkrili fragmentov kalupov ponovno naleteli na sledove metalurške aktivnosti. V sondi 3 (5 × 3 m) smo našli več fragmentov posod, ki so podobni leta 2004 najdenim odlomkom. Na nekaterih fragmentih je opaziti sledove bakra. Izredno pomembna najdba z vidnimi ostanki bakra pa je tudi enodelni kalup (sl. 3), ki je bil odkrit leta 2007 in se je nahajal na dnu kulturne plasti v južnem profilu sonde 3 (sl. 4).

Z omembo najdb s Starih gmajn zaključujemo z nizom metalurških pripomočkov, ki izvirajo s kolišč iz 4. tisočletja pr. Kr. na Ljubljanskem barju. Sledijo jim najdbe iz 3. tisočletja. Večino je našel Dežman (Deschmann 1878, 6-8) in so bile obravnavane že v več študijah (npr. Šmid 1909, 118-123; Durman 1983; Greif 1997, 50-54; Velušček, Greif 1998, 36-46). V novejšem času je bil odkrit le fragment dvodelnega kalupa (Velušček, Čufar 2003, 129, T. 4,10). Izvira s kolišča somogyvár-vinkovške kulture Založnica pri Kamniku pod Krimom (karta 1), katerega na podlagi radiokarbonskih datacij in dendrokronoloških raziskav postavljamo okvirno v 25. stoletje pr. Kr. (Velušček, Čufar 2003, Pril. 1).

Z omenjenega najdišča pa fragment kalupa ni edina najdba te vrste. Pred približno pol stoletja so odkrili tudi valjasti nastavek za meh. Izviral naj bi iz jarka Založnice (Jesse 1955, 265, T. 2,14).

Iz obdobja na koncu 3. in v okvirno prvi polovici 2. tisočletja pr. Kr. na Ljubljanskem barju ni neposrednih dokazov za obstoj metalurške dejavnosti, čeprav indici zanjo so. Slednje kažejo predvsem najdbe in najdišča iz zgodnjega 2. tisočletja. V prvi polovici 2. tisočletja so na Ljubljanskem barju prisotni nosilci litzenske keramike, za katere se zdi, da jih moremo povezovati z metalurško dejavnostjo in iskanjem bakrove rude (Teržan 1983, 58-60). Tezi v prid govore tudi kovinske najdbe iz približno istega obdobja (npr. Gaspari 2002, 36; 2004, 41; Pavlin 2006, 69-83). Med njimi je treba najprej omeniti bodalo z območja ižanskih kolišč (npr. Pavlin 2006, sl. 7,2) ter zgodnje meče z ročajno ploščo tipa Sauerbrunn z Lavrice in iz Ljublanice (Šinkovec 1995, T. 29,199, T. 29,200; Pavlin 2006, sl. 6; Turk 2007, 214-215). Izvor teh mečev še ni ugotovljen. Za kratka meča, z Lavrice in iz Ljublanice, P. Pavlin (Pavlin 2006, 77) meni, da je njun izvor iskati v vzhodnih oziroma jugovzhodnih Alpah, kar zagovarja tudi P. Turk (Turk 2007, 214).

### Metalurška dejavnost na koliščih

Iz analogij v starih kulturah Azije, Afrike in obeh Amerik vemo, da so imeli kovači pomemben položaj v družbi. M. Eliade (1983, 93) o enem takšnih primerov piše: »Kovač na Javi

in the immediate vicinity of a ditch passing by the location (Fig. 6) in which the mould fragments had been discovered, we came across traces of metallurgical activity. In test-pit 3 (5 × 3 m), we found several fragments of vessels, similar to the fragment discovered in 2004. On some of the fragments, traces of copper could be discerned. Yet another very significant find which contained visible traces of copper is a single-piece mould (Fig. 3), discovered in 2007 at the bottom of the cultural layer in the southern profile of test-pit 3 (Fig. 4).

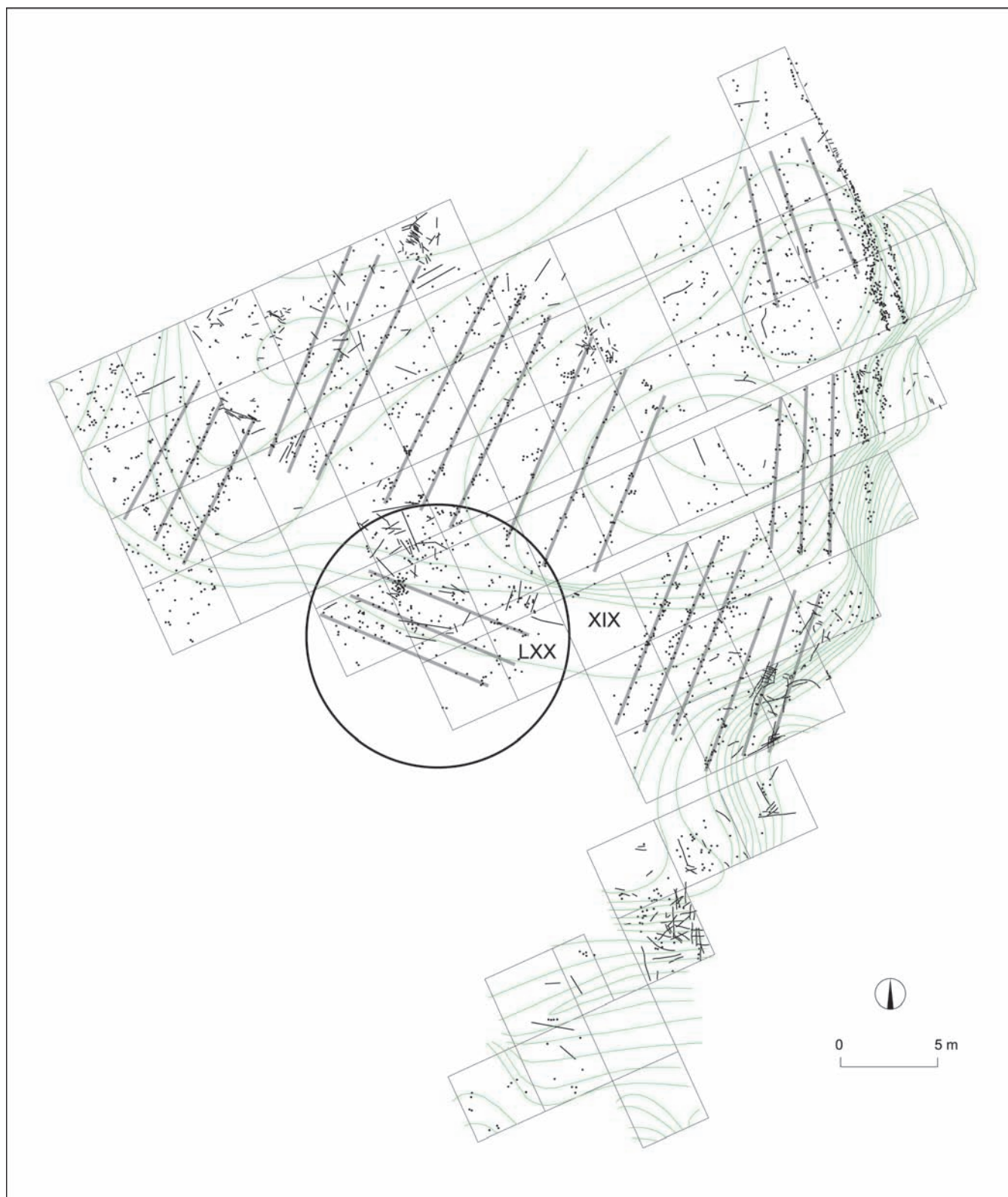
We shall conclude the discussion of the Stare Gmajne finds with a range of metalworking utensils discovered in Ljubljansko Barje pile-dwelling settlements, originating from the 4<sup>th</sup> millennium B.C. They were followed by finds dating from the 3<sup>rd</sup> millennium B.C., mostly discovered by Dežman (Deschmann 1878, pp. 6-8), which have already been discussed in several studies (e.g. Šmid 1909, pp. 118-123; Durman 1983; Greif 1997, pp. 50-54; Velušček, Greif 1998, pp. 36-46). In recent years, a fragment of a two-piece mould has been discovered (Velušček, Čufar 2003, p. 129, Pl. 4, 10). It originates from the pile-dwelling settlement of Založnica near Kamnik pod Krimom that belonged to the Somogyvár-Vinkovci culture (Map 1). On the basis of radiocarbon dating and dendrochronological analysis, the site has been dated approximately to the 25<sup>th</sup> century B.C. (Velušček, Čufar 2003, App. 1).

The mould fragment is not the only find of its kind discovered at this site. Approximately half a century ago, a cylindrical end piece that used to be attached to the bellows was discovered there. It was allegedly found in the Založnice canal (Jesse 1955, p. 265, Pl. 2, 14).

There is no direct evidence of metallurgical activity in Ljubljansko Barje in the late 3<sup>rd</sup> and the first half of the 2<sup>nd</sup> millennium B.C., although there are some indications that it did exist. These are primarily the finds from the sites originating in the early 2<sup>nd</sup> millennium B.C. In the first half of the 2<sup>nd</sup> millennium B.C., people belonging to the Litzen Pottery culture were present in Ljubljansko Barje, and it is known that they can be linked to metalworking and prospecting for copper ore (Teržan 1983, pp. 58-60). This is further confirmed by metal finds from approximately the same period (e.g. Gaspari 2002, p. 36; 2004, p. 41; Pavlin 2006, pp. 69-83). Among them, we should first of all mention the dagger originating from the area of pile-dwellings at Ig (e.g. Pavlin 2006, Fig. 7, 2) and early tanged swords of the Sauerbrunn type from Lavrica and the Ljublanica (Šinkovec 1995, Pl. 29, 199, Pl. 29, 200; Pavlin 2006, Fig. 6; Turk 2007, pp. 214-215). The source of the swords is still uncertain. As far as the short swords from Lavrica and from the Ljublanica River are concerned, P. Pavlin (Pavlin 2006, p. 77) believes that their source should be sought in the eastern or south-eastern Alps, and this opinion is also held by P. Turk (Turk 2007, p. 214).

### Metallurgical activity in pile-dwelling settlements

On the basis of analogies in the ancient cultures of Asia, Africa and both Americas, we know that metal workers held a significant position in society. To consider one such example, M. Eliade (1983, p. 93) wrote: "Nowadays a blacksmith in Java is a poor man, but there are some indications that he still holds a privileged position in his community. If he is a regular blacksmith, he is called 'pande' (expert), and if he produces weapons,



Sl. 5 Maharski prekop, načrt izkopavanj 1970-1977 (po Bregant 1996). Obkroženo je območje domnevne livarske delavnice. Pripravila: D. Valoh in T. Korošec.

Fig. 5 Maharski prekop, excavation plan 1970-1977 (by Bregant 1996). The area of the probable casting workshop is circled. Prepared by D. Valoh and T. Korošec.

je danas siromašan čovjek, no neki znaci govore da još uvijek ima povlašten položaj u zajednici. Zovu ga pande (stručnjak) kada je običan kovač, a empu ili kyai (gospodin, gospodar) kada je kovač oružja. No u stara vremena taljenje se smatralo tajanstvenim poslom i čitava jedna literatura nastala je u vezi

he is addressed as 'empu' or 'kyai' (lord, master). In ancient times, smelting was considered to be a magical activity, and there is an entire literature that was created around the blacksmith who produces krises (Malayan daggers), who is often worshipped like a king. Until recently, the blacksmith occupied a position of



s kovačem koji pravi krisove (malajski bodež) i koga često štujaju poput kralja. Kovač je donedavno zauzimao počastan položaj na dvoru i u određenim prilikama mogao je zastupati cjelu zajednicu. U staro doba na Javi su odnosi između kovača i kralja bili poput onih između krvne braće. Genealogija kovača kako i genealogija kraljeva sezale su sve do bogova.«

Pomembnega statusa pa kovači niso pridobili brez razloga. Tudi iz arheoloških virov vemo, da je bilo ukvarjati se z metalurško dejavnostjo precej nevarno početje (npr. Ottaway 1994, 26-29). Pri topljenju rude in taljenju kovine je bilo potrebno doseči zelo visoko temperaturo. Tališče bakra je npr. pri 1083 °C (Matuschik 1998, 211). Ogenj je netil iskre, ki so bile stalna grožnja naselbini. Med metalurškim procesom, še posebej, ko se je uporabljalo kompleksnejšo rudo, so se sproščali strupeni plini, ki so zastrupljali kovača in okolico (npr. Durman 2004, 34).

Obstajajo torej razlogi, družbeni in okoljevarstveni, ki podpirajo hipotezo, da je v okviru naselbin treba iskati ločen prostor, kjer se je odvijala metalurška dejavnost. Dober primer je Gradac z »Megaronom ljevača bakra« na Vučedolu, ki ga je v vučedolskem obdobju od naselbine ločeval globok jarek. Na Gradacu pa ni bila samo delavnica temveč tudi svetišče posvečeno nekemu vučedolskemu bogu ognja ali livarstva (Durman 2004, 26, 28, 34). Gre za model za katerega se zdi, da mu lahko sledimo tudi na koliščarskih naselbinah Ljubljanskega barja.

Arheološko najdišče Maharski prekop pri Igu (karta 1) je med letoma 1970 in 1977 bolj podrobno raziskovala T. Bregant (Bregant 1996, 27). Naselbino je sestavljalo več samostojnih koliščarskih stavb, ki so bile s kopenske strani obdane z dvojno palisado (sl. 5, glej Gabrovec 1983, 30, Greif 1997, 26, 27; Velušček 2001, 76-77; 2005c, 202). Prve radiokarbonske datacije kažejo na izredno dolgo poselitveno sekenco (Bregant 1975, 49). Nasprotno pa arheološke najdbe (npr. Parzinger 1984, Abb. 7; Velušček 2001, 93-96) in najnovije radiokarbonske datacije (Mlekuž et al. 2006, Tab. 1) izpričujejo, da je naselbina obstajala krajše obdobje, kar potrjujejo tudi rezultati dendrokronoloških raziskav.

Leta 2005 je ekipa Inštituta za arheologijo ZRC SAZU na že raziskanem območju Maharskega prekopa zastavila več sond. Tako smo na cenovno sprejemljiv način pridobili vzorce za dendrokronološke raziskave. Analiza rezultatov še poteka, trenutno kaže, da Maharski prekop ne odstopa od dendrokronološko raziskanih naselbin Ljubljanskega barja (Velušček 2005b, 213-214). Zdi se, da je kolišče obstajalo manj kot stoletje v obdobju okoli 3500 pr. Kr. (ustno K. Čufar).

Za našo študijo pa je pomembno, da sta bili na Maharskem prekopu odkriti dve najdbi, ki ju povezujemo z metalurško dejavnostjo (Velušček, Greif 1998, 32-33). T. Bregant ju je našla v sosednjih kvadrantih XIX in LXX, ki ležita v bližini skupine treh drugače orientiranih vrst s koli, kot je to sicer za Maharski prekop običajno, kjer izrazito prevladuje jugozahodno-severovzhodna orientacija (sl. 5). Važno je tudi, da skupine kolov, ki so razporejeni v tri vrste ustreza-

honour at court, and in certain situations he could stand for the entire community. In ancient times, the relationship between the blacksmith and the king in Java resembled the relationship between blood brothers. The genealogy of blacksmiths – as with the genealogy of royalty – went back all the way to gods."

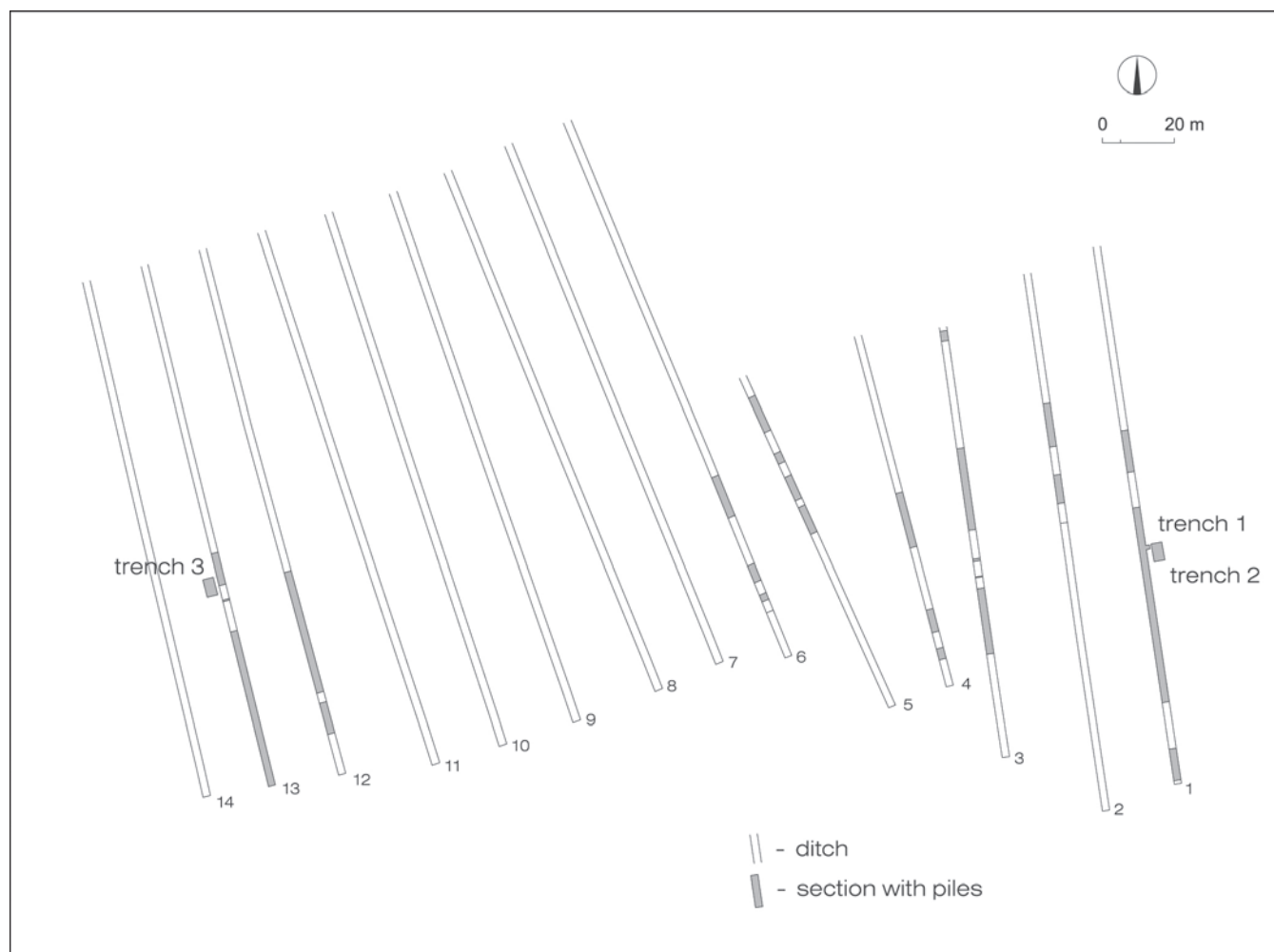
Metalworkers were not accorded such a distinguished position without reason. The archaeological sources also show that metalworking was a very dangerous activity (e.g. Ottaway 1994, pp. 26-29). The smelting of ore and metal requires very high temperature. For example, the melting point of copper is 1083 °C (Matuschik 1998, p. 211). The fire released sparks, which were constantly threatening the settlement. On top of that, if a complex ore was used, the metal processing was accompanied by toxic gases that suffocated the smelter and the surrounding area (e.g. Durman 2004, p. 34).

Therefore, there are reasons – both societal and environmental – that support a hypothesis that within a settlement an isolated place had to be found for the metallurgical activity. A good example of this is Gradac, with its "Megaron of the Copper Smelter" at Vučedol, which was separated from the rest of the settlement by a deep ditch. Gradac contained not only a workshop, but also a sanctuary dedicated to a Vučedol god of fire or smelting (Durman 2004, pp. 26, 28, 34). It seems that this model can be easily traced in the pile-dwelling settlements of Ljubljansko Barje.

The archaeological site of Maharski Prekop near Ig (Map 1) was extensively researched between 1970 and 1977 by T. Bregant (Bregant 1996, p. 27). The settlement consisted of several detached pile-dwellings, which were surrounded on the coastal side by a double palisade (Fig. 5, see Gabrovec 1983, p. 30; Greif 1997, pp. 26, 27; Velušček 2001, pp. 76-77; 2005c, p. 202). The first radiocarbon dating indicated an exceptionally long settlement sequence (Bregant 1975, p. 49). However, the archaeological finds (e.g. Parzinger 1984, Abb. 7; Velušček 2001, pp. 93-96) and the latest radiocarbon dating (Mlekuž et al. 2006, Pl. 1) testify that the settlement existed for a short period of time. This has also been confirmed by the results of dendrochronological analysis.

In 2005, a team from the Institute of Archaeology of the SRC of the SASA made several test-pits in the previously researched area of Maharski prekop. This was a financially acceptable way of getting samples for a dendrochronological analysis. The results are still being discussed, but at the moment they indicate that Maharski prekop falls within the same period as other settlements of Ljubljansko barje that have been subjected to dendrochronological analysis (Velušček 2005b, pp. 213-214). It would appear that the settlement existed for less than a century in the period around 3500 B.C. (K. Čufar, personal communication).

For our purpose it is important that two finds were discovered at Maharski prekop which can be linked to metalworking (Velušček, Greif 1998, pp. 32-33). T. Bregant found them in the neighbouring quadrants XIX and LXX, which lay in the vicinity of a group of three differently oriented rows of poles – this being rather common at Maharski prekop, where the predominant orientation is a northeast-southwest one (Fig. 5). It is important that the groups of poles, distributed



Sl. 6 Načrt raziskanega območja na koliščarski naselbini Stare gmajne. Pripravila: D. Valoh in T. Korošec.  
 Fig. 6 Plan of the excavated area in the pile-dwelling settlement of Stare gmajne. Prepared by D. Valoh and T. Korošec.

jo tlorisom samostojnih stavb pravokotnih oblik (Velušček 2001, 76, sl. 23; 2005c, 202). Potrditev in analogijo najdemo npr. nedaleč proč, na sicer nekoliko mlajšem kolišču, v današnji strugi Iščice (Velušček et al. 2000, sl. 6).

Gre za ugotovitev, ki jo seveda lahko prenesemo tudi na skupino treh drugače orientiranih vrst s koli, kjer moremo govoriti o samostojni, drugače orientirani stavbi. Ob tem pa se najprej zastavlja vprašanje ali ni drugačna orientacija stavbe v bližini najdb metalurških pripomočkov zgolj navidezna. Mogoče je, da gre za kolibo, ki sploh ni sočasna z ostalimi stavbami na Maharskem prekopu, kar je sicer malo verjetno. Drugo vprašanje je, če lego morda ni pogojeval relief oziroma ovira, kot se je to zgodilo s stavbami, ki so bile postavljene vzdolž palisade (Velušček 2001, 76, sl. 23; 2005c, 202). Mogoče je tudi, da drugačna orientacija stavbe dejansko kaže na njen poseben status. Morda jo je uporabljal zelo pomemben član skupnosti. Predpostavljamo, da bi to lahko bil kovač.

Naslednje kolišče, ki ga v tem sklopu obravnavamo so Stare gmajne, ki se nahajajo na jugozahodu Ljubljanskega barja (karta 1). Vzhodni del najdišča je bil odkrit leta 1992, medtem ko je bil leta 1995 odkrit njegov zahodni del (sl. 6). Ekipa Inštituta za arheologijo ZRC SAZU je najdišče razisko-

in three rows, correspond to the ground plan of detached buildings of a rectangular shape (Velušček 2001, 76, Fig. 23; 2005c, p. 202). The confirmation and analogy for this can be found, for example, in the vicinity, at a somewhat later pile-dwelling settlement, located in today's river bed of the Iščica (Velušček et al. 2000, Fig. 6).

It seems to be a fact – and this fact can be easily applied to the three differently oriented rows of poles – that we can talk about some detached and differently oriented buildings. The first question that arises in connection with this is whether the different orientation of a building that stood in the vicinity of the finds of metalworking utensils is only apparent. It is possible that this was a dwelling which really was not contemporary with other dwellings at Maharski Prekop, but this is rather improbable. Another question is whether the position of the building was such due to the layout of the ground or of a barrier, as with the position of the dwellings standing along the palisade (Velušček 2001, p. 76, Fig. 23; 2005c, p. 202). It is also possible that the different orientation of the building indicated its special status. It may have been used by a particularly significant member of the group. We can assume that it could have been a metalworker.

The last pile-dwelling settlement that shall be discussed in this context is Stare gmajne, located in the south-west of

vala v letih 1995,<sup>5</sup> 2002,<sup>6</sup> 2004,<sup>7</sup> 2006<sup>8</sup> in 2007.<sup>9</sup> Odkriti del kolišča se razprostira na območju, ki presega 15.000 m<sup>2</sup> (sl. 6). Na podlagi podatkov iz drenažnih jarkov, ki se raztezajo z juga proti severu na razmaku od 10 do 20 m, lahko precej zanesljivo in natančno sledimo robu naselbine na severni in zahodni strani. Razvidno je tudi, da sta zahodni in vzhodni naselbinski del približno 120 m narazen (sl. 6).

Najdišče Stare gmajne je postalo znano po odkritju lese-nega kolesa in osi (npr. Velušček 2006b, 39-45). Atraktivnih najdb pa je več: npr. dva drevaka (Velušček 2005c, 203-204), otroški lok, ostanki preje itd. Keramične najdbe (glej Velušček 2006b, Fig. 6) kažejo, da gre za naselbino, ki jo lahko primerjamo s horizontom kolišč tipa Maharski prekop ter Blatna Brezovica po Parzingerju (Parzinger 1984, 51). Drugače povedano, Stare gmajne so mlajše od Hočevarice in starejše od vučedolskih naselbin pri Igu (Velušček 2004d, 260, Tab. 5.3.1). Relativno kronološko pozicijo podpirajo tudi rezultati dendrokronoloških raziskav in radiokarbonsko datiranje. Le-ti naselbino postavljajo v okvirno 33. oziroma 32. stoletje pr. Kr. (Velušček 2005b, 210). Dendrokronološke raziskave tudi kažejo, da, prostorski razpršenosti navkljub, gre za eno samo naselbino, ki je živela manj kot stoletje (ustno K. Čufar).

Leta 2004 smo, kot že omenjeno, v drenažnem jarku 13 na skrajnem severozahodnem delu naselbine med naselbinskimi najdbami<sup>10</sup> odkrili odlomke najmanj dveh kalupov.<sup>11</sup> Leta 2007 se je s sondiranjem v sondi 3, v neposredni bližini odkritja metalurških pripomočkov v jarku 13, število najdb te vrste povečalo. Ob tej priložnosti pa je bil najden še eden v celoti ohranjen kalup (sl. 3).

Takšen izbor najdb dokazuje, da je v neposredni bližini sonde 3 morala biti livarska delavnica. Kar je še bolj pomembno, gre za poseljeni prostor oziroma stavbo, morda več stavb, ki je odmaknjena od ostalih naselbinskih stuktur na zahodnem delu naselbine (sl. 6). Še zanimivejši so rezultati dendrokronoloških raziskav. Kažejo, da je bil prostor z območja sonde 3 v uporabi ves čas življenja v naselbini (ustno K. Čufar).

O livarski delavnici lahko govorimo tudi na Založnici (karta 1). Že omenjeni fragment dvodelnega kalupa (Velušček, Čufar 2003, 129, 134, sl. 2, T. 4,10) namreč izvira iz jarka 3, z območja z odsekoma 19-20 (sl. 7). Toda, čeprav se zdi, da je predel z odsekoma 19-20 v jarku 3 ločen od ostale naselbine, pozicija domnevne livarske delavnice glede na celotno naselbino ni tako razpoznavna kot na Starih gmajnah. Razlogov je več, naj navedemo samo najpomembnejša: 1. na mestu odkritja fragmenta kalupa meja naselbine še ni ugotovljena; 2. valjasti nastavek za meh je bil najden na

Ljubljansko barje (Map 1). The eastern part of the site was discovered in 1992, while its western part was located in 1995 (Fig. 6). A team from the Institute of Archaeology of the SRC of the SASA explored the site in 1995,<sup>5</sup> 2002,<sup>6</sup> 2004,<sup>7</sup> 2006<sup>8</sup> and 2007.<sup>9</sup> The uncovered part of the pile-dwelling settlement stretches over an area of 15,000 m<sup>2</sup> (Fig. 6). On the basis of the data collected from the drainage canals, stretching in a north-south direction every 10 to 20 m, we can follow the edge of the settlement on its northern and western sides with a high degree of probability and precision. It remains clear that the eastern and western parts of the settlement stood approximately 120 m apart (Fig. 6).

The site of Stare gmajne has become known for the discovery of a wooden wheel and axle (e.g. Velušček 2006b, pp. 39-45). There have been several attractive finds: for example, two dugouts (Velušček 2005c, pp. 203-204), a child-size bow, remains of yarn etc. The pottery finds (see Velušček 2006b, Fig. 6) indicate that this settlement can be compared to the pile-dwelling horizon of the Maharski prekop and Blatna Brezovica type according to Parzinger (Parzinger 1984, p. 51). In other words, the Stare gmajne settlement is younger than Hočevarice and older than the Vučedol Culture settlements at Ig (Velušček 2004d, p. 260, Pl. 5.3.1). Such a relative chronological position is further supported by the results of dendrochronological analyses and radiocarbon dating, which have dated the settlement to approximately the 33<sup>rd</sup> or 32<sup>nd</sup> century B.C. (Velušček 2005b, p. 210). The dendrochronological analyses have also shown that, regardless of the scattered position of the dwellings, this was a single settlement which existed for less than a century (K. Čufar, personal communication).

As I have already mentioned, in 2004, in drainage canal 13 in the north-western part of the settlement, among various settlement finds<sup>10</sup>, we discovered fragments of at least two moulds.<sup>11</sup> In 2007, when test-pit 3 was opened in the immediate vicinity of the finding-site of metalworking utensils from canal 13, the number of finds of this type increased. On that occasion yet another completely preserved mould was discovered (Fig. 3).

Such a selection of finds indicates that a smelting workshop was certainly located in the immediate vicinity of test-pit 3. More importantly, it was probably a settled area or a building, possibly several buildings, which were removed from other dwellings in the western part of the settlement (Fig. 6). The results of dendrochronological analyses are even more interesting. They show that the area in which test-pit 3 was opened was in use during the entire period of inhabitation in this settlement (K. Čufar, personal communication).

A smelting workshop can also be found at Založnica (Map 1). The above-mentioned fragment of a two-piece mould (Velušček, Čufar 2003, pp. 129, 134, Fig. 2, Pl. 4, 10) was found in canal 3, in the area covering sections 19-20 (Fig. 7). However, although it seems that the area covering sections 19-20 in canal 3 is separated from the rest of the settlement, the location of the presumptive smelting workshop within the entire

5 Topografija.

6 Dokumentiranje in vzorčenje lesa v jarkih 1-5, ter izkop sonde 1 ob jarku 1.

7 Dokumentiranje in vzorčenje lesa v jarkih 6-14.

8 Izkop sonde 2 vzdolž jarka 1.

9 Izkop sonde 3 vzdolž jarka 13.

10 Vertikalni koli, keramika, živalske kosti itd.

11 Skoraj v celoti ohranjen kalup je na sl. 1.

5 Topography.

6 Recording and sampling wood from canals 1-5, and opening of test-pit 1 near canal 1.

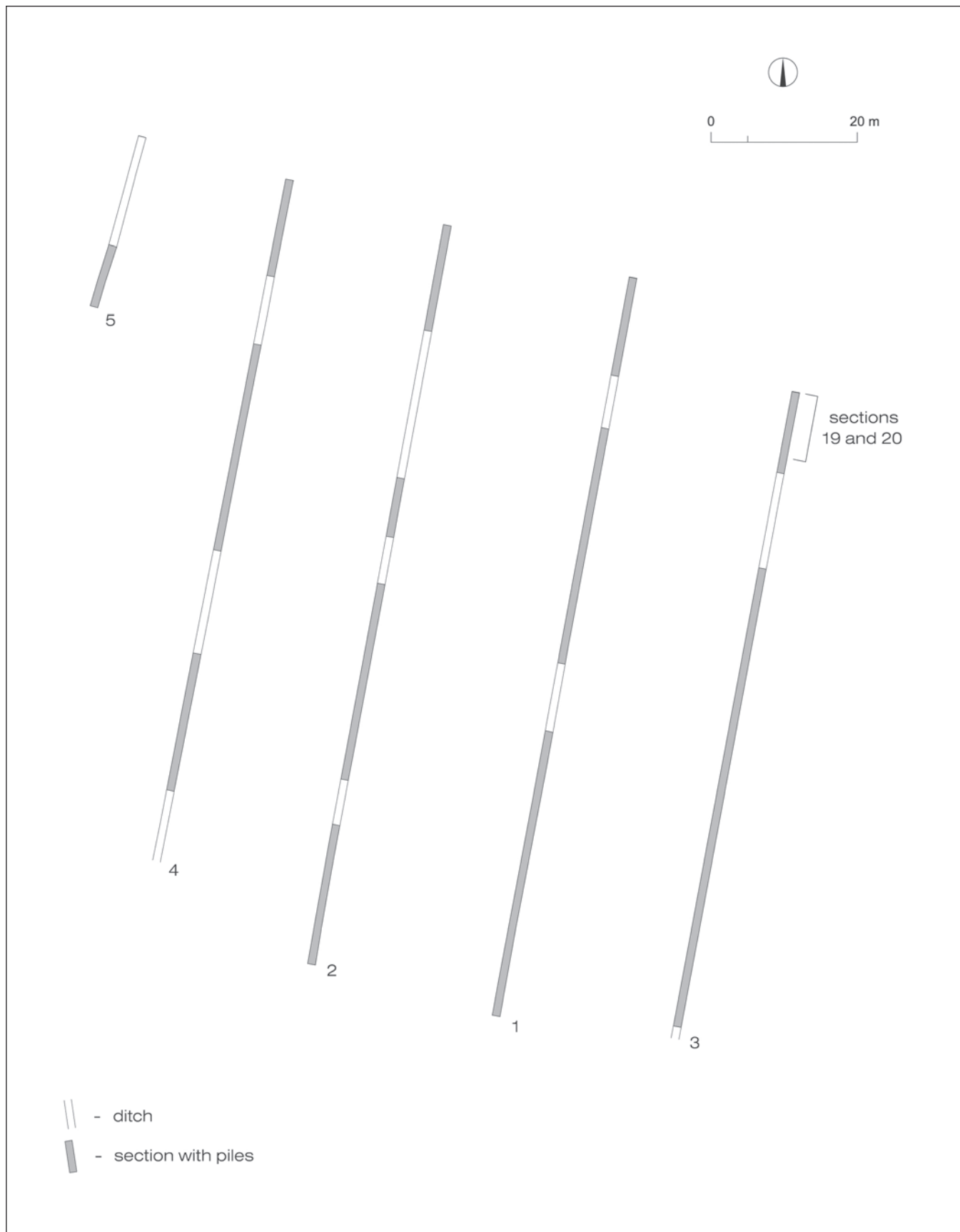
7 Recording and sampling wood from canals 6-14.

8 Opening of test-pit 2 along canal 1.

9 Opening of test-pit 3 along canal 13.

10 Vertical poles, pottery, animal bones etc.

11 The almost-entirely preserved mould can be seen in Fig. 1.



Sl. 7 Načrt raziskanega območja na koliščarski naselbini Založnica. Pripravila: D. Valoh in T. Korošec.  
Fig. 7 Plan of the excavated area of the pile-dwelling settlement of Založnica. Prepared by D. Valoh and T. Korošec.

drugem koncu naselbine - zelo verjetno izvira iz jarka Založnice (Jesse 1955, 265, T. 2,14), ki teče jugozahodno oziroma zahodno od na sliki 1 označenih jarkov.

Dokaj prepričljive podatke o livarskih delavnicah torej imamo z dveh oziroma s treh najdišč Ljubljanskega barja: Maharskega prekopa, Starih gmajn in morda tudi z Založnice. Zagotovo pa to niso edina kolišča, kjer jih lahko pričakujemo. Že Dežman je našel najdbe, ki zagotovo kažejo na njihov obstoj (Deschmann 1877, 475; 1878, 6-8). Žal, o tem ni ohranjenih nobenih uporabnih stratigrafskih podatkov. Na obstoj delavnice kažejo tudi najdbe s Hočevarice, a je bila sonda, vsega 8 m<sup>2</sup>, premajhna za ožje lociranje livarske delavnice v naselbino, katere natančen obseg, tudi sicer, še ni ugotovljen (Velušček 2004c, sl. 3.1.2, sl. 3.1.3).

### Zaključek

Kakor je razvidno sta bila razvoj koliščarskih kultur in poselitev Ljubljanskega barja tesno povezana z metalurško dejavnostjo, kar nedvomno dokazujejo številne tovrstne najdbe. Zdi se tudi, da sta proizvodnja in distribucija kovinskih predmetov v Srednji Evropi v pozitivni korelaciji, s krajšo časovno distanco, s koliščarsko poselitvijo Ljubljanskega barja: v obdobju večjega povpraševanja po bakrenih predmetih je bilo Ljubljansko barje poseljeno, v obdobju, ko se povpraševanje zmanjša Ljubljansko barje ni poseljeno (Velušček, Greif 1998, 45-46; Velušček 2004a, 76-79; 2004b, 303-304; prim. s Krause 2003, Abb. 240).

Trenutno je na Ljubljanskem barju prvi metalurški »boom« povezljiv s koliščarji iz 4. tisočletja pr. Kr. Bolj natančno moremo začetek lokalne metalurške proizvodnje postaviti v drugo četrtino 4. tisočletja (glej Velušček, Greif 1998, 38-41; Velušček 2004b, 298-303). Njenemu razvoju pa lahko bolj ali manj kontinuirano sledimo do 32. stoletja. Do ponovnega razcveta metalurške dejavnosti pride približno v obdobju druge in tretje četrtine 3. tisočletja pr. Kr. (glej Durman 1983, 66-67; Velušček, Greif 1998, 42-44; Velušček 2005c, 206-207) in zdi se, da tudi ob koncu koliščarske dobe okvirno v prvi polovici 2. tisočletja, v obdobju t. i. litzenske keramike.

Tako kot drugod, so verjetno tudi na prazgodovinskem Ljubljanskem barju kovači imeli pomembno vlogo v družbi (prim. Eliade 1983, 93-104; Durman 2004). Ukvarjali so se namreč z dejavnostjo, ki je zahtevala veliko znanja ter je bila po značaju magijska (Eliade 1983; Durman 2004), v praksi pa je dejansko ogrožala vas in življenja vaščanov (prim. z Durman 2004, 34). Zdi se, da se takšen status kovača in njegove dejavnosti odseva tudi v izpostavljenosti livarske delavnice.

Na Maharskem prekopu opazimo, da je stavba, v kateri oziroma v bližini katere je morda deloval kovač drugače orientirana od ostalih stavb (sl. 5). Nekoliko drugače je na Starih gmajnah, kjer je ugotovljena livarska delavnica, ki je bila nedvomno ločena od ostale naselbine (sl. 6), kar bi lah-

settlement is not as distinguishable as it is at Stare gmajne. There are several reasons for this, and we will only mention the most important: 1. in the area in which the mould fragment was found, the settlement boundary has not yet been determined; 2. the cylindrical end piece of the bellows was found at the opposite end of the settlement – most probably it originates from a Založnica ditch (Jesse 1955, p. 265, Pl. 2, 14), which passes to the south-west or west of the ditches marked on Fig. 1.

We have somewhat convincing indications of the existence of smelting workshops from two or even three sites in Ljubljansko barje: Maharski prekop, Stare gmajne, and possibly also Založnica. These are certainly not the only pile-dwelling settlements in which we can expect them. Even Dežman came across finds that suggest with a high degree of certainty that such workshops existed (Deschmann 1877, p. 475; 1878, pp. 6-8). Unfortunately, we have no usable stratigraphic data concerning these finds. Some finds from Hočevarica also indicate that a workshop existed there, but the test-pit measuring only 8 m<sup>2</sup> was too small to locate the smelting workshop within the settlement, the exact surface of which has not yet been determined (Velušček 2004c, Fig. 3.1.2, Fig. 3.1.3).

### Conclusion

It is evident that the development of pile-dwelling cultures and settlement of Ljubljansko barje were closely related to metalworking – a fact that is clearly confirmed by numerous finds. It would also appear that the production and distribution of metal objects in Central Europe were correlated, with a brief temporal distance, with the development of pile-dwelling settlements in Ljubljansko Barje: in the period in which the demand for copper items was higher, Ljubljansko Barje was inhabited, whereas in the period in which the demand fell, Ljubljansko Barje was not inhabited (Velušček, Greif 1998, pp. 45-46; Velušček 2004a, pp. 76-79; Velušček 2004b, pp. 303-304, cf. Krause 2003, Abb. 240).

At the moment, the first metallurgical boom in Ljubljansko barje can be linked to the pile-dwellers from the 4<sup>th</sup> millennium B.C. More precisely, we can place the beginning of the local metalworking in the second quarter of the 4<sup>th</sup> millennium B.C. (see Velušček, Greif 1998, pp. 38-41; Velušček 2004b, pp. 298-303). Afterwards, its development can be traced more or less continuously until the 32<sup>nd</sup> century. The renewal of the metalworking activity occurred in approximately the second and third quarter of the 3<sup>rd</sup> millennium B.C. (see Durman 1983, pp. 66-67; Velušček, Greif 1998, pp. 42-44; Velušček 2005c, pp. 206-207) and then probably also at the end of the pile-dwelling era, falling approximately in the first half of the 2<sup>nd</sup> millennium B.C., in the period of so-called Litzsen Pottery.

As elsewhere, in prehistoric Ljubljansko barje the smelters probably played a significant role in the society (e.g. Eliade 1983, pp. 93-104; Durman 2004). They were engaged in an activity which required a lot of knowledge, and it has magical implications (Eliade 1983, Durman 2004), and in practice it posed a real danger to them and other villagers (cf. Durman 2004, p. 34). It seems that such a status of the smelter and his activity was also reflected in the isolated position of the smelting workshop.

At Maharski prekop we can see that the building in which, or in the vicinity of which, the smelter may have carried out his activity, was oriented differently than other buildings (Fig. 5). The situation is somewhat different at Stare gmajne, where the smelting workshop was undoubtedly separated from the rest of the settlement (Fig. 6), and the same could be true of

ko veljalo tudi v primeru približno 700 do 800 let mlajšega kolišča Založnica pri Kamniku pod Krimom (sl. 7).

Za konec naj poudarimo, da izstopajo položaj livarskih delavnic kaže, da je med koliščarji na Ljubljanskem barju zagotovo obstajala delitev dela. Še več, zdi se da moremo govoriti tudi že o pojavu elit, ki med drugim, v 2. polovici 4. tisočletja pr. Kr., uporabljajo eminentno iznajdbo, tj. dvokolesni voz (prim. s Pétrequin et al. 2006, 394).

the pile-dwelling settlement of Založnica near Kamnik pod Krimom (Fig. 7), which was 700 to 800 years younger.

In the end we can underline that the isolated position of smelting workshops is an indication that the inhabitants of pile-dwelling settlements in Ljubljansko barje practised division of labour. Moreover, it seems that we can even talk about the appearance of a social elite, which, among other things, in the second half of the 4<sup>th</sup> millennium B.C., used a prominent innovation: a two-wheeled cart (cf. Pétrequin et al. 2006, p. 394).

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